Proposed Solar PV Development

Byers Gill Solar
EN010139

6.2.11 Environmental Statement Chapter 11 Noise and Vibration

Planning Act 2008

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

February 2024

Revision C01

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Table of Contents

Figures

Appendices

11. Noise and Vibration

11.1. Introduction

11.1.1. This Environmental Statement (ES) chapter presents the impact assessment and likely significant effects of Byers Gill Solar ('the Proposed Development') on Noise and Vibration.

11.1.2. The Environmental Impact Assessment (EIA) Scoping Report (ES Appendix 4.1) (Document Reference 6.4.4.1) sets out the scope of the Noise and Vibration assessment. In summary, the following have been scoped in and assessed in this ES:

- The potential impact of noise and vibration from the construction activities upon the nearest existing sensitive receptors.
- The potential impact of noise and vibration from construction traffic whilst on site and whilst using the road network on existing sensitive receptors.
- The potential impact of noise from the proposed operation including any plant and operational traffic related to the Proposed Development upon the nearest existing sensitive receptors.

11.1.3. This ES chapter:

- Details the requirements of principal legislation, policy and guidance relevant to this assessment;
- Details the methodology followed for the assessment, and any associated assumptions and limitations;
- Describes the existing environment surrounding the Proposed Development;
- Describes the potential effects of the Proposed Development on the nearest sensitive receptors from noise and vibration and describe the mitigation measures.

11.1.4. This ES chapter is supported by the following appendices:

- ES Appendix 11.1: Noise and Vibration Guidance (6.4.11.1)
- ES Appendix 11.2: Noise Monitoring Data (Document Reference 6.4.11.2);
- ES Appendix 11.3 Details of Noise Model (Document Reference 6.4.11.3);
- ES Appendix 11.4 BS4142 Assessment Calculations (Document Reference 6.4.11.4); and
- ES Appendix 11.5 Selection of background levels (Document Reference 6.4.11.5).

11.1.5. This ES chapter is also supported by ES Figures11.1 to 11.8 (Document References 6.3.11.1 to 6.3.11.8).

11.1.6. This ES Chapter should be read in combination with ES Chapter 12 Traffic and Transport (Document Reference 6.2.12) to provide a full understanding of the context and the likely impacts of Noise and Vibration.

11.1.7. An assessment of the impacts of the Proposed Development on vibration during the operational phase has been scoped out of the assessment. For further information, see Section 11.3, Scoping and Consultation, of this ES Chapter.

11.1.8. The cumulative impact assessment of noise and vibration is addressed in ES chapter 13 Cumulative Effects.

11.1.9. This ES chapter and the supporting ES Appendices and ES Figures have been prepared by competent experts at Wardell Armstrong LLP. Full details of these competent experts are provided in ES Appendix 1.1 Competent Expert Evidence (Document Reference 6.4.1.1).

11.2. Legislative and policy framework

11.2.1. The relevant legislation, planning policy and guidelines which underpin the assessment methodology for this chapter and inform the scope of the assessment are outlined in this section.

Legislation

11.2.2. The following key legislation is applicable to the assessment:

11.2.3. The Control of Pollution Act 1974 (COPA 1974), is the key legislation of relevance for the assessment. COPA 1974 gives the local authority power to serve a notice under Section 60 imposing requirements as to the way in which works are to be carried out. This could specify times of operation, maximum levels of noise which should be emitted and the type of plant which should or should not be used.

11.2.4. If required, a contractor can obtain prior consent under Section 61 of COPA 1974. Section 61 enables anyone who intends to carry out works to apply to the local authority for consent. Under Section 61 the local authorities and those responsible for demolition and construction work, have an opportunity to settle any problems, relating to the potential noise, before work starts.

11.2.5. Section 72 of COPA also defines Best Practicable Means (BPM), which will form the basis of mitigation during the construction stage.

Section 72 states the following:

(1) This section shall apply for the construction of references in this Part of this Act to best practicable means.

(2) In that expression "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.

(3) The means to be employed include 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.

(4) The test of best practicable means is to apply only so far as compatible with any duty imposed by law, and in particular is to apply to statutory undertakers only so far as compatible with the duties imposed on them in their capacity of statutory undertakers.

(5) The said test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

(6) Subject to the preceding provisions of this section, regard shall be had, in construing references to "best practicable means", to any relevant provision of a code of practice approved under the preceding section.

Policy

11.2.6. The following national and local policies of relevance have been considered:

National

11.2.7. Under Section 104 of the Planning Act 2008 (the Act), the Secretary of State (SoS) is directed to determine a Development Consent Order (DCO) application with regard to the relevant National Policy Statement (NPS), the local impact report, matters prescribed in relation to the Proposed Development, and any other matters regarded by the SoS as important and relevant. Following their designation on 17 January 2024, there are three NPSs which are considered to be 'relevant NPS' under Section 104 of the Act:

- Overarching NPS for energy (NPS EN-1)
- NPS for renewable energy infrastructure (NPS EN-3)
- NPS for electricity networks infrastructure (NPS EN-5)

11.2.8. It is considered that other national and local planning policy will be regarded by the SoS as 'important and relevant' to the Proposed Development. A detailed account of the planning policy framework relevant to the Proposed Development is provided in the Planning Statement (Document Reference 7.1). The Policy Compliance Document (Document Reference 7.1.1) evidences how the assessment of climate change has been informed by and is in compliance with the NPSs and relevant national and local planning policies. It provides specific reference to relevant sections of the ES which address requirements set out in policy.

Guidance

11.2.9. The following guidance informs the assessment:

- National Planning Practice Guidance - Noise [1]
- Guidelines for Environmental Noise Impact Assessment [2]
- British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings – Code of Practice (BS8233) [3]
- British Standard 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound [4]
- BS5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (BS5228-1), and Part 2: Vibration (BS5228-2) [5].

11.2.10. Further details of the guidance documents are shown in ES Appendix 11.1 Noise and Vibration Guidance (Document Reference 6.4.11.1).

11.3. Scoping and Consultation

11.3.1. This section describes the scope of this Noise and Vibration assessment, including how the assessment has responded to the Scoping Opinion. A description of the consultation and engagement undertaken with relevant technical stakeholders to develop and agree this scope is also provided.

Scoping

11.3.2. The EIA Scoping Report set out the proposed scope and assessment methodologies to be employed in the EIA and is provided in ES Appendix 4.1 EIA Scoping Report (Document Reference 6.4.4.1).

11.3.3. In response to the EIA Scoping Report, a Scoping Opinion was received from the Planning Inspectorate (PINS) on 6 December 2022 and is provided in ES Appendix 4.2 EIA Scoping Opinion (Document Reference 6.4.4.2)

11.3.4. ES Appendix 4.3 EIA Scoping Opinion Response Matrix (Document Reference 6.4.4.3) contains a table that outlines all matters identified by PINS in the EIA Scoping Opinion and how these have been addressed in the ES or other DCO application documentation.

11.3.5. The Proposed Development does not include any sources of vibration during the operational phase. Vibration during the operational phase has therefore not been considered further.

11.3.6. An assessment of traffic movements during the operational phase of the development is provide in ES Chapter 12 Traffic and Transport (Document Reference 6.2.12). Traffic during the operational phase will be less than 1 vehicle per day. The Design Manual for Roads and Bridges [6] notes that a 25% increase in road traffic would result in a noise

increase of less than 1dB, which is not discernible to the human ear. 1 vehicle per day would be far less than a 25% increase on any of the routes in question and is therefore not expected to cause any adverse noise impact.

Consultation

11.3.7. Engagement in relation to Noise and Vibration has been undertaken with a number of stakeholders throughout the EIA process. The stakeholders consulted were:

- Stockton on Tees Borough Council; and
- Darlington Borough Council.

11.3.8. The Consultation Report (Document Reference 5.1) submitted alongside the DCO application contains a full account of the previous statutory consultation process and issues raised in feedback. Matters raised regarding the scope, methodology or mitigation considered as part of the Noise and Vibration assessment were then subject to further discussions directly with stakeholders.

11.3.9. Table 11-1 provides a summary of engagement with relevant stakeholders which has been undertaken to inform the EIA.

Table 11-1 Stakeholder engagement relating to Noise and Vibration

Stakeholder	Comment	Response
Stockton on Tees Borough Council	Proposed survey and assessment methodology issued via email on 3 of April 2023 to the Council from Wardell Armstrong LLP	A response was received on 17 April stating the following requirements: ▪ in line with BS4142 guidelines, the predicted rating level of the Proposed Development should not exceed background noise levels by more than 5dB; and ▪ there should be no increase to ambient noise levels at receptors due to noise from the Proposed Development.
Darlington Borough Council	Proposed survey and assessment methodology issued via email on 17 April 2023 to the Council from Wardell Armstrong LLP	Response received on 21April 2023 confirming the proposed methodology

11.4. Assessment Methodology

11.4.1. This section outlines the methodology employed for assessing the likely significant effects on Noise and Vibration from the construction, operation and decommissioning of the Proposed Development.

11.4.2. Noise and vibration emissions due to the Proposed Development will occur during the construction and decommissioning phases. The noise and vibration levels during the construction and decommissioning phases are likely to be similar. Noise emissions due

to the Proposed Development during the operational phase of the Proposed Development may also occur.

11.4.3. The noise assessment has been undertaken using the following steps:

- Baseline noise monitoring to establish the existing noise levels at existing sensitive receptors. The monitoring was undertaken in line with guidelines outlined in this chapter to determine representative noise levels at the receptors during the daytime (0700-2300hrs) and night-time(2300-0700hrs). The survey is described in paragraph 11.4.4;
- Noise modelling using modelling software has been undertaken, taking into account the Proposed Development's layout, proposed equipment noise levels and traffic data (operational phase) to predict noise levels at receptors associated with the Proposed Development. Full details of the noise model and set up are included within ES Appendix 11.3 Details of Noise Model (Document Reference 6.4.11.2);
- A comparison has been undertaken of the existing and proposed noise levels during the operational phase to determine the magnitude of impact and significant effects, according to the guidelines;
- An estimate of the degree of impact of the construction/decommissioning noise and vibration has been undertaken according to the suggested standards outlined in this chapter, by reference to the time periods, during which noise and vibration may occur in excess of quoted values;
- Review of requirements for potential noise mitigation where results from the above steps suggest mitigation is required; and
- Assessment of magnitude of impact and subsequent residual significant effects

11.4.4. Background noise monitoring was undertaken between 18 - 21 April 2023 at nine locations around the Proposed Development that are considered representative of the nearest noise sensitive receptors. The monitoring was undertaken during dry calm weather with low wind speeds in line with relevant noise monitoring guidelines. The monitoring locations are shown in ES Figure 11.2 (Document Reference 6.3.11.2), and the monitoring data is shown in full in ES Appendix 11.2 Noise Monitoring Data (Document Reference 6.4.11.1).

11.4.5. This monitoring data has been compared with predicted noise levels associated with the Proposed Development in line with guidelines, to determine the potential impact of the Proposed Development.

11.4.6. The Proposed Development has been assessed in accordance with the guidance detailed in ES Appendix 11.1 Noise and Vibration Guidance (Document Reference 6.4.11.1) to determine whether statutory objectives are exceeded or whether undesirable/desirable consequences may occur on the receiving environment. Where potential adverse impacts are identified, appropriate mitigation measures are proposed to avoid, reduce or compensate for the adverse effects. The significance of an environmental impact will

be determined not only by the magnitude of the impact but also by the sensitivity of the receptor as shown in Table 11-2 - Table 11-7.

11.4.7. The sensitivity of the receptors has been considered on a scale of high, moderate, low or negligible. The methodology used to determine the sensitivity is shown below in Table 11-2.

Table 11-2 Sensitivity of Receptor

Sensitivity	Receptor Type
High	Receptor/resource has little ability to absorb change without fundamentally altering its present character or is of international or national importance. For example, hospitals, residential care homes, and internationally and nationally designated nature conservation Sites which are also known to contain noise sensitive species (i.e., noise may change breeding habits or threaten species in some other way).
Moderate	Receptors/resource has moderate capacity to absorb change without significantly altering its present character. For example, residential dwellings, offices, schools, and play areas. Locally designated nature conservation Sites which are also known to contain noise sensitive species (i.e., noise may change breeding habits or threaten species in some other way).
Low	Receptor/resource is tolerant of change without detriment to its character or is of low or local importance. For example, industrial estates.
Negligible	Receptor/ resource is not sensitive to noise.

11.4.8. The magnitude of impact (hereafter referred to as the magnitude of change for consistency across the ES) has been considered as the change experienced from the current baseline conditions at the sensitive receptor and has been considered on a scale of high, moderate, low or negligible.

11.4.9. The methodology used to determine the magnitude of change for operational noise, road traffic noise, construction noise and construction vibration is shown below in Table 11-3, Table 11-4, Table 11-5 and Table 11-7 respectively.

Table 11-3 Magnitude of Operational Noise Impact

Magnitude of Change	Criteria
High	Impact resulting in a considerable change in baseline environmental conditions predicted either to cause statutory objectives to be significantly exceeded or to result in severe undesirable/desirable consequences on the receiving environment.
Moderate	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause statutory objectives to be marginally exceeded or to result in undesirable/desirable consequences on the receiving environment.
Low	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated.
Negligible	No discernible change in the baseline environmental conditions, within margins of error of measurement.

Table 11-4 Magnitude of Road Traffic Noise Impact Criteria

Magnitude of Change	Criteria
High	> 10.0 dB increase in traffic noise (equating to a clearly perceptible increase in the loudness of noise).
Moderate	5.0 – 9.9 dB increase in traffic noise (equating to an increase in the loudness of the noise which is at or about the threshold of perception)
Low	3.0 – 4.9 dB increase in traffic noise
Negligible	0.1 – 2.9 dB increase in traffic noise.

Table 11-5 Magnitude of Construction Noise Impact

Magnitude of Change	Criteria
High	Noise levels exceed the Assessment Category threshold level, (Assessment Category Thresholds described in Table 11-6) for the duration of the construction works.
Moderate	Noise levels exceed the Assessment Category threshold level for periods of more than one month, but for significantly less than the whole duration of the construction works.
Low	Noise levels exceed the Assessment Category threshold level for periods of less than one month.
Negligible	Noise levels do not exceed the Assessment Category threshold level during any period.

Table 11-6 Thresholds of Significant Impact from Construction Noise at Residential Receptors in accordance with the ABC method of BS5228-1

Assessment Category Threshold Value Period (L_{Aeq})	Threshold Value in Decibels (dB)		
	Category A *1	Category B *2	Category C *3
Daytime (0700 to 1900 hours) and Saturdays (0700 to 1300 hours)	65	70	75
*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.			
*2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.			
*3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.			

Table 11-7 Magnitude of Construction Vibration Assessment Impact

Magnitude of Change	Criteria
High	> 10mm per sec. Vibration likely to be intolerable for more than brief exposure. Approaching the level at which cosmetic damage may occur in light structures.
Moderate	5mm – 10mm per second. Tolerance less likely even with prior warning and explanation.
Low	1mm – 5mm per second. Complaints are likely, but can be tolerated if prior warning and explanation given.
Negligible	<1mm per second. Below level at which complaints are likely.

11.4.10. The significance of effect has been informed by the magnitude of change due to the Proposed Development and the evaluation of the sensitivity of the affected receptor. The significance of effect has been determined using professional judgement and Table 11-8 has been a tool which has assisted this process.

11.4.11. Whilst Table 11-8 provides ranges, the level of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. Effects which are moderate and above are considered significant. Effects with are slight and below are considered not significant.

Table 11-8 Effect Significance Matrix

Sensitivity	Magnitude of Change			
	High	**Moderate**	**Low**	**Negligible**
High	Very Substantial	Substantial	Moderate	None
Moderate	Substantial	Substantial	Moderate	None
Low	Moderate	Moderate	Slight	None
Negligible	None	None	None	None

11.5. Assessment Assumptions and Limitations

11.5.1. This section provides a description of the assumptions and limitations to the Noise and Vibration assessment.

Assumptions

- The equipment within the Proposed Development will operate at 100% of their operational capacity during the daytime and night-time.
- The noise specifications for each piece of equipment (as supplied by the Applicant, and shown in Appendix 11.3) are up to date and accurate.
- The equipment installed will be serviced as instructed.

Limitations

11.5.2. It was not possible to undertake monitoring directly adjacent to all Existing noise Sensitive Receptors (ESR)s due to restricted access, therefore the monitoring has been undertaken at the nearest suitable location that is considered to be representative of the ESRs in accordance with relevant guidelines.

11.6. Study Area

11.6.1. For the purpose of the noise assessment, the study area consisted of the Order Limits and within a radius of up to 300m beyond those Order Limits where there any ESRs, in line with best practice. There 35 identified ESRs within the assessment area, which are shown on Figure 11.1. No specific dimension of a study area is given for assessment of industrial and commercial sound or construction noise and vibration; however, our professional judgement is that 300m is sufficient to encompass where any noise sensitive receptors are potentially affected by a Proposed Development of this type and has been used for this assessment. Where a receptor sits slightly outside the 300m buffer, but is representative of receptors in a certain direction, it has been included for completeness and to ensure a robust assessment.

11.7. Baseline Conditions

11.7.1. This section provides a description of existing conditions in the study area.

Existing conditions

11.7.2. The Proposed Development is in a rural area of low population density, except for individual settlements such as Bishopton and Redmarshall to the north and Carlton to the east. Potential noise-sensitive dwellings are located within these settlements or as more isolated properties or farms. The nearest identified sensitive receptors to the Proposed Development are shown in ES Figure 11.1 (Document Reference 6.3.11.1).

Panel Area A: Brafferton

- Properties in towns and settlements: Brafferton village 6km to the west, Newton Ketton 3km to the east;
- Local farms: Lovesome Hill Farm within 100m north and west, High House 150m north, High Grange 500m north and East Ketton immediately south; and
- Ecological receptors: there are no onsite ecological receptors. The nearest designated sites are Redcar Field Site of Special Scientific Interest (SSSI) which is approximately 650m to the west of Panel Area A and Newton Ketton Meadow SSSI located approximately 900m to the east of Panel Area A.

Panel Area B: Hauxley Farm

- Properties in towns and settlements: there are no nearby towns or settlements;

- Local farms: Oat Hill Farm immediately west, Stainton Hill House immediately north, Fir Tree Farm approximately 300m southwest and Hauxley Farm which lies in the centre of Panel Area B; and
- Ecological receptors: there are no onsite ecological receptors. The nearest site is Newton Ketton Meadow SSSI located approximately 450m to the south of Panel Area B.

Panel Area C: Byers Gill Wood

- Properties in towns and settlements: there are no nearby towns or settlements;
- Local farms: The Mount immediately east, Viewley Hill Farm 350m east, Long Pasture Farm 500m southeast and Mount Pleasant Farm which lies in the centre of Panel Area B; and
- Ecological receptors: Byers Gill Wood and Square Wood within the centre of Panel Area C, Galloping Hill Plantation located to the east, with Nova Scotia Plantation and Catkill Lane Plantations to the south. The nearest designated site is Newton Ketton Meadow SSSI located approximately 100m to the west of Panel Area C.

Panel Area D: Great Stainton

- Properties in towns and settlements: Great Stainton village lies 10m northwest;
- Local farms: Viewley Farm 250m west, Broad Lea farm 400m east, Woogra Farm 300m east and Mount Pleasant Farm 250m southwest; and
- Ecological receptors: there are no onsite ecological receptors. The nearest designated site is Newton Ketton Meadow SSSI located approximately 1.5km to the south of Panel Area D.

Panel Area E: West of Bishopton

- Properties in towns and settlements: residential properties approximately 40m north and the small rural village Bishopton, along the northwestern boundary;
- Local Farms: New Summer Farm adjacent to the northern boundary of Panel Area E. and
- Ecological receptors: there are no onsite ecological receptors. The nearest designated site is Whitton Bridge Pasture SSSI located approximately 2.5km to the east of Panel Area E.

Panel Area F: North of Bishopton

- Properties in towns and settlements: Bishopton Village lies approximately 10m south, with Old Stillington village approximately 220m north;
- Local farms: Downland Farm which lies encircled in Panel Area F, Adeux Lodge 300m east, Glebe Farm 500m southeast and West House Farm immediately east; and

- Ecological receptors: there are no onsite ecological receptors. The nearest designated site is Whitton Bridge Pasture SSSI, located approximately 900m to the east of Panel Area F.

Baseline Monitoring

11.7.3. Wardell Armstrong LLP carried out a survey to assess the sound levels at nine MLs shown in ES Figure 11.2 (Document Reference 6.3.11.2) and described in Table 11-9 below.

11.7.4. The survey was undertaken between the 18 April and 21 April 2023.

Table 11-9 Noise Monitoring Locations

Monitoring Location	6 digit coordinates (x,y)	Description of Location	Observations / Noise Sources
ML1	429703 ,521215	Down a mud track surrounded by trees and open agricultural land. Houses and abandoned farmhouses nearby.	Road traffic noise from the A1(M) heard to the northwest. Birdsong in trees and the occasional car passing on private track road.
ML2	431324 ,520618	Located on a Slaters Lane. Farmhouses and agricultural buildings nearby. Surrounded by open land.	Just audible distant road traffic noise. Birdsong and occasional car passing on nearby farm track (Slaters Lane).
ML3	432198 ,522381	Residential property at Stainton Hill Darm, located along Lodge Lane	Nearby road traffic noise on Ledge Lane, vehicles passing frequently. Agricultural noise from a local farm on the opposite side of Lodge Lane. Birdsong could also be heard.
ML4	432500 ,521974	Located on a country road that leads to Hauxley Poultry Farm. Surrounded by open land.	Road traffic noise from road to the north.
ML5	433772 ,520455	Located along a road surrounded by open agricultural land. Wind turbines could be seen towards the southwest.	Road traffic noise from Bishopton Lane
ML6	433596 ,521751	Positioned near some woodland along Elstob Lane. Near a small settlement of houses to the south of Glebe Road.	Road traffic noise from Bishopton Lane and some noise from the farm to the south.
ML7	433853 ,522062	Located on Glebe Road which leads into a residential estate.	Primarily road traffic noise to the north. Occasional car on Glebe Road.
ML8	435682 ,521273	Located down a country lane surrounded by open agricultural land and a farm.	Road traffic noise on nearby road to the north.
ML9	436578 ,521524	Residential property at 2 Cobby Castle Lane. Neighbouring property is further up the road, but the surroundings are mainly open agricultural land.	Road traffic noise on Mill Lane to the south.

11.7.5. Noise monitoring was undertaken for a representative period, i.e. 24 hours to cover a full day and night, to establish the baseline conditions during the daytime and part of the night-time during which it would be bright enough for the solar farm to operate.

11.7.6. The noise measurements were made using Type 1, integrated sound level meters. The microphones were mounted on tripods with the diaphragms horizontal, 1.5m above the ground and more than 3.5 metres from any other reflecting surfaces.

11.7.7. All noise monitoring took place during dry and calm weather conditions. The sound level meters were calibrated to a reference level of 94dB at 1kHz both before, and on completion of, the noise survey. No drift in calibration over 0.5dB was recorded during the survey.

11.7.8. A-weighted[1] L_{eq}[2] and L_{90}[3] noise levels have been measured to comply with the requirements of BS4142. A-weighted maximum sound pressure levels were also measured to provide additional information.

Existing measured noise levels

11.7.9. The results of each of the monitoring locations are presented in Table 11-10 The noise monitoring results are provided in full at ES Appendix 11.2 Details of Noise Model (Document Reference 6.4.11.2).

11.7.10. The daytime measured noise levels presented in Table 11-10 have been defined in 1-hour periods and the night-time over 15-minute periods in accordance with reference periods required by BS4142.

Table 11-10 Noise Monitoring Levels Summary

Monitoring Location	Time	Average Measured Ambient Noise Level (dB $L_{Aeq,T}$)	Measured Background Noise Levels (dB L_{A90})			
			Range	Mode	Mean	Median
ML1	Daytime (0700-2300)	48	38-53	51	38	51
	Night-time (2300-0700)	46	38-56	39	34	40
ML2	Daytime (0700-2300)	52	28-39	37	33	37
	Night-time (2300-0700)	55	29-47	30	29	31
ML3	Daytime (0700-2300)	63	25-51	37-39	36	39

[1] A' Weighting An electronic filter in a sound level meter which mimics the human ear's response to sounds at different frequencies under defined conditions.

[2] L_{eqs} Equivalent continuous noise level; the steady sound pressure which contains an equivalent quantity of sound energy as the time-varying sound pressure levels.

[3] L_{90} The noise level which is exceeded for 90% of the measurement period.

Monitoring Location	Time	Average Measured Ambient Noise Level (dB $L_{Aeq,T}$)	Measured Background Noise Levels (dB L_{A90})			
			Range	Mode	Mean	Median
	Night-time (2300-0700)	57	23-52	25	25	26
ML4	Daytime (0700-2300)	49	27-44	42	37	41
	Night-time (2300-0700)	48	28-47	28	29	39
ML5	Daytime (0700-2300)	70	27-52	40	38	38
	Night-time (2300-0700)	61	25-56	26	26	30
ML6	Daytime (0700-2300)	57	32-57	51-53-55	49	52
	Night-time (2300-0700)	52	21-60	21	22	26
ML7	Daytime (0700-2300)	53	33-52	49	41	49
	Night-time (2300-0700)	53	29-49	31	31	33
ML8	Daytime (0700-2300)	62	30-42	36	34	38
	Night-time (2300-0700)	55	28-42	31	29	31
ML9	Daytime (0700-2300)	50	29-45	39	34	41
	Night-time (2300-0700)	43	27-46	42	29	38

Uncertainty

11.7.11. To reduce measurement uncertainty, the following steps have been taken:

- The background sound measurement locations were selected to be representative of the background noise level at ESRs.
- In accordance with guidance, the sound level meter was mounted on a tripod 1.5m above the ground. The monitoring location was also more than 3.5 metres from any other reflecting surfaces.
- The noise measurements were taken during dry and calm weather conditions for most of the monitoring period.
- The noise measurements were undertaken during proposed operational times and are representative of the daytime and night-time periods.
- The results of each measurement period were recorded to the nearest 0.1dB.
- Background noise measurements were made using Class 1 integrating sound level meters.

Future Baseline

11.7.12. The general approach to defining future baseline for the Proposed Development is described in ES Chapter 4 Approach to EIA (Document Reference 6.2.4), and has been followed in this chapter.

11.7.13. The Proposed Development is located in a rural area where noise levels remain fairly low due to the absence of any loud noise sources. The main source of noise affecting all receptors is road traffic. Whilst traffic noise may increase slightly in future years, due to the rural nature of the development location it is unlikely that this will be perceptible. If baseline noise levels do increase, this will further mask the noise of the Proposed Development and lower any perceived impact. Because of this, no future baseline assessment is considered necessary or relevant and therefore no future baseline noise levels are required.

11.8. Potential impacts

11.8.1. Based on the design of the Proposed Development during operation and associated construction and decommissioning activities, the Proposed Development has the potential to impact on Noise and Vibration during construction, operation and decommissioning.

11.8.2. Mitigation measures incorporated in the design and construction of the Proposed Development are reported as embedded mitigation in ES Chapter 2 The Proposed Development (Document Reference 6.2.2). Essential mitigation is reported in Section 11.9, design, mitigation and enhancement measures, of this ES chapter.

11.8.3. Potential impacts of the Proposed Development, prior to the implementation of the essential mitigation measures described in Section 11.9, are described in this section. The effects of the Proposed Development, accounting for this essential mitigation, are then described in Section 11.10.

Construction

11.8.4. During the construction phase, the Proposed Development will produce the following effects:

- construction traffic, including heavy goods vehicle (HGV) trips to and from the Proposed Development; and
- construction activities, including preparatory works, and installation of solar PV modules and supporting equipment. These may include activities such as site clearance and ground excavation, which could all be sources of noise and vibration.

11.8.5. Construction of the Proposed Development will be transient in nature and best working practice will be implemented to ensure the effects associated with noise and vibrations will be less significant. This will be managed via the CEMP, which will be secured as under requirement 4 of the DCO. The CEMP will be based upon ES

Appendix 2.6 Outline Construction Environmental Management Plan (Document Reference 6.4.2.6).

Operation

11.8.6. During the operational phase, the Proposed Development may produce the following effects:

- road traffic to and from the Proposed Development; and
- supporting infrastructure including inverters and transformers, battery energy storage system (BESS) and the on-site substation.

Decommissioning

11.8.7. During the decommissioning phase, the methods and duration of works are expected to be similar to or lower than the construction phase, meaning that the potential effects will be similar or less. This will be managed via the DEMP, which will be secured as under requirement 5 of the DCO. The DEMP will be based upon ES Appendix 2.7 Outline Decommissioning Environmental Management Plan (DEMP) (Document Reference 6.4.2.7) .

11.9. Embedded mitigation

11.9.1. The Proposed Development has been designed to avoid and prevent adverse environmental effects on noise and vibration through the process of design development and consideration of good design principles.

11.9.2. Mitigation measures incorporated in the design and construction of the Proposed Development, considering the potential impacts, are reported as embedded mitigation in ES Chapter 2 The Proposed Development (Document Reference 6.2.2).The effects of the Proposed Development are assessed considering embedded mitigation is in place and are reported in Section 11.10.

11.9.3. Where required further mitigation is deemed required as a result of a potentially significant effect, this is termed essential mitigation. Essential mitigation is set out as part of the assessment of effects in Section 11.10.

11.9.4. A further definition of these classifications of mitigation and how they are considered in the EIA is provided in Section 4.5 in ES Chapter 4 Approach to EIA (Document Reference 6.2.4).

11.10. Assessment of likely significant effects

11.10.1. This section presents the likely effects on noise and vibration resulting from the construction, operation and decommissioning of the Proposed Development.

11.10.2. The assessment of effects takes into account the potential impacts to each receptor (as set out in Section 11.8) following the implementation of embedded mitigation (as set

out in Section 11.9). Where required to mitigate potentially significant effects, essential mitigation measures are outlined as part of the assessment, and the overall significance of residual effects set out.

Construction

11.10.3. Noise and vibration effects during the construction phase would be caused by works activities associated with site preparation, plant installation, substation construction and cable laying.

11.10.4. The above activities have the potential to generate short-term increases in noise levels, above those recommended in BS5228-1 [5]. The levels of noise received at the receptors closest to the Proposed Development would depend on the sound power levels of the machines used, the distance to the properties, the presence of screening or reflecting surfaces and the ability of the intervening ground to absorb the propagating noise.

Noise from construction traffic

11.10.5. There is the potential for noise and vibration effects due to construction traffic, as HGV trips to and from the Proposed Development will be required to deliver materials and equipment. These vehicle trips would be temporary and would be unlikely to include large scale material removal or delivery. For instance, due to the nature of the Proposed Development, it is unlikely there will be a need to remove large amounts of material, spoil, earth etc. from the Proposed Development, nor a need for large amounts of construction materials such as concrete to be delivered.

11.10.6. An assessment of estimated construction traffic vehicles, generated by the Proposed Development, has been undertaken, as outlined in ES Chapter 12 Traffic and Transport (Document Reference 6.2.12).

11.10.7. As noted in paragraph 11.3.6, a traffic increase of less than 25% in traffic is not discernible in terms of noise levels. Therefore, while there may be short term temporary noise impacts due to construction traffic, it is very unlikely that these would be sufficient to constitute a significant effect due to the temporary nature, and the relatively low volume of movements. The magnitude of change is considered to be negligible in accordance with Table 11-4.

11.10.8. The sensitivity of the proposed receptors is considered to be moderate in accordance with Table 11-2.

11.10.9. Therefore, there is likely to be a short-term adverse effect, which is considered to be not significant.

11.10.10. No essential mitigation is required and therefore residual effects remain as reported.

Noise from construction activities

11.10.11. Based on the ambient noise levels measured, the appropriate category value has been determined for each of the sensitive receptors, as detailed in Table 11-11.

Table 11-11 Construction Noise Categories

Monitoring Location	Existing Sensitive Receptors	Average Measured Daytime Noise Levels (dB L_{Aeq})	Ambient Noise Level Rounded to the nearest 5dB L_{Aeq}	Appropriate Category Value A, B or C in accordance with BS5228-1 [5]	Noise level above which construction activities may cause a significant impact at receptor dB L_{Aeq}
ML1	4-8	48	50	A	65
ML2	1-3	52	50	A	65
ML3	9-12	63	65	B	70
ML4	13	49	50	A	65
ML5	14,15,23,24, 27	70	70	C	75
ML6	16	57	60	A	65
ML7	17-22, 25, 28	53	55	A	65
ML8	26, 29-31	62	60	A	65
ML9	32-35	50	50	A	65

The distance of the noise sensitive receptor to the Proposed Development, will vary depending on the phase of the Proposed Development under construction. Given the potentially small distances between the construction activities and residential dwellings, noise levels at the receptors may occur above those detailed in Table 11-11. The noise generated by the earthworks and construction phases of the Proposed Development may therefore exceed the relevant categories in BS5228 at the existing sensitive receptors located in the immediate vicinity of the construction phases of the proposed development at some times. However, this is likely to be limited to short periods of time during any working day and not for a number of days longer than 1 month, due to the transient nature of the construction. Construction will also be during daytime hours only. To minimise the potential levels of noise generated by the construction works best working practice would be put in place. Details can be found in Section 11.9 of this chapter and ES appendix 2.6 Outline CEMP (Document Reference 6.4.2.6). The noise impact from construction is therefore considered to be low in accordance with Table 11-5.

11.10.12. The sensitivity of the proposed receptors is considered to be moderate in accordance with Table 11-2. The magnitude of change is considered to be low in accordance with Table 11-5Table 11-5. Therefore, there is likely to be a short-term moderate adverse effect which is considered to be significant.

11.10.13. No essential mitigation is available and therefore residual effects remain as reported, although it is noted that these are temporary in nature and will only exist for short periods (not for longer than 1 month).

Vibration from construction activities

11.10.14. BS5228-2 [5] indicates that the threshold of perception is generally accepted to be between a PPV of 0.14 and 0.3mm/sec. In an urban situation it is unlikely that such vibration levels would be noticed. BS5228-2 [5] also indicates that it is likely that vibration of 1.0 mm/s in residential environments can cause complaint but can be tolerated if prior warning and explanation has been given to residents. The standard also indicates that 10 mm/s is likely to be intolerable for any more than a very brief exposure to this level.

11.10.15. The Ground Vibration caused by Civil Engineering Works Report [6] suggests that, when vibration levels from an unusual source exceed the human threshold of perception, complaints may occur. The onset of complaints due to continuous vibration is probable when the PPV exceeds 3mm/sec.

11.10.16. British Standard BS6472: 2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Part 1: Vibration Sources Other than Blasting' (BS6472-1) [7] suggests that adverse comments or complaints due to continuous vibration are rare in residential situations below a PPV of 0.8mm/sec. Continuous vibration is defined as "vibration which continues uninterrupted for either a daytime period of 16 hours or a night-time period of 8 hours". The proposed earthworks and construction work at the Proposed Development would not cause continuous vibration as defined in BS6472-1.

11.10.17. Human perception of vibration is extremely sensitive. People can detect and be annoyed by vibration before there is any risk of structural damage. Cases where damage to a building have been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants.

11.10.18. It is not possible to establish exact vibration damage thresholds that may be applied in all situations. The likelihood of vibration induced damage or nuisance would depend upon the nature of the source, the characteristics of the intervening solid and drift geology and the response pattern of the structures around the Proposed Development. Most of these variables are too complex to quantify accurately and thresholds of damage, or nuisance, are therefore conservative estimates based on a knowledge of engineering.

11.10.19. Where ground vibration is of a relatively continuous nature, there is a greater likelihood of structural damage occurring, compared to transient vibration; for example, that caused by transiting vehicles.

11.10.20. BS5228-2 [5] suggests that the onset of cosmetic damage is 15mm/sec (15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz for residential or light commercial type buildings). Any earthworks would be very minimal, and far less than what would be expected to damage a residential or light commercial type building.

11.10.21. Wardell Armstrong LLP's archives contain field trial measurements of ground vibration associated with types of machinery. This is used for representative purposes only and does not necessarily reflect the type of equipment to be used on site, although is considered to be conservative in estimating potential vibration levels. Therefore, these measurement levels are used as an indicative worst-case scenario of how much vibration could be produced. The representative measured levels made by Wardell Armstrong LLP using a Vibrock B801 Digital Seismograph, are set out in Table 11-12.

Table 11-12 Measured vibration levels of plant under normal operating conditions

Equipment	PPV (mm/s) at distance from source		
	10m	20m	30m
25-30 tonne excavator	0.175	0,075	Background
25 tonne dumptruck (Volvo A25) **Loaded** **Empty**	 1.000 0.225	 0.150 0.050	 Background Background
Dozer	1.050	0.400	Background
Vibrating roller drum **Vibrator on** **Vibrator off**	 4.470 0.500	 3.270 0.150	 2.350 0.050
Loading shovel	1.025	0.150	Background

11.10.22. The nearest sensitive receptors to the proposed construction works will vary depending on the part of the Proposed Development under construction. As a worst-case scenario earthworks and construction works may potentially take place at a distance of approximately 15m from existing residential properties. This vibration would also be transient only and for very limited periods during the works (i.e. when activities take place at the Site's boundaries, close to dwellings).

11.10.23. At this distance, it is considered unlikely that vibration due to the operation of construction machinery will be above the threshold of complaint.

11.10.24. In addition to the earthworks and construction works described, it is possible that piling will be required. At this time, the type(s) of piling which would be used at various locations across the Order Limits is not known and this will be confirmed at the pre-construction stage.

11.10.25. BS5228-2 [5] recognises that the most common form of vibration associated with piling is the intermittent type derived from conventional driven piling. The intensity of vibration disturbance, which may be registered at a receptor, will be a function of many factors. These are set out in BS5228-2 [5] and include:

- energy per blow or cycle;
- distance between source and receptor;
- soil structure interaction i.e., nature of connection between soil and structure being monitored; and
- construction of structure and location of measuring points e.g., soil surface, building foundation and internal structural element.

11.10.26. The receptors likely to be affected by piling will vary depending on the phase of the Proposed Development under construction. Once the precise building locations, ground conditions for each location and type(s) of piling are confirmed, vibration levels could be estimated and recommendations for control made as appropriate, however piling locations and methodology can selected such that vibration levels do not exceed the threshold of complaint as described in Table 11-7. Outline mitigation measures are discussed within Section 11.6 of this Chapter.

11.10.27. Following standard mitigation measures the magnitude of change is likely to be negligible.

11.10.28. The sensitivity of the proposed receptors is considered to be moderate in line with Table 11-2. The magnitude of change is considered to be negligible in line with Table 11-7. Therefore, there is likely to be no effect, which is considered to be not significant.

11.10.29. No essential mitigation is required and therefore residual effects remain as reported.

Operation

Identification of the Specific Sound

11.10.30. Details of the noise modelling equipment are shown in ES Appendix 11.3 Details of Noise Model (Document Reference 6.4.11.2). Noise modelling software SoundPLAN 8.2 has been used to calculate the operational noise levels at the existing receptors. The noise generating activities of the Proposed Development in operation have been carried out using data provided by the Applicant. The locations of the ESRs are shown in ES Figure 11.1 (Document Reference 6.3.11.1). The plant and modelled noise contours are shown on ES Figures 11.3 to 11.8 (Document Reference 6.3.11.3 to 6.3.11.8) and the specific noise levels at each receptor are shown in ES Appendix 11.4 BS4142 Assessment Calculations (Document Reference 6.4.11.3).

11.10.31. The noise levels have been modelled to the worst-case scenario with all equipment operating at 100% capacity, therefore the modelled noise levels are applicable for the daytime and night-time assessments.

Identification of the Background Sound Level

11.10.32. Section 8 of BS 4142 provides guidance on the selection of the background sound to be used in the assessment. BS 4142 states that the background sound levels used for the assessment should be representative of the period being assessed (i.e., daytime or night-time periods,) and that there is no 'single' background sound level.

11.10.33. For the purpose of the assessment the range of background sound levels during the day and night-time periods, measured at monitoring locations 1-9, have been used. The data collected and presented within ES Appendix 11.5 BS4142 Assessment Calculations (Document Reference 6.4.11.3) is considered representative of the $L_{A90,1\ hour}$ daytime and $L_{A90,15\ minutes}$ night-time, background sound levels at existing sensitive receptors.

11.10.34. The background sound levels measured throughout the daytime and night-time have been averaged for each Monitoring Location as shown in ES Appendix 11.5 BS4142 Assessment Calculations (Document Reference 6.4.11.3) and summarised in Table 11-13.

Table 11-13 Background Sound Levels at Existing Sensitive Receptors

Monitoring Location	Receptors	Background Sound Level	
		Daytime	Nighttime
ML1	4-8	42	34
ML2	1-3	37	33
ML3	9-12	38	25
ML4	13	42	33
ML5	14,15,23,24, 27	39	26
ML6	16	53	26
ML7	17-22, 25, 28	50	31
ML8	26, 29-31	40	31
ML9	32-35	44	34

Application of weighting for characteristics of specific sound

11.10.35. BS 4142 includes guidance on the application of additional weighting to be applied in cases where the industrial noise is considered to be 'tonal', 'impulsive', or 'intermittent' at the existing sensitive receptor.

11.10.36. All proposed plant would run continuously and therefore no penalty for impulsivity or intermittency has been applied. The proposed plant would produce noise that is broadband in nature, which has resulted in no tonal correction needing to be applied.

11.10.37. In addition, the existing residual levels are significantly higher than the specific levels during the day which will result in the Proposed Development not being distinctively audible at any receptor during the daytime.

BS4142 Assessment

11.10.38. In accordance with BS4142, the noise rating level for the noise sources associated with the Proposed Development at the receptors, have been compared with the corresponding background noise levels during the daytime and night-time.

11.10.39. The results of the initial BS4142 assessment indicate that noise from the proposed development will not exceed the background sound levels at any ESRs during the daytime. However, during the night-time it is expected that the proposed development may exceed existing levels by 1 to 2dB at ESRs 15, 23 and 25 and up to 6dB at ESR 16, as the background noise levels at these locations are particularly low.

11.10.40. It is noted in Table 11.1 that noise from the Proposed Development should achieve a noise level less than 5dB above background noise level as requested by Stockton on Tees Borough council. This is achieved in all locations except ESR 16 at night. However, it should also be noted that the background noise level at this location is 26dB, i.e. very low and the noise rating level of the Proposed Development at this location is 32dB. As the exceedance occurs at night, the noise would only be considered internally, as outdoor amenity space is not generally in use at this time of day. Any noise from the Proposed Development would likely be inaudible internally even with windows open, and would not disturb sleep.

11.10.41. This has led to the initial assessment determining that operational noise will have a low adverse impact during the daytime, but could have a significant adverse impact at some receptors during the night-time depending on context in line with the BS4142 guidance. A further context assessment in line with BS4142 guidelines has therefore been undertaken to determine the potential impact

11.10.42. The initial daytime and night-time BS 4142 results are summarised in ES Appendix 11.4 BS4142 Assessment Calculations (Document Reference 6.4.11.3).

BS 4142 context assessment

11.10.43. Section 11 of BS 4142:2014, as outlined in ES Appendix 11.1 Noise and Vibration Guidance (Document Reference 6.4.11.1) 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 sources exceeds the background sound level and the context in which the sound occurs”.

11.10.44. The first requirement of this statement has been determined within Section 11 of BS4142 above. To determine the context in which the industrial sound will reside, three factors must be considered. These are:

- The absolute level of sound.

- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor

Absolute level of sound[4]

11.10.45. To determine the first context test in BS 4142 it is necessary to determine whether the residual and background sound levels are high or low. Section 11 of BS 4142 states:

> "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
>
> Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse".

11.10.46. During the daytime and night-time, the rating levels are low, and the background sound levels are moderate which suggests the absolute level of sound would be more relevant in this instance.

11.10.47. The absolute sound levels are not affected by the Proposed Development at any ESRs. This would suggest that the impact of the Proposed Development would be lower than suggested in ES Appendix 11.4 BS4142 Assessment Calculations (Document Reference 6.4.11.3).

Character and level of the residual sound

11.10.48. The ESRs are located in rural areas where road traffic noise from local roads and agricultural noise will dominate the acoustic environment. The Proposed Development is expected to produce noise which is broadband in nature which is not expected to be noticeable within the current acoustic environment.

11.10.49. During all periods, the Proposed Development will produce noise levels considerably lower than the existing residual sound levels. Therefore, the Proposed Development is expected to be inaudible at all sensitive receptors during the daytime and at most receptors during the night-time.

11.10.50. When taking into consideration the character and level of the residual sound, the noise impact at sensitive receptors is expected to be lower than suggested in ES Appendix 11.4 BS4142 Assessment Calculations (Document Reference 6.4.11.3).

[4] The absolute level of sound refers to the total level of sound relative to 0dB

Sensitivity of the receptor

11.10.51. The ESRs have a moderate sensitivity to noise as they are all residential properties, as defined in Table 11-2. However, the Proposed Development is not expected to cause a noticeable impact during the day due to the noise levels being considerably lower than the existing background levels.

11.10.52. During the night-time, noise emissions from the Proposed Development may slightly increase current background levels. However, noise during the night-time would be considered internally only as outdoor amenity space is not generally in use. It should be noted that even through an open window, noise levels are likely to be mitigated by up to 13dB. The noise level from the Proposed Development internally, would be less than 20dB at all receptors. Therefore, when taking the sensitivity of the receptor into consideration, the Proposed Development is expected to produce an effect which is lower than the initial results.

11.10.53. At ESR 16, where the background noise level is exceeded by 6dB, the expected internal noise level from the Proposed Development would be 19dB, which would likely be inaudible most of the time and would not disturb sleep.

Summary of BS4142 Assessment

11.10.54. A BS4142 assessment has been undertaken to assess the potential noise impact from the Proposed Development during its operation at existing receptors.

11.10.55. The initial assessment found that rating levels from the Proposed Development will be significantly lower than the background sound level during the day. The noise impact during the daytime is therefore expected to be negligible.

11.10.56. During the night-time, background levels exceed the requested 5dB above background in only one location. However, when taking the context assessment into consideration, there is expected to be a negligible noise impact at all existing sensitive receptors as there will be no discernible change in baseline environmental conditions.

11.10.57. The sensitivity of the existing sensitive receptors is moderate, in accordance with Table 11-2. In accordance with Table 11-3The magnitude of impact (hereafter referred to as the magnitude of change for consistency across the ES) has been considered as the change experienced from the current baseline conditions at the sensitive receptor and has been considered on a scale of high, moderate, low or negligible.

11.10.58. The methodology used to determine the magnitude of change for operational noise, road traffic noise, construction noise and construction vibration is shown below in Table 11-3, Table 11-4, Table 11-5 and Table 11-7 respectively.

Table 11-3 Magnitude of Operational Noise Impact

Magnitude of Change	Criteria
High	Impact resulting in a considerable change in baseline environmental conditions predicted either to cause statutory objectives to be significantly exceeded or to result in severe undesirable/desirable consequences on the receiving environment.
Moderate	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause statutory objectives to be marginally exceeded or to result in undesirable/desirable consequences on the receiving environment.
Low	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated.
Negligible	No discernible change in the baseline environmental conditions, within margins of error of measurement.

Table 11-4 Magnitude of Road Traffic Noise Impact Criteria

Magnitude of Change	Criteria
High	> 10.0 dB increase in traffic noise (equating to a clearly perceptible increase in the loudness of noise).
Moderate	5.0 – 9.9 dB increase in traffic noise (equating to an increase in the loudness of the noise which is at or about the threshold of perception)
Low	3.0 – 4.9 dB increase in traffic noise
Negligible	0.1 – 2.9 dB increase in traffic noise.

Table 11-5 Magnitude of Construction Noise Impact

Magnitude of Change	Criteria
High	Noise levels exceed the Assessment Category threshold level, (Assessment Category Thresholds described in Table 11-6) for the duration of the construction works.
Moderate	Noise levels exceed the Assessment Category threshold level for periods of more than one month, but for significantly less than the whole duration of the construction works.
Low	Noise levels exceed the Assessment Category threshold level for periods of less than one month.
Negligible	Noise levels do not exceed the Assessment Category threshold level during any period.

Table 11-6 Thresholds of Significant Impact from Construction Noise at Residential Receptors in accordance with the ABC method of BS5228-1

Assessment Category Threshold Value Period (L_{Aeq})	Threshold Value in Decibels (dB)		
	Category A *1	Category B *2	Category C *3
Daytime (0700 to 1900 hours) and Saturdays (0700 to 1300 hours)	65	70	75
*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.			
*2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.			
*3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.			

Table 11-7 Magnitude of Construction Vibration Assessment Impact

Magnitude of Change	Criteria
High	> 10mm per sec. Vibration likely to be intolerable for more than brief exposure. Approaching the level at which cosmetic damage may occur in light structures.
Moderate	5mm – 10mm per second. Tolerance less likely even with prior warning and explanation.
Low	1mm – 5mm per second. Complaints are likely, but can be tolerated if prior warning and explanation given.
Negligible	<1mm per second. Below level at which complaints are likely.

11.10.59. The significance of effect has been informed by the magnitude of change due to the Proposed Development and the evaluation of the sensitivity of the affected receptor. The significance of effect has been determined using professional judgement and Table 11-8 has been a tool which has assisted this process.

11.10.60. Whilst Table 11-8 provides ranges, the level of effect is confirmed as a single level and not a range, informed by professional judgement. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. Effects which are moderate and above are considered significant. Effects with are slight and below are considered not significant.

11.10.61. Table 11-8, the magnitude of change is negligible. Therefore, the significance of effect is likely to be none in accordance with Table 11-8.

11.10.62. If any additional mitigation measures, beyond those embedded into the design, are required to reduce noise levels associated with the Proposed Development, these could include noise barriers around the noise sources, or selection of equipment with lower

sound power levels. At this stage no essential mitigation is required and therefore residual effects remain as reported.

Decommissioning

11.10.63. During the decommissioning phase, the intensity/duration of work is expected to be similar to or lower than the construction phase and would be subject to the same guidelines and mitigation measures. There would likely be use of similar equipment for removal of the Proposed Development and fewer site preparation and earthworks, therefore the potential effects will be similar or lower.

11.10.64. The sensitivity of the proposed receptors is considered to be moderate in accordance with Table 11-2. The magnitude of change is considered to be low in accordance with Table 11-4.

11.10.65. Therefore, in accordance with Table 11-8 there is likely to be a short-term adverse effect, which is considered to be of moderate significance.

11.10.66. No essential mitigation is available and therefore residual effects remain as reported, although it is noted that these are temporary in nature and will only exist for short periods (not for longer than 1 month).

11.11. Monitoring

11.11.1. Due to the low predicted noise levels, noise monitoring during the operational phase of the Proposed Development is not considered necessary. This would not normally be a requirement for this type of development.

11.11.2. It is not proposed to undertake noise and vibration monitoring during the construction phase due to the likely moderate and short term impact of noise and no likely vibration impact.

11.12. Summary

11.12.1. Table 11-14 provides a summary of the identified impacts, mitigation and likely effects of the Proposed Development on Noise and Vibration. The table has been subdivided into effects for construction, operation and decommissioning.

Table 11-14 Noise and Vibration assessment summary

Construction and Decommissioning				
Construction/decommissioning Traffic noise and vibration	Low level of traffic predicted A Construction Traffic Management Plan (CTMP) would be produced by the PC and agreed with the relevant local planning authorities prior to construction. ES Appendix 2.8 Outline CTMP (Document Reference 6.4.2.8) includes details on construction logistics and construction worker travel.	Moderate	Negligible	Short term, reversible adverse insignificant effect -
Construction/decommissioning Activities noise and vibration	A Construction Environmental Management Plan (CEMP)/Demolition Environmental Management Plan (DEMP) would be produced by the PC and agreed with the relevant local planning authorities prior to construction/decommissioning. ES Appendix 2.6 Outline CEMP (Document Reference 6.4.2.6) outlines the mitigation and management measures to be implemented to manage any potential noise and vibration impacts.	Moderate	Low	Short term, reversible, moderate adverse significant effect
Operation				
Operational Activities noise	Location of 'noisy' equipment placed as far as practicable from receptors	Moderate	Negligible	Long Term, reversible adverse insignificant effect

References

[1] Department for Levelling Up, Housing and Comunities, "Planning Practice Guidance - Noise," 2014. [Online]. Available: https://www.gov.uk/guidance/noise--2. [Accessed 9 October 2023].

[2] IEMA, "Guidelines for Environmental Noise Impact Assessment," 2014.

[3] BSI, "British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings – Code of Practice (BS8233)," 2014.

[4] BSI, "British Standard 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound," 2014.

[5] BSI, "BS5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (BS5228-1), and Part 2: Vibration (BS5228-2).," 2009.

[6] Design Manual for Roads and Bridges, 2011.

[7] Transport and Road Research Laboratory, "Ground Vibration caused by Civil Engineering Works," 1986.

[8] BSI, "Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting," 2008.