EAST YORKSHIRE SOLAR FARM

East Yorkshire Solar Farm

EN010143

Environmental Statement

Volume 1, Chapter 11: Noise and Vibration
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East Yorkshire Solar Farm

Environmental Statement - Chapter 11: Noise and Vibration

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11. Noise and Vibration

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents the findings of an assessment of the likely significant effects from Noise and Vibration as a result of the proposed East Yorkshire Solar Farm (hereafter referred to as the Scheme). For a description of the Scheme, refer to **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**.

11.1.2 This chapter has considered the potential impacts and likely significant effects of the Scheme on Noise and Vibration during the construction, operation, and decommissioning phases.

11.1.3 This chapter is supported by the following appendices in **ES Volume 2 [EN010143/APP/6.2]**:

a. **Appendix 11-1:** Legislation and Planning Policy;

b. **Appendix 11-2:** Acoustic Terminology;

c. **Appendix 11-3:** Baseline Noise Surveys; and

d. **Appendix 11-4:** Construction and Operational Noise Modelling.

11.1.4 This chapter is supported by the following figures in **ES Volume 3 [EN010143/APP/6.3]**:

a. **Figure 11-1**: Site boundary, receptor locations and noise monitoring positions; and

b. **Figure 11-2**: Noise Contours – Operational Phase.

11.1.5 A glossary and list of abbreviations are defined in **Chapter 0: Table of Contents, Glossary and Abbreviations, ES Volume 1 [EN010143/APP/6.1]**.

11.1.6 A Non-Technical Summary of the ES is presented in **ES Volume 4 [EN010143/APP/6.4]**.

11.1.7 Noise and vibration interfaces with many other aspects and as such, should be considered alongside ecology and heritage receptors. The impacts of noise and vibration on heritage receptors are assessed in **Chapter 7: Cultural Heritage, ES Volume 1 [EN010143/APP/6.1]**. The impacts of noise and vibration on ecological receptors are assessed in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]** and the **Habitats Regulations Assessment [EN010143/APP/7.12]**.

11.2 Legislation, Policy and Guidance

11.2.1 Legislation, planning policy, and guidance relating to Noise and Vibration and pertinent to the Scheme comprises of the documents listed below. More detailed information can be found in **Appendix 11-1, ES Volume 2 [EN010143/APP/6.2].**

Legislative Framework

11.2.2 Legislation that has been considered includes:

a. Control of Pollution Act 1974 (Ref. 11-3); and

b. Environmental Protection Act 1990 (Ref. 11-4).

National Policy

11.2.3 National planning policy that has been considered includes:

a. National Planning Policy Statement EN-1 (2011) (Ref. 11-7);

b. National Planning Policy Statement EN-3 (2011) (Ref. 11-8);

c. Draft National Planning Policy Statement EN-1 (2023) (Ref. 11-9);

d. Draft National Planning Policy Statement EN-3 (2023) (Ref. 11-10);

e. National Planning Policy Framework (NPPF) (2023) (Ref. 11-5); and

f. Noise Policy Statement for England (NPSE) (Ref. 11-6).

Local Policy

11.2.4 Local planning policy and guidance that has been considered includes:

a. East Riding Local Plan 2012 – 2029 (Ref. 11-11);

b. East Riding Local Plan Update 2020 – 2039;

c. Selby District Core Strategy Local Plan (Ref. 11-12);

d. Selby District Local Plan 2005 Saved Policies; and

e. Selby District Council Local Plan Publication Version Consultation 2022.

Guidance

11.2.5 Guidance that has been considered includes:

a. Planning Practice Guidance Noise (PPGN) (Ref. 11-17).

b. British Standard (BS) 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (Ref. 11-18).

c. BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (Ref. 11-19)

d. BS 7445-1:2003 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures (Ref. 11-20).

e. BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (Ref. 11-21).

f. BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (Ref. 11-22).

g. World Health Organization Guidelines for Community Noise (Ref. 11-23).

h. Calculation of Road Traffic Noise (Ref. 11-24).

i. Design Manual for Road and Bridges LA111: Noise and Vibration, Revision 2 (Ref. 11-2).

11.3 Consultation

Scoping

11.3.1 A scoping exercise was undertaken in September 2022 to establish the content of the assessment and the approach and methods to be followed.

11.3.2 The Scoping Report (**Appendix 1-1, ES Volume 2 [EN010143/APP/6.2]**) was issued on 9 September 2022 and records the findings of the scoping exercise and details the technical guidance, standards, best practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on Noise and Vibration.

11.3.3 The Scoping Opinion was received on 20 October 2022 (**Appendix 1-2, ES Volume 2 [EN010143/APP/6.2]**). The feedback received from stakeholders at scoping and Applicant responses in relation to Noise and Vibration are presented in **Appendix 1-3, ES Volume 2 [EN010143/APP/6.2].** This is also summarised in **Table 11-1**.

Additional Consultation

11.3.4 Consultation was undertaken with East Riding of Yorkshire County Council, and North Yorkshire County Council and Selby District Council (now amalgamated into North Yorkshire Council) in November 2022 on the following aspects of the noise and vibration assessment:

a. Study Area;

b. Receptor locations;

c. Noise monitoring locations;

d. Duration of monitoring; and

e. Construction noise assessment criteria.

11.3.5 The councils were provided with a Baseline Monitoring Plan setting out the above providing mapping showing the proposed monitoring locations in relation to receptor locations. The document also included details of the Scheme.

11.3.6 East Riding of Yorkshire County Council queried whether a monitoring period of seven days would be sufficient to obtain data during periods of adverse weather conditions. The Applicant's response was that weather conditions would be reviewed prior to monitoring and a weather station will be set up so weather conditions can be remotely monitored. Monitoring of weather data allows noise monitoring to be extended at any location if prolonged periods of adverse weather conditions were observed. Adverse weather conditions are defined as wind speeds greater than 5 m/s and one-hour periods of rainfall of 1 mm and above.

11.3.7 Selby District Council commented that: "*the working hours in BS 5228-1 working hours are not aligned to those considered to protect residential amenity in the early mornings/evenings/nights (i.e., Monday – Friday 08:00*

to 18:00hrs, Saturday 08:00 to 13:00 hrs, and not at all on Sundays and Bank Holidays). I appreciate it is early stages but would like to emphasise the importance of defining/justifying construction working hours before commenting on the suitability of adopting, for example, night-time noise criteria".

11.3.8 Core construction work periods have been defined in Paragraph 11.4.47. Mitigation outlined in in section 11.6 controls noisy activities during the 'shoulder' periods (the first and last hours of the workday) so work hours for noisy activities align with work periods specified by Selby District Council. This commitment is secured in the **Framework Construction Environmental Management Plan (CEMP) [EN010143/APP/7.7]** and **Framework Decommissioning Environmental Management Plan (DEMP) [EN010143/APP/7.9].**

11.3.9 Selby District Council requested a monitoring location along the Grid Connection Corridor to provide baseline sound data for R39 and R40. This noise monitoring has been undertaken at location N16 (see **Table 11-5**).

11.3.10 No comments were received from North Yorkshire Council as this was addressed by Selby District.

11.3.11 On 1 April 2023 North Yorkshire County Council, Selby District Council and the five other District Councils within North Yorkshire were amalgamated to become the Unitary Authority of North Yorkshire Council. Therefore, consultation after 1 April has taken place with the new Unitary Authority of North Yorkshire Council.

Statutory Consultation

11.3.12 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information Report (PEI Report), issued in May 2023. Responses to this statutory consultation are presented in the **Consultation Report [EN010143/APP/5.1]**. **Table 11-2** outlines the statutory consultation responses relating to Noise and Vibration and how these have been addressed through the ES.

11.3.13 Further detail on consultation can also be found in **Chapter 4: Consultation, ES Volume 1 [EN010143/APP/6.1]**.

Table 11-1. Scoping opinion responses – noise and vibration

Consultee	Summary of comment	How matter has been addressed	Location of response
Planning Inspectorate	It is proposed to scope out this matter [operational vibration] because no part of the Proposed Development would generate perceptible levels of vibration. Based on the nature and characteristics of the Proposed Development, the Inspectorate agrees that operational vibration may be scoped out from further assessment. However, the detailed description of the Proposed Development within the ES should demonstrate that operational plant and equipment is of a type and to be used in locations unlikely to result in significant vibration impacts on sensitive receptors.	Operational plant are described in paragraph 11.4.62. Distances from the Order limits to nearest receptors are provided to justify scoping out operational vibration.	**Table 11-4** of this Chapter
Planning Inspectorate	The Inspectorate agrees that a separate assessment of decommissioning noise may be scoped out on the basis that the noise assessment presented for the construction phase would be representative, or an overestimate, of noise impacts during the decommissioning phase. However, it must be clearly articulated in the ES that decommissioning impacts have been considered.	Decommissioning noise is likely to be a similar magnitude to construction noise, albeit shorter duration and most probably without drilling or excavation noise along the cable route. To provide a worst case assessment, this chapter assumes decommissioning noise effects will be the same magnitude and significance as construction noise effects.	Section 11.6 of this Chapter

Consultee	Summary of comment	How matter has been addressed	Location of response
Planning Inspectorate	The ES should assess any impacts resulting from the transport of waste generated during construction and decommissioning of the Proposed Development which are likely to result in significant effects.	Noise impacts due to construction and decommissioning traffic have been assessed.	**Table 11-9** of this Chapter
Planning Inspectorate	Table 11-1 [of the Scoping Report] lists 48 receptor locations whereas Figure 11-1 [of the Scoping Report] depicts only 36 locations. Care should be taken to ensure that information is reflected consistently and accurately throughout the ES.	Following changes to the Order limits, an additional seven receptors have been included in the assessment.	The 55 receptor locations are described in **Table 11-4** of this Chapter and accurately illustrated in **Figure 11-1, ES Volume 3 [EN010143/APP/6.3]**.
Planning Inspectorate	It is stated that at this stage no specific noise mitigation measures have been included for operational plant and assumed that, based on the proposed installations, the plant will be designed to have no tonal, impulsive or intermittent features. The design features that would achieve this should be described in the ES. An assessment should be provided where significant effects may occur and mitigation for any significant residual effects should be described in the ES and secured in the Development Consent Order (DCO).	The proposed plant does not contain any impulsive or intermittent features. However, a rating correction has been applied to account for any potential tonal features to account for a reasonable worst-case.	Embedded mitigation measures to reduce operational noise as far as reasonably practicable are discussed in section 11.6 of this Chapter. These measures are secured in the **Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9].**

Consultee	Summary of comment	How matter has been addressed	Location of response
Planning Inspectorate	The criteria for assessing the significance of noise and vibration effects should be clearly set out in the ES with reference to established guidance. Consistent with the Noise Policy Statement for England, Significant Observed Adverse Effect Level (SOAEL) and Lowest Observed Adverse Effect Level (LOAEL) should be defined for all of the construction, operational and decommissioning noise matters assessed.	The criteria for assessing noise and vibration effects have been set against the LOAEL and SOAEL, as defined in the Noise Policy Statement for England.	**Table 11-6** of this Chapter
Planning Inspectorate	It is stated that baseline noise monitoring will be carried out to establish the noise environment around the Proposed Development site at selected locations representative of noise-sensitive receptors. The ES should explain the basis on which receptor locations were determined to be representative, with reference to relevant information including noise contour mapping.	Baseline noise monitoring locations have been selected through consultation with North Yorkshire County Council, East Riding of Yorkshire Council, and Selby District Council.	Section 11.4 of this Chapter
North Yorkshire County Council and Selby District Council	Overall, the report identifies a potential for amenity impacts during the construction phase in relation to the Grid Connection Corridor, primarily from underground cable installation. The applicant commits to accompanying the DCO application with a CEMP and the proposed assessment methodology is appropriate. There is uncertainty regarding the identification of sensitive receptors in the Selby district which should be addressed in the noise and vibration assessment but is otherwise considered a suitable approach.	Receptors in North Yorkshire along the Grid Connection Corridor have been selected through review of aerial imagery. These were confirmed through consultation with Selby District Council who were the relevant consultee at the time of consultation.	Section 11.4 of this Chapter

Table 11-2. Statutory consultation responses – noise and vibration

Consultee	Summary of comment	How matter has been addressed	Location of response
East Riding of Yorkshire Council	Public Protection's District Team have requested that the CEMP [Construction Environmental Management Plan] and the DEMP [Decommissioning Environmental Management Plan] states the threshold value of noise at dwellings to be applied for daytime working (07.00-19.00), Saturday working (07.00-13.00), evening working, weekend working and night-time working (23.00-07.00) (BS 5228-1:2009 +A1:2014) and that this together with any mitigation including reduced hours of working near residential receptors is agreed as part of the DCO application.	Construction noise thresholds and mitigation have been included as part of the DCO application.	**Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9].**
East Riding of Yorkshire Council	In terms of operational noise, mitigation is to be detailed in the OEMP [Operational Environmental Management Plan] and further consideration should be given to low frequency noise.	A commitment to further consideration on low frequency noise has been included.	**Framework OEMP [EN010143/APP/7.8]**
North Yorkshire Council	In reference to PEI Report Volume 2 Chapter 11: Noise and Vibration May 2023. There are two residential receptors captured in the study area for construction effects (R37 & R38). The effects are associated with Noise Generating Activities (NGA) 2; 300m within cable installation (general works) at the Grid Connection Corridor and the Interconnecting Cable Corridor. BS5228-1:2009+A1:2014 assessment methodology is adopted and the Lowest Observed Adverse Effect Level (LOAEL) is aligned to ABC Category A threshold values (65dB LAeq,T). The measured background sound levels at monitoring location N16 (representative	The CEMP contains mitigation measures that will be used to control construction noise. Mitigation covers 'best practicable means' as defined in section 72 of the Control of Pollution Act. This would provide a means for preventing unnecessary construction noise and reducing noise	**Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9].**

Consultee	Summary of comment	How matter has been addressed	Location of response
	of R37 & R38) is 47dB LAeq,1hrand so Category A is appropriate. A construction noise monitoring scheme shall be developed as per requirements of the Framework CEMP (Appendix 02-01), but construction noise predictions indicate that noise levels are below the lowest observed adverse effect level (LOAEL). Construction working hours are defined (11.5.28) inclusive of controls for noisy activities during 'shoulder' periods (the first and last hours of the workday) (11.8.3[s]). This prohibits working on Sundays and Bank Holidays. The potential for construction impacts has been assessed in accordance with relevant assessment methodology and effects below LOAEL, and the proposed construction working hours are suitable.	emissions as far as reasonably practicable.	
North Yorkshire Council	In reference to PEI Report Volume 2 Chapter 11: Noise and Vibration May 2023: It appears that receptors R37 and R38 have been scoped out of operational noise assessment. Overall, [the council] do not envisage significant operational noise impacts at receptors R37 and R38	Noise impacts at receptors R37 and R38 have been considered and no significant residual operational noise effects identified.	**Table 11-20** of this chapter

11.4 Assessment Methodology

Assumptions, Limitations and Uncertainties

Baseline Assumptions and Limitations

11.4.1 The measured ambient sound levels (taken during January and February 2023, **Table 11-5**) have been considered as representative of the future baseline scenarios. The earliest that construction will commence is 2025, with operation in 2027, and decommissioning 40 years after commencement of operation, in approximately 2067. No major developments (e.g., highway or railway schemes, industrial facilities) are currently known to be proposed in the area that are likely to notably alter the local baseline noise environment.

11.4.2 Any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort has been made such that measurements were undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey.

Construction Noise Assumptions and Limitations

11.4.3 The assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors, based on information presented in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** and previous experience of construction sites and professional judgement. These assessments are based on a reasonable representative worst-case scenario. Construction noise predictions have been undertaken using the computer modelling software CadnaA® (v2019) (Ref. 11-25), based on an example schedule of plant items that are typically used in such developments for the purposes of carrying out a quantitative assessment at this stage. Construction plant is summarised in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]**.

11.4.4 Construction noise predictions in CadnaA® have been undertaken using BS 5228:2014+A1:2019 ‘Code of practice for noise and vibration control on construction and open sites’ (Ref. 11-18) methodologies and AECOM’s library data of sound sources associated with the proposed construction activities. These sound sources are taken to be representative of the plant and/or activities that will be used during the construction process of the Scheme. Noise predictions were carried out to represent a conservative scenario where construction plant is active nearest to the identified receptors and does not take into account quieter periods when limited activities take place or at further distances. Consequently, noise predictions may overestimate construction noise levels and are therefore considered to be a reasonable likely worst case.

11.4.5 The solar PV mounting structures will be installed by direct drive technique as described in **Chapter 2: The Scheme, ES Volume 1**

[EN010143/APP/6.1]. Piling may be required for the construction of foundations for the Field Station Units/Field Substations, although this is dependent upon local ground conditions and other types of foundation such as concrete blocks or plinths, ground screws, or reinforced concrete piles may be used. To present a worst case for the assessment it is assumed that piling will be used to install auger piles, which is a typical approach in similar developments, and that this would also apply to the installation of the solar PV mounting structures.

11.4.6 Noise effects during the decommissioning phase of the Scheme will be similar or less than noise effects during the construction phase as each phase will utilise similar heavy plant. Decommissioning noise is likely to be of shorter duration and most probably without drilling or excavation noise along the cable routes. The noise assessment presented for the construction phase is therefore considered representative (or an overestimate) of the decommissioning phase. As such a separate assessment for noise from the decommissioning phase is not included.

Operational Assumptions and Limitations

11.4.7 A series of assumptions were made for the generation of the operational noise model as follows:

a. Digital noise modelling of the operational Scheme has been based on the maximum worst-case parameters set out in the drawings, plans, and construction and operation details as set out in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**;

b. Sound level data for operational noise-producing plant (i.e., inverters and transformers) have been based on industry sound pressure level measurement data (see **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]**;

c. Surrounding ground conditions are rural farmland and have been modelled as soft (G=0.8);

d. Air temperature was set at 10 degrees Celsius and humidity 80%, which are typical annual average weather conditions in Yorkshire based on historical weather data;

e. One order of reflection was modelled; and

f. Land topography has been incorporated into the noise modelling.

11.4.8 Operational noise has been predicted with all plant being in maximum operation at all times of day. Cooling fans on inverters will operate dependent on ambient temperatures and would not be in a full mode of operation during cooler temperatures. Consequently, noise predictions represent a reasonable worst-case and are likely to overestimate actual impacts.

11.4.9 Sound level data for transformers in reduced modes of operation is not available from manufacturers and therefore not available for the purposes of this assessment. Noise predictions for transformers are based on inverters and cooling fans operating at full load so are likely to represent an overestimate of actual conditions.

11.4.10 As discussed in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**, the Scheme would either utilise a ‘central inverter

solution' or a 'utility scale string inverter solution'. While there would be more string inverters (up to 1,334 string inverters) compared to centralised inverters (up to 100), the overall sound outputs of the utility scale and small-scale string inverter solutions will be generally quieter than the centralised inverter solution. From a noise perspective it is therefore assumed that the central inverter solution is a reasonable worst-case scenario when in operation and is therefore the basis of the assessment. A sensitivity test of a scenario with 1,334 string inverters has been carried out to demonstrate that the centralised inverter solution is reasonable worst-case. This sensitivity test is presented in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2].**

11.4.11 Some flexibility in the locating of plant is required. Consequently, should there be any changes in the locations of noise generating infrastructure, the Applicant commits to not exceed the predicted noise levels modelled at the sensitive receptors for the illustrative design provided with the DCO Application, which is secured in the **Framework OEMP [EN010143/APP/7.8]**. This may be achieved through procurement of quieter equipment than has been modelled, for example, or locating noise generating equipment further from receptors than has been modelled. No acoustic barriers will be introduced unless they can be incorporated within the Design Parameters set out in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**.

Matters Scoped in/Scoped out

Matters Scoped In

11.4.12 The noise and vibration assessment considers the following assessments:

a. construction noise;

b. construction vibration;

c. construction traffic noise; and

d. operational Scheme noise.

Matters Scoped Out

11.4.13 The following assessments have been scoped out:

a. Operational Vibration – Operational vibration is scoped out of any further assessment (as agreed with the Planning Inspectorate in the Scoping Opinion (**Appendix 1-2, ES Volume 2 [EN010143/APP/6.2]**). There are no sources of vibration during operation with the potential to cause significant effects.

b. Operational Road Traffic Noise – **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** advises that there will be up to three permanent staff onsite at any one time during the operational phase. There would be occasional light goods vehicles and repair trucks associated with maintenance works. Additionally, as a worst case, the panels would require cleaning every two-years which requires about 220 trucks over a 2-month period for the delivery of water (most likely delivered in 1 m^3 intermediate bulk containers). This operational traffic would amount to a small number of movements on a typical day. It would take an approximate increase in traffic of 25% (assuming the

vehicle composition remains consistent) to result in an increase in noise of 1 dB. As noise is not sensitive to small changes in traffic, the increase in traffic that may result from three permanent staff is not considered to be significant. Consequently, an assessment of operational traffic noise has been scoped out of the assessment.

Study Area

11.4.14 The Study Area has been defined to include construction, decommissioning and operational noise and vibration features likely to be at risk from possible direct and indirect impacts that might arise from the Scheme. It considers activities within the Solar PV Site, Ecology Mitigation Area, Interconnecting Cable Corridor, Grid Connection Corridor, and Site Accesses, although there will be no noticeable, likely significant effects attributed to the Site Accesses or Ecology Mitigation Areas during operation and therefore this is not discussed further.

11.4.15 For construction noise effects from the Solar PV Site, the area for which impacts are expected is 300 m, based on guidance in BS 5228-1 (Ref. 11-18), which states construction noise predictions are generally reliable up to 300 m. However, for the Solar PV Site, the Study Area is based on the extent of operational noise effects, which is set at 500 m. This distance of 500 m is based on professional judgement and AECOM's previous experience of solar farm projects and ensures that all potential impacts are captured. The wider 500 m operational Study Area has therefore been used for both the construction and operational noise and vibration assessment of the Solar PV Site.

11.4.16 The Study Area for construction noise effects along the Interconnecting Cable Corridor and the Grid Connection Corridor will include receptors within 300 m, as per guidance in BS 5228-1 (Ref. 11-18). Additionally, a Study Area of 50 m either side of construction traffic routes (see **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]**) has been defined based on guidance in the Design Manual for Roads and Bridges LA111 (DMRB) (Ref. 11-24).

11.4.17 The Study Area was agreed through a meeting with North Yorkshire County Council on 29 November 2022, East Riding of Yorkshire Council on 1 December 2022, and Selby District Council on 5 December 2022 (note, on 1 April 2023 North Yorkshire County Council and its six constituent District Councils, including Selby District Council, were merged to form the new Unitary Authority of North Yorkshire Council).

Methodology

Sensitive Receptors

11.4.18 Potential sensitive receptors (i.e., buildings whose occupants may be disturbed by adverse noise and vibration levels, and structures that are sensitive to vibration) have been taken into consideration when assessing the effects associated with noise and vibration levels from the construction and operational phases of the Scheme.

11.4.19 The approach to the assessment of non-residential receptors differs from that adopted for residential receptors. This is because government policy for noise in the NPSE (Ref. 11-6) is based on relationships between noise

and health/quality of life, and noise insulation of a typical dwelling and is not considered applicable to non-residential receptors. As such, the types of receptors that may experience significant effects due to the construction and operation of the Scheme are identified in **Table 11-3** as residential and non-residential.

Table 11-3. Receptor types

Receptor Group	Receptors in Group
Residential	Individual dwellings and private open spaces (e.g., gardens)
Non-residential	Non-residential community facilities such as schools, hospitals, places of worship, and noise sensitive commercial properties

11.4.20 The effects of noise and vibration generated during the construction and operational phases of the Scheme are considered at nearby sensitive receptors. A number of receptors that may potentially be affected have been considered in this assessment. When considering groups of properties as a single receptor, noise and vibration is assessed at the nearest receptor to the Site (i.e., the receptor that will experience the highest levels of noise and vibration). Although noise and vibration may be perceivable at other receptors in each identified receptor group, effects will not be significant if they are suitably controlled at the identified sensitive receptors.

11.4.21 Noise-sensitive receptors have been identified through a desktop study of aerial imagery and mapping and are presented in **Figure 11-1, ES Volume 2**, and summarised in **Table 11-4**. The selection of receptors presented was agreed with the Local Planning Authorities through the Scoping process and through consultation with North Yorkshire County Council, East Riding of Yorkshire County Council, and Selby District Council (see section 11.3).

11.4.22 All receptors covered in the PEI Report have been included in **Table 11-4**; however, due to changes to the Order limits, some receptors are no longer in the Study Area. These receptors are identified as not covered in the construction or operational assessment phases.

Table 11-4. Sensitive receptors

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R1	Oak Cottages, Willitoft	Residential	53°48’36.94”N, 0°52’33.15”W	190	n/a	n/a
R2	Willitoft Hall, Willitoft	Residential	53°48’24.07”N, 0°52’15.75”W	260	n/a	n/a
R3	Gribthorpe Properties	Residential	53°48’38.52”N, 0°50’51.39”W	130	n/a	n/a
R4	The Long Barn / The Fold Yard / Four Beeches Farm Gribthorpe	Residential	53°48’35.62”N, 0°50’54.41”W	60	n/a	n/a
R5	Sandy Field Farm, Selby	Residential	53°47’38.50”N, 0°54’25.86”W	350	n/a	n/a
R6	Fine Country Lodges / The Dadpad / Waterloo Farm, Willitoft	Residential	53°47’44.66”N, 0°53’20.84”W	210	n/a	n/a
R7	Webbwood House / The Grange, Willitoft	Residential	53°47’56.23”N, 0°52’8.81”W	170	220	n/a
R8	Crossroad Cottages, Willitoft	Residential	53°48’3.15”N, 0°51’56.22”W	30	20	n/a
R9	Lake View House, Willitoft	Residential	53°47’55.70”N, 0°51’39.24”W	90	110	n/a
R10	Mount Pleasant Farm	Residential	53°47’45.22”N, 0°51’36.63”W	360	300	160

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R11	The Old Hall, Spaldington	Residential	53°47’35.69”N, 0°51’5.52”W	140	n/a	n/a
R12	Spaldington Properties	Residential	53°47’34.64”N, 0°50’49.25”W	250	n/a	n/a
R13	Cottage Farm, Spaldington	Residential	53°47’57.11”N, 0°50’2.86”W	130	n/a	n/a
R14	Warham Farm, Spaldington	Residential	53°47’45.57”N, 0°48’27.39”W	420	n/a	n/a
R15	Intake Farm, Wressle	Residential	53°47’10.53”N, 0°54’13.90”W	340	n/a	n/a
R16	Newsholme House, Willitoft	Residential	53°47’22.52”N, 0°52’51.18”W	70	15	50
R17	Rose Dale / Drome Villa, Willitoft	Residential	53°47’26.92”N, 0°52’41.15”W	140	30	240
R18	Brind Leys Farm, Spaldington	Residential	53°46’50.89”N, 0°53’0.94”W	300	n/a	n/a
R19	Oak Tree Fram, Spaldington	Residential	53°47’15.46”N, 0°50’1.80”W	500	n/a	n/a
R20	Spaldington Grange, Spaldington	Residential	53°46’46.78”N, 0°51’1.14”W	340	n/a	230

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R21	Sandwood Cottage, Spaldington	Residential	53°46’58.37”N, 0°50’26.64”W	40	n/a	90
R22	Sandwood Villa, Spaldington	Residential	53°46’59.67”N, 0°50’18.83”W	30	n/a	240
R23	Old Rush Farm, Spaldington	Residential	53°46’58.75”N, 0°49’58.01”W	190	n/a	n/a
R24	Wressle Brickyard Farm, Newsholme	Residential	53°46’24.30”N, 0°54’8.01”W	200	n/a	n/a
R25	Gardeners Cottage / Wood Farm, Brind	Residential	53°46’26.17”N, 0°53’33.79”W	50	n/a	300
R26	Damson Cottage/ Rowland Hall, Newsholme	Residential	53°46’10.58”N, 0°54’7.23”W	70	5	n/a
R27	8/9 Brind Lane, Brind	Residential	53°46’3.63”N, 0°52’47.38”W	30	50	n/a
R28	The Old Parlour / Mill End Farm / Pond View Barn / Brind Lane Farm, Brind	Residential	53°46’7.32”N, 0°52’40.57”W	80	220	n/a
R29	The Straw Bale Cabin / Village Farm / Orchard Farm, Brind	Residential	53°46’11.10”N, 0°52’30.16”W	290	n/a	n/a
R30	Brind Chapel, Brind	Residential	53°46’12.65”N, 0°52’21.96”W	430	n/a	n/a

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R31	Deer Crossing, Goole	Residential	53°46’8.95”N, 0°51’17.09”W	280	n/a	n/a
R32	Maalkedo House / Poplar Farm, Spaldington	Residential	53°46’35.38”N, 0°48’54.18”W	50	n/a	n/a
R33	High Grove House, Spaldington	Residential	53°46’38.21”N, 0°48’48.68”W	170	n/a	n/a
R34	Avalon / Stonycroft / Beech Tree Farm, Newsholme	Residential	53°45’30.24”N, 0°54’25.56”W	400	n/a	n/a
R35	Parks Farm, Newsholme	Residential	53°45’19.17”N, 0°53’45.85”W	470	n/a	n/a
R36	Barnhill Farm, Brind	Residential	53°45’4.75”N, 0°53’15.43”W	n/a	n/a	n/a
R37	Drax Abbey Farm, Long Drax	Residential	53°44’50.80”N, 0°59’7.75”W	n/a	140	n/a
R38	Derwent View Farm, Long Drax	Residential	53°44’56.28”N, 0°58’20.50”W	n/a	130	n/a
R39	1-2 Tidal Barrage, Barmby-on-the-Marsh	Residential	53°44’59.35”N, 0°58’3.14”W	n/a	140	n/a
R40	High Street properties, Barmby-on-the-Marsh	Residential	53°45’1.80”N, 0°57’45.20”W	n/a	120	n/a

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R41	Derwent House, Barmby-on-the-Marsh	Residential	53°45’5.63”N, 0°57’32.57”W	n/a	110	n/a
R42	Brackenholme Cottages, Brackenholme	Residential	53°45’49.42”N, 0°56’38.80”W	n/a	10	n/a
R43	Brackenholme Hall/ Demense, Brackenholme	Residential	53°45’43.89”N, 0°56’26.15”W	n/a	70	n/a
R44	Hagthorpe Hall/ Hagthorpe House, Brackenholme	Residential	53°45’48.59”N, 0°56’18.11”W	n/a	25	n/a
R45	Loftsome Bridge Coaching House, Wressle	Residential	53°45’49.60”N, 0°55’38.92”W	n/a	150	n/a
R46	Tithe Farm, Wressle	Residential	53°46’3.62”N, 0°55’35.08”W	n/a	20	n/a
R47	Station Road properties, Wressle	Residential	53°46’14.14”N, 0°55’35.49”W	n/a	180	n/a
R48	Cross Common Crossing, Wressle	Residential	53°46’18.83”N, 0°54’53.90”W	n/a	35	n/a
R49	Newfield House	Residential	53°45’39.75”N, 0°50’22.69”W	n/a	n/a	n/a
R50	Caville Farm	Residential	53°45’58.33”N, 0°50’8.17”W	n/a	n/a	n/a

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)	Distance to Interconnecting Cable Corridor (m) (if within Study Area)
R51	Highfield Bungalow / Highfield House	Residential	53°48′58″N, 000°53′40″W	410	n/a	n/a
R52	Field View Cottage	Residential	53°47′37″N, 000°50′26″W	380	n/a	n/a
R53	Elder Farm	Residential	53°48′15″N, 000°52′17″W	240	n/a	n/a
R54	Burland Cottage	Residential	53°45′51″N, 000°49′30″W	n/a	n/a	n/a
R55	Bell Lane – Holiday Chalets	Non-Residential	53°48’58.65”N, 0°51’16.34”W	190	n/a	n/a

Public Rights of Way Receptors

11.4.23 Noise is assessed based on the effect on health and quality of life. Noise generated by the construction, operational, and decommissioning phases of the Scheme will only affect Public Rights of Way (PRoW) users for limited periods of time when they are near a noise source.

11.4.24 It is acknowledged that short-term exposure to noise can cause disturbance to PRoW users and result in adverse noise effects. Planning Practice Guidance Noise (Ref. 11-17) identifies an adverse noise effect as "*Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life*." This is considered to describe the level of noise effect that may be perceived by PRoW users.

11.4.25 However, given the linear nature of PRoWs, the range of noise impacts along them forming the ambient noise environment, and the transient usage of a PRoW, it is not considered that there would be a material change in the experience of using the PRoW as a whole as a result of noise emissions from the Scheme, which could affect PRoW users' health or quality of life. Consequently, no significant adverse effects on PRoW users have been identified as arising from the Scheme and this has been scoped out of the noise assessment.

11.4.26 The NPSE (Ref. 11-6) provides a means for noise effects to be identified. It allows for adverse effects on health and quality of life to occur where all reasonable steps have been taken to reduce these effects whilst taking into account sustainable development.

11.4.27 In accordance with the NPSE, all reasonable steps to minimise the effects of noise on PRoW users will be taken during the construction, operational and decommissioning phases of the Scheme. These measures are set out in the Framework CEMP **[EN010143/APP/7.7]**, Framework DEMP **[EN010143/APP/7.9]**, and the Framework OEMP **[EN010143/APP/7.8]**. The production of detailed versions of these documents prior to the commencement of the relevant stage of the Scheme will be secured through the DCO.

Baseline Noise Monitoring Methodology

11.4.28 Baseline noise monitoring has been carried out to establish the existing noise climate in the area. The monitoring procedures followed guidance from BS 7445-1:2003 'Description and environment of environmental noise – Part 1: Guide to quantities and procedures' (Ref. 11-20) and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (Ref. 11-1). All noise measurements included $L_{Aeq,T}$ and $L_{A90,T}$ sound level indicators (for definitions refer to **Appendix 11-2: Acoustic Terminology, ES Volume 2 [EN010143/APP/6.2]**).

11.4.29 Noise monitoring was carried out at sixteen locations for a period of one week in the period from 18 January to 14 February 2023. These locations provide suitably representative baseline noise data for sensitive receptors affected by the operational Solar PV Site. Land access was granted to areas within the Solar PV Site and at one residential property, the Granary (R25). Noise monitoring was otherwise carried out in public areas that were considered to provide representative noise conditions to nearby sensitive receptors.

11.4.30 Monitoring locations are shown in **Figure 11-1, ES Volume 3 [EN010143/APP/6.3]** and described in **Table 11-5**. The monitoring locations have been allocated as representative of the local noise environment at each of the noise-sensitive receptors (**Table 11-4**) within the Solar PV Study Area.

11.4.31 A weather station was installed along with noise monitors so weather conditions could be logged during noise monitoring. This allows periods of adverse weather conditions (i.e., wind speeds exceeding 5 m/s and precipitation) to be identified and noise data for these periods to be removed.

11.4.32 As Interconnecting and Grid Connection Cables will be installed underground, there are no operational noise risks associated with them. Consequently, noise monitoring at sensitive receptors along the Grid Connection Corridor and the Interconnecting Cable Corridor (R37 to R48) has not been undertaken as construction noise and vibration criteria are not dependent on measured baseline noise data (see section 11.5). This approach was agreed through consultation with North Yorkshire County Council, East Riding District Council, and Selby District Council (see section 11.3). Selby District Council requested that noise monitoring was undertaken to define ambient noise conditions at R37 and R38 and ambient noise conditions are presented for R37 and R38 but are not defined at receptors R39 to R48.

Table 11-5. Noise Monitoring Locations

Monitor Location	Start date	End Date	Representative of Receptors
N1	18/01/2023	25/01/2023	R1, R2, R51, R53
N2	25/01/2023	01/02/2023	R3, R4, R55
N3	08/02/2023	14/02/2023	R7, R8, R9, R10
N4	25/01/2023	01/02/2023	R13, R52
N5	08/02/2023	13/02/2023	R14
N6	25/01/2023	31/01/2023	R11, R12
N7	18/01/2023	25/01/2023	R16, R17
N8	18/01/2023	24/01/2023	R5, R6, R15
N9	25/01/2023	01/02/2023	R19, R20, R21, R22, R23
N10	01/02/2023	08/02/2023	R32, R33
N11	08/02/2023	14/02/2023	R18, R24, R25, R26
N12	18/01/2023	25/01/2023	R27, R28, R29, R30
N13	01/02/2023	08/02/2023	R31
N14	01/02/2023	08/02/2023	R49, R50, R54
N15	18/01/2023	24/01/2023	R34, R35, R36
N16	18/01/2023	24/01/2023	R37, R38

Impact Assessment Methodology

11.4.33 The NPSE sets definitions for 'significant adverse effects' and 'adverse effects' using the concepts:

a. Lowest Observed Adverse Effect Level (LOAEL) – the level above which, as an average response, adverse effects on health and quality of life can be detected; and

b. Significant Observed Adverse Effect Level (SOAEL) – the average response level above which, as an average response, significant adverse effects on health and quality of life occur.

11.4.34 The NPSE states that:

"*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".*

11.4.35 Noise levels exceeding the SOAEL should be avoided as far as reasonably practicable. For noise levels exceeding the LOAEL, the NPSE (Ref. 11-6) states that:

"It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development … This does not mean that such adverse effects cannot occur".

11.4.36 All noise effects are local, only affecting nearby sensitive receptors, and are direct in nature; however, defining a likely effect and whether it is significant or not depends on the nature of a noise source. Likely effects have been defined based on guidance set out in the NPSE and PPGN (Ref. 11-17).

11.4.37 A new source of noise is assessed through the absolute noise level it generates at sensitive receptors. Where an exceedance of the defined SOAEL for each noise source occurs, it is an indication of a likely significant effect. However, for the assessment of construction traffic noise where an existing noise source (road traffic noise) is changed, the assessment of the effect level due to the change in noise refers to guidance within DMRB LA111 (Ref. 11-2) and consideration of the absolute noise level based on guidance set out in the NPSE (Ref. 11-6) and PPGN (Ref. 11-17).

11.4.38 Government policy for noise is based on community exposure response relationships between noise and health/quality of life, and noise insulation of a typical dwelling. Consequently, an assessment based on LOAELs and SOAELs cannot be applied to non-residential sensitive receptors. As such, the approach to the assessment of non-residential receptors differs from that adopted for residential receptors. Non-residential receptors are considered on a case-by-case basis by considering the applicable design criteria for good internal noise levels.

Assessment Scenario

11.4.39 There are three options being considered for the Scheme regarding how the design of noise generating plant at the Field Stations will proceed (as

further described in **Chapter 2: the Scheme, ES Volume 1 [EN010143/APP/6.1]**):

a. Option 1 – Field Station Units that will house transformers, switchgear and central inverters together.

b. Option 2 – Field Substations that will house transformers and switchgear. Inverters would be provided separately as string inverters located next to the panels. These are smaller than central inverters and generate lower levels of noise; however, a substantially larger number of inverters are required in a string arrangement.

c. Option 3 – transformers, switchgear and inverters (as central or string-type) each provided separately and not housed in in Field Station Units.

11.4.40 For the construction assessment scenario, Option 1 is considered to represent a reasonable worst-case due to the likely requirement that Field Station Units will require more substantial foundations than alternative options. The requirement for more substantial foundations will mean either additional noise may be generated by larger plant or the construction time for robust foundations may be longer. These high generating noise activities in distributed locations will generate higher level of noise than the string inverter option, which will not require the use of heavy plant during construction.

11.4.41 Although plant within Field Station Units or Field Substations will require cooling fans to regulate the temperature within the units, noise emissions from internal plant will be attenuated by the unit, which acts as a noise barrier. The level of attenuation is dependent on the surface density of the unit material, and an assumed 5 mm steel construction can attenuate noise by a weighted sound reduction index (known as ‘Rw’) of 39 dB, which is sufficient performance to noticeably attenuate noise levels. Consequently, Option 3 is considered to represent the worst-case scenario for operational noise.

11.4.42 Option 3 will be either string or central inverters. The string inverters would not generate high levels of noise; however, there would be multiple units spread throughout Solar PV Areas. Although there would be a far smaller number of central inverters, these generate higher levels of noise than string inverters. Consequently, the Option 3 assessment considers noise emissions from 100 central inverters (identified as the maximum number of central inverters in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**) as the reasonable worst-case scenario. The modelled layout is based on **Figure 2-3: Indicative Site Layout ES Volume 3 [EN/010143/APP/6.3].**

11.4.43 A sensitivity test is provided in **Appendix 11-4: Construction and Operational Noise Modelling, ES Volume 2 [EN010143/APP/6.2]** for the string inverter option that confirms that there is no material difference in noise predictions when compared to Option 3.

Construction and Decommissioning Phase

Overview of Works

11.4.44 As discussed in paragraph 11.4.40, Option 1 is considered to represent a reasonable worst case assessment scenario for the construction noise and vibration assessment. For the purposes of assessing noise and vibration, the construction programme has been summarised into three scenarios that represent high Noise Generating Activities (NGA). These activities are most likely to generate likely significant effects and are as follows:

a. NGA1 – Construction of the Grid Connection Substations, Field Station Units and ground mounted solar PV panel arrays;

b. NGA2 – Cable installation (general works) at the Grid Connection Corridor and the Interconnecting Cable Corridor; and

c. NGA3 – Cable installation (Horizontal Directional Drilling (HDD) activities) at the Grid Connection Corridor and the Interconnecting Cable Corridor.

11.4.45 Detailed information on construction of the Scheme can be seen in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1].**

11.4.46 The earliest construction is anticipated to start is in 2025 and construction of the Grid Connection Cables is anticipated to require 12 months, whereas construction of the solar farm (Solar PV Site and Interconnecting Cables) will require an estimated 24 months, with operation therefore anticipated to commence in 2027.

11.4.47 The core working hours are defined as:

a. Monday to Friday 07:00 to 19:00 (daylight hours permitting); and

b. Saturday 07:00 to 13:00 (daylight hours permitting).

11.4.48 Emergency working and continuous work may require work to extend beyond the core working hours quoted above.

11.4.49 Cabling and groundworks will be prioritised during the drier summer months (longer daylight hours) where possible.

11.4.50 It is noted that the working construction hours stated above conflict with the request from Selby District Council in paragraph 11.3.7 to limit construction hours between 08:00 and 18:00 Monday to Friday, and between 08:00 and 13:00 on Saturday. This issue has sought to be resolved in Section 11.6 as part of the Embedded Mitigation as it is intended to not carry out any noise generating activities during shoulder hours (the first and last hour of the working day). Quiet non-intrusive works such as, but not limited to, the installation of PV panels, electrical testing, commissioning and inspection may take place during these hours. This is secured in the **Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9]**

11.4.51 For the purposes of the assessment, decommissioning activities are assumed to be comparable, but no worse than construction activities. This approach has been agreed through consultation with the Planning Inspectorate (see **Table 11-1**).

Prediction Methodology

11.4.52 Noise levels experienced by sensitive receptors during construction and decommissioning works depend upon several variables, the most significant of which are:

a. The noise generated by plant or equipment used on site, generally expressed as sound power levels (Lw) or the vibration generated by the plant;

b. The periods of use of the plant on site, known as its on-time;

c. The distance between the noise/vibration source and the receptor;

d. The noise attenuation due to ground absorption, air absorption and barrier effects;

e. In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and

f. The time of day or night the works are undertaken.

Construction and Decommissioning Noise Criteria

11.4.53 Annex E of BS 5228-1 (Ref. 11-18) provides example methods for the assessment of the significance of construction noise effects. With reference to the NPSE (Ref. 11-6), the LOAEL and SOAEL thresholds have been set in **Table 11-6** below. Although there is currently a lack of evidence relating to health effects due to construction and decommissioning noise, the defined LOAEL and SOAEL have been accepted as appropriate in other consented major schemes[1]. Additionally, the LOAEL and SOAEL for construction noise are defined in DMRB LA111 (Ref. 11-2), which further supports the criteria in **Table 11-6.** The Unacceptable Adverse Effect Level (UAEL) for construction noise is based on the trigger level for temporary rehousing as set out in section E.4 of BS 5228-1 (Ref. 11-18).

Table 11-6. Thresholds of Potential Effects of Construction Noise at Residential Buildings

Time Period	Threshold Value ($L_{Aeq,T}$ dB)		
	LOAEL	SOAEL	UAEL
Day (07:00–19:00) Saturday (07:00–13:00)	65	75	85
Evening (19.00–23.00) Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays)	55	65	75
Night (23.00–07.00)	45	55	65

Note: The values apply to a location one metre from a residential building façade containing a window, ignoring the effect of the acoustic reflection from that façade.

11.4.54 In terms of sound insulation or temporary rehousing due to construction noise, BS 5228-1 states that a property would be eligible if exposed to

[1] For example High Speed 2, A14 Cambridge to Huntingdon, Thames Tideway and Manston Airport.

significant levels of noise "*for a period of 10 or more days of working in any 15* consecutive *days or for a total number of days exceeding 40 in any 6 consecutive months*" (Ref. 11-18). Consequently, although no requirement for insulation or temporary re-housing is identified (see section 11.7), these durations will be considered where a significant effect is identified.

Construction and Decommissioning Vibration

11.4.55 BS 5228-2 (Ref. 11-19) provides guidance on the perception of vibration within occupied buildings. This provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with construction and decommissioning induced vibration. **Table 11-7** details Peak Particle Velocity (PPV) levels (a standard measure of vibration effects) and their potential effect on humans.

Table 11-7. Criteria for Construction and Decommissioning Vibration (Human Response)

Magnitude of Impact	PPV Vibration Level	BS 5228-2 Description of Impact
LOAEL	0.3 mm/s	Vibration might be just perceptible in residential environments.
SOAEL	1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but it can be tolerated if prior warning and explanation has been given to residents.

11.4.56 The recommended PPV vibration limits for transient vibration, above which cosmetic damage could occur for different types of buildings are provided in BS 5228-2 (Ref. 11-19) and presented in **Table 11-8**. For these limits, 'minor damage' is possible at vibration magnitudes that are greater than twice those given in **Table 11-7**, and 'major damage' can occur at values greater than four times the tabulated values. Consequently, the significance of effect has been provided based on the sensitivity of a building to vibration induced cosmetic damage. Cosmetic damage would precede the onset of any structural damage.

Table 11-8. Criteria for Construction and Decommissioning Vibration (Cosmetic Building Damage)

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4 Hz to 15 Hz	~~4 Hz to~~ 15 Hz and above
Reinforced or framed structures, Industrial and heavy commercial buildings Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4 Hz to 15 Hz	~~4 Hz to~~ 15 Hz and above
Unreinforced or light framed structures Residential or light commercial buildings ~~Industrial and heavy commercial buildings~~	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Guide values in Table B.2 might need to be reduced by up to 50% due to dynamic loading from continuous vibration.

Note 2: A potential negligible effect (not significant) is indicated at vibration levels up to the threshold values.

Note 2: A potential minor adverse effect (not significant) is indicated at vibration levels up to a magnitude of twice the threshold values.

Note 3: A potential moderate adverse effect (significant) is indicated at vibration levels up to a magnitude of four times the threshold values.

Note 4: A potential major adverse effect (significant) is indicated at vibration levels equal to or greater than a magnitude of four times the threshold values.

Determining a Construction and Decommissioning Noise and Vibration Effect

11.4.57 Although a significant effect due to construction and decommissioning activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise, consideration of the significance of the effect for temporary construction activities exceeding the LOAEL is undertaken through qualitative consideration of the following:

a. Duration of activities;

b. Frequency of events;

c. Number of receptors; and

d. Sensitivity of receptors.

Construction and Decommissioning Traffic Noise

11.4.58 During the peak construction period, there will be up to 25 heavy goods vehicle (HGV) deliveries and 50 tractor/trailer movements per day based on the most rapid feasible construction programme. Traffic during decommissioning is expected to be similar to, but no worse than the construction phase. Construction and decommissioning traffic noise have been assessed for a representative worst-case day during the construction stage based on information in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**. Predicted construction traffic noise levels along the main access routes set out in **Appendix 13-2, ES Volume 2 [EN010143/APP/6.2]** have been compared to measured ambient noise levels so a potential change in noise can be derived.

11.4.59 Road traffic noise levels have been calculated with reference to methodology within the Calculation of Road Traffic Noise (CRTN) (Ref. 11-24), which contains an equation for the calculation of the Basic Noise Level (BNL) from a road in terms of the 18-hour Average Annual Weekday Traffic (AAWT) flow from 06:00 to 24:00. The temporary changes in road traffic noise levels along the local road network due to construction traffic have been assessed based on short-term changes in noise from Table 3.54a of DMRB LA111 (Ref. 11-2). Assessment criteria are presented in **Table 11-9**.

Table 11-9. Construction Traffic Noise Assessment Criteria

Effect Level	Magnitude criteria
Negligible	≥ 0 dB and < 1 dB
Minor	≥ 1 dB and < 3 dB
Moderate	≥ 3 dB and < 5 dB
Major	≥ 5 dB

11.4.60 DMRB defines the LOAEL as 55 dB $L_{A10,18h}$ and the SOAEL as 68 dB $L_{A10,18h}$. DMRB goes on to state that:

"Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0 dB or over results in a likely significant effect".

11.4.61 This implies that receptors experiencing noise levels exceeding the SOAEL are more sensitive to smaller changes in noise than receptors experiencing absolute noise levels below the SOAEL. As the CRTN method calculates the BNL at 10 m from the roadside, the absolute noise level is not considered to be representative of what nearby receptors may experience; however, it is appropriate for defining a change in noise level. Should an increase in noise of greater than 1 dB be identified from a road where the BNL exceeds the SOAEL, additional calculations are undertaken to identify the absolute noise levels at nearby receptors and the likelihood of significant effects.

Operational Noise

11.4.62 As discussed in paragraph 11.4.41, the central inverter Option 3 is considered to represent a reasonable worst case assessment scenario for the operational noise and assessment. This considers the following significant sources of operational noise:

a. Transformers; and

b. Inverters/ switchgears.

11.4.63 A tracker system will be used on the solar PV modules to maximise their efficiency by keeping them oriented towards the sun. Noise emissions from tracker motors are very low and unlikely to be perceptible at sensitive receptors. Consequently, tracker motors have not been included in the operational noise assessment. Details on noise emissions from tracker motors can be found in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]**.

11.4.64 Noise predictions of the operational Scheme have been undertaken using CadnaA®, which implements the calculation procedures of ISO 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (Ref. 11-25), to predict the propagation of noise away from the Scheme in all directions and to quantify resultant noise levels at the identified noise sensitive receptor locations.

11.4.65 Operational noise has been assessed following BS 4142 guidance (Ref. 11-21), whereby the rating level of noise emissions from activities are compared against the background level of the pre-development noise climate. Source data for operational noise emissions is presented in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]**. The relevant parameters in this instance are as follows:

a. Background sound level – $L_{A90,T}$ – defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels;

b. Specific sound level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and

c. Rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

11.4.66 BS 4142 recognises that certain acoustic features of a sound source can increase the impact over that expected based purely on the sound level. The standard identifies the following features to be considered:

a. Tonality – a penalty of 2 dB is applied for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible;

b. Impulsivity – a penalty of 3 dB is applied for impulsivity which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible. An impulse is defined as the sudden onset of a sound;

c. Intermittency – a penalty of 3 dB can be applied if the intermittency of the specific sound is readily identifiable against the residual acoustic environment at the receptor i.e. it has identifiable on/off conditions; and

d. Other sound characteristics – a penalty of 3 dB can be applied where the specific sound features characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment.

11.4.67 BS 4142 states the following regarding the assessment of impacts, comparing the rating level of the new noise source with the existing background level:

a. "Typically, the greater this difference, the greater the magnitude of the impact.

b. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

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

d. The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

11.4.68 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.

11.4.69 BS 4142 advises that, where rating levels and background levels are low, which is the case in rural areas surrounding the Site, the assessment of operational noise should take into context the absolute noise level. The ANC Guide to BS 4142 (Ref. 11-26) provides context to this by stating:

"*BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$".*

11.4.70 The ANC Guide suggests that: *"…similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate*".

11.4.71 A minimum rating level of 35 dB $L_{Ar,Tr}$ for the LOAEL would align with guidance in PPGN, which defines noise below the LOAEL as follows:

"*Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life*".

11.4.72 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (Ref. 11-22) and the World Health Organization (WHO) 'Guidelines for Community Noise' (1999) (Ref. 11-23) provide guidance levels for internal noise within dwellings of 30 dB $L_{Aeq,T}$ for good sleeping conditions at night. In accordance with examples in Annex A of BS 4142, it is assumed that building envelope attenuation would be reduced to approximately 10 dB by a partially open window. Consequently, an external SOAEL of 40 dB $L_{Ar,Tr}$ has been adopted for the night-time.

Table 11-10. Operational Noise Assessment Criteria

Effect Level	Rating Level (External) at Receptor, $L_{Ar,Tr}$	
	Daytime (07:00–19:00) and Evening (19:00–23:00)	**Night-time (23:00–07:00)**
LOAEL	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 35 dB $L_{Ar,Tr}$	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 30 dB $L_{Ar,Tr}$
SOAEL	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$	Greater than 10 dB above the background noise level – minimum of 40 dB $L_{Ar,Tr}$

Non-Residential Receptors

11.4.73 Design guides for good internal conditions in non-residential receptors are set indoors. There is one non-residential receptor in the assessment that comprises of multiple holiday chalets (R51 identified in **Table 11-4**). BS 8233 recommends a design criterion for holiday accommodation that is to the same as those for living accommodation (Ref. 11-22). Therefore, the same criteria that applies to residential receptors in this report has been used for R51.

11.5 Baseline Conditions

11.5.1 This section describes the baseline environmental characteristics for the Scheme and surrounding areas with specific reference to noise and vibration. Further details of the methodology and results of the baseline noise surveys are presented in **Appendix 11-2, ES Volume 2**.

Data Sources

11.5.2 In preparation of this chapter, the following sources of published information have been used to establish the baseline conditions:

a. Aerial imagery of the site and surrounding area to define sensitive receptors and monitoring locations;

b. **Figure 2-3: Indicative Site Layout, ES Volume 3 [EN010143/APP/6.3]** for the noise model;

c. Plant noise source data were referenced from specification sheets provided by the Applicant and previous solar farm noise assessments;

d. **Chapter 2: The Scheme [EN010143/APP/6.1]** for information on the operational Scheme and construction; and

e. **Chapter 13: Transport and Access [EN010143/APP/6.1]** for information on construction traffic.

Existing Baseline

11.5.3 During the surveys, the dominant noise source at the majority of the locations was observed to be road traffic from the surrounding road

network. Additionally, at N11 and N12, train movements had a substantial contribution to the noise environment. Other local noise sources that influence noise conditions are road traffic from the M62 to the south, Drax Power Station to the south-west, York Flying School to the west, and local wind farms and agricultural farming activities.

11.5.4 A summary of the noise monitoring results is presented in **Table 11-11**. Typical ambient ($L_{Aeq,1h}$) and background ($L_{A90,1h}$) arithmetic averaged sound levels are presented for the daytime, evening and night week-long monitoring locations. More details on the baseline data are available in **Appendix 11-3: Baseline Noise Survey, ES Volume 2 [EN010143/APP/6.2]**.

Table 11-11. Summary of Baseline Noise Monitoring Results

Location Reference	Sound Level Indicator	Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
N1	$L_{Aeq,1h}$	50	44	38
	$L_{A90,1h}$	35	29	28
N2	$L_{Aeq,1h}$	50	41	35
	$L_{A90,1h}$	31	25	23
N3	$L_{Aeq,1h}$	45	35	38
	$L_{A90,1h}$	33	29	26
N4	$L_{Aeq,1h}$	48	41	30
	$L_{A90,1h}$	29	24	24
N5	$L_{Aeq,1h}$	45	36	35
	$L_{A90,1h}$	35	28	27
N6	$L_{Aeq,1h}$	41	34	38
	$L_{A90,1h}$	34	32	35
N7	$L_{Aeq,1h}$	53	44	40
	$L_{A90,1h}$	41	36	35
N8	$L_{Aeq,1h}$	42	35	29
	$L_{A90,1h}$	32	27	25
N9	$L_{Aeq,1h}$	56	49	45
	$L_{A90,1h}$	36	31	31
N10	$L_{Aeq,1h}$	58	54	53
	$L_{A90,1h}$	47	34	35
N11	$L_{Aeq,1h}$	47	42	36

Location Reference	Sound Level Indicator	Day (07:00–19:00) dB	Evening (19:00–23:00) dB	Night (23:00–07:00) dB
	$L_{A90,1h}$	34	29	25
N12	$L_{Aeq,1h}$	50	46	40
	$L_{A90,1h}$	36	32	29
N13	$L_{Aeq,1h}$	54	49	48
	$L_{A90,1h}$	46	38	38
N14	$L_{Aeq,1h}$	53	49	47
	$L_{A90,1h}$	44	36	37
N15	$L_{Aeq,1h}$	47	42	38
	$L_{A90,1h}$	46	38	38
N16	$L_{Aeq,1h}$	47	44	43
	$L_{A90,1h}$	42	40	41

Future Baseline

11.5.5 The future baseline scenarios are set out in **Chapter 5: Environmental Impact Assessment Methodology, ES Volume 1 [EN010143/APP/6.1]**. In the absence of the Scheme, it is considered likely that the future baseline noise environment will be higher than represented by the January–February 2023 measurements of the ambient sound levels. This is due to natural growth of road traffic flows resulting in increased noise in the local area. However, natural growth alone is unlikely to result in perceptible changes to baseline noise and measured current baseline data is therefore considered representative of future baseline conditions.

11.5.6 The assessment of construction traffic noise effects accounts for the future peak construction year, which includes natural traffic growth. However, the operational noise assessment assumes that the measured baseline data is representative (i.e., no higher) than future baseline conditions, which represents a reasonable worst-case scenario.

11.6 Embedded Mitigation

11.6.1 Where practicable, mitigation measures have been incorporated into the Scheme design and/or how it shall be constructed. Through iterative assessment, potential impacts have been predicted and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation/mitigation by design approach has been taken into account when evaluating the significance of the potential impacts.

Construction and Decommissioning

11.6.2 Measures to control noise are defined in Annex B of BS 5228-1 (Ref. 11-18) and measures to control vibration are defined in Section 8 of BS 5228-2 (Ref. 11-19). These embedded measures represent Best Practicable Means (BPM) (as defined in Section 72 of the Control of Pollution Act, Ref. 11-3) and are secured within the **Framework CEMP [EN010143/APP/7.7]** for the construction phase and **Framework DEMP [EN010143/APP/7.9]** for the decommissioning phase. These documents are secured through DCO requirements.

11.6.3 Best Practicable Means that would be implemented during construction works and secured through the CEMP and DEMP are presented below:

a. Ensuring that all appropriate processes, procedures and measures are in place to minimise noise before works begin and throughout the construction programme;

b. All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) which should form a prerequisite of their appointment;

c. Ensuring that, where reasonably practicable, noise and vibration are controlled at source (e.g., the selection of inherently quiet plant and low vibration equipment), review of the construction programme and methodology to consider quieter methods, consideration of the location of equipment on-site and control of working hours;

d. Use of modern plant, complying with applicable UK noise emission requirements;

e. Hydraulic techniques for breaking concrete or rocks to be used in preference to percussive techniques, where reasonably practicable;

f. When piling, use of lower noise piling where reasonably practicable;

g. Off-site pre-fabrication where reasonably practicable;

h. Regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications;

i. All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;

j. Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the Site to be conducted in such a manner as to minimise noise generation, as far as reasonably practicable;

k. All vehicles used on-site shall incorporate broadband reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance where reasonably practicable;

l. Appropriate routing of construction traffic on public roads and along access tracks to avoid sensitive areas where practicable (see **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** and the **Framework Construction Traffic Management Plan (CTMP),**

Appendix 13-5 ES Volume 2 [EN010143/APP/6.2] which also contains figures detailing traffic routing);

m. Provision of information to the relevant local authority and local residents to advise of potential noisy works that are due to take place;

n. Monitoring of noise complaints and reporting to the Applicant for immediate investigation and action. A display board will be installed on-site, and a website will be set up. These will include contact details for the Site Manager or alternative public interface with whom nuisance or complaints can be lodged. A logbook of complaints will be prepared and managed by the Site Manager;

o. Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use;

p. Drop heights of materials will be minimised;

q. Plant and vehicles will be sequentially started up rather than all together;

r. Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas;

s. Works undertaken in Grid Connection Corridor and the Interconnecting Cable Corridor would be undertaken at least 15m from a sensitive receptor where practicable.

t. Noise generating activities near residential properties, such as use of power tools or piling, would be limited to the hours between 08:00 and 18:00 from Monday to Friday and between 08:00 and 13:00 on Saturday;

u. Core working hours onsite will be 07:00 to19:00 Monday to Friday and 07:00 to 13:00 on Saturday, but will be shortened if working would necessitate artificial lighting and therefore the working day will be shorter in the winter months (with the exception of activities such as HDD which require continuous working). There will be no work on a Sunday or Bank Holiday unless crucial to construction (e.g., HDD which must be a continuous activity etc.) or in an emergency; and

v. Where high noise generating works are required to be undertaken outside of core daytime working hours, consents will be sought from the relevant local authority under Section 61 of the Control of Pollution Act 1974 (Ref. 11-3) for the proposed construction works, excluding non-intrusive surveys. The Section 61 application will set out the specific method of working, calculations of noise levels at nearby receptors, the actual working hours required, noise monitoring locations, details of communication measures and the mitigation measures implemented to minimise noise and vibration impacts.

11.6.4 It is noted that the construction hours stated in paragraph 11.4.47 conflicts with consultation from Selby District Council in paragraph 11.3.7 regarding working hours. Mitigation outlined above (paragraph 11.6.3t) seeks to prevent noise generating activities from occurring during the shoulder hours in the first and last hours of the working day.

11.6.5 A construction noise monitoring scheme shall be developed as per requirements of the **Framework CEMP [EN010143/APP/7.7]** following appointment of a principal contractor and prior to commencement of construction works. Requirements for monitoring during the decommissioning stages are outlined in the **Framework DEMP [EN010143/APP/7.9]**.

11.6.6 The effect of noise and vibration on nearby sensitive receptors can be minimised through a good communication strategy. Prior to construction works being undertaken, liaison will be undertaken with occupiers of sensitive receptors that may be adversely affected by construction noise and vibration.

11.6.7 Noise complaints will be monitored and reported to the Applicant for immediate investigation and action. A display board will be installed on-site, and a website will be set up. These will include contact details for the Community Liaison Officer or alternative with whom nuisance or complaints can be lodged. A logbook of complaints will be prepared and managed by the Site Manager.

11.6.8 The communication strategy and noise complaint system will be secured through the DCO as part of the **Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9]**.

11.6.9 The Applicant will submit an application for prior consent to carry out noisy work under Section 61 of the Control of Pollution Act (Ref. 11-3) to demonstrate that noise and vibration has been minimised as far as reasonably practicable. The Section 61 application will set out the specific method of working, calculations of noise levels at nearby receptors, the actual working hours required, noise monitoring locations, details of communication measures, and the mitigation measures implemented to minimise noise and vibration impacts.

11.6.10 As requirements and locations for HDD activities will not be finalised until a principal contractor is appointed, a hierarchy of mitigation measures is contained in the Framework CEMP (**Appendix 2-1, ES Volume 2**) to ensure that significant noise effects do not occur due to potential night-time works:

a. Where practicable, avoid HDD works within 200 m (the distance at which significant effects are predicted at night) of residential receptors (although this will depend on the results of the ground investigation survey);

b. Where HDD activities may occur within 200 m of sensitive receptors, the option for open cut cable laying will be explored as an alternative to HDD;

c. The potential for the use of quieter equipment than listed in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]** will be explored by the principal contractor; and

d. Depending on the location, plant and timing of works, temporary acoustic fencing will be installed around the HDD site boundary to screen receptors from noise emission if HDD works are required within 200 m of a sensitive receptor. This mitigation could provide

10 dB of attenuation when the noise screen completely hides the sources from the receiver.

11.6.11 Consideration has been given to traffic routing, timing, and access points to the Scheme to minimise noise impacts at existing receptors as detailed in **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]**. Management of Heavy Goods Vehicles (HGV) on the highway network will be managed through the **Framework Construction Traffic Management Plan (CTMP)** (**Appendix 13-5, ES Volume 2 [EN010143/APP/6.2]**), which will be secured through the DCO. Appropriate routing of construction and decommissioning traffic on public roads and along access tracks will be pursuant to the CTMP.

Operation

11.6.12 Embedded mitigation measures that will be applied for the operational phase of the Scheme are summarised as follows:

a. Plant selection;

b. Design Location and orientation of Field Station Units / Field Substations, and the Grid Connection Substations to minimise noise at receptors.

11.6.13 Plant that will be used in the Scheme has not yet been finalised. Consequently, a conservative approach has been taken when defining sound data for noise sources and it may be possible that quieter plant can be incorporated into the final design. Quieter plant would be the most effective way of controlling noise emissions. Noise source data for inverters has been referenced from SMA (model Sunny Central Up) and is considered to represent a reasonable worst-case assessment.

11.6.14 The Scheme layout has been optimised to locate inverters as far as practicable from sensitive receptors where the highest levels of noise were predicted. In general, Field Stations will be located at least 250 m from residential properties. The exception to this is a specific exclusion area for a sensitive receptor in Spaldington. This exclusion area is defined in the **Outline Design Principles Statement [EN010143/APP/7.4]**.

11.6.15 Although the indicative Scheme layout has been optimised to minimise noise levels at sensitive receptors, there is a requirement to retain some flexibility on where infrastructure will be located on-site. Consequently, if there is a decision in the future to move noise generating infrastructure closer to sensitive receptors than shown in **Figure 11-2, ES Volume 3 [EN010143/APP/6.3]**, the Applicant commits that noise at sensitive receptors will be no higher than the levels presented in Section 11.7. The measures to achieve this are discussed in Section 11.6 and will be secured in the **Framework OEMP [EN010143/APP/7.8]**.

11.6.16 Low frequency noise can be very difficult to predict with a high level of certainty and similarly hard to identify and resolve if present. This is because it can be generated by the unexpected interactions between system components and can be amplified by the geometry of the site and receptor buildings. The issue of low frequency noise will be considered during the detailed design post consent for the substation and eliminated through design, or appropriately mitigated (isolation and attenuation

measures) where appropriate and would be secured through the **Outline Design Parameters [EN010143/APP/7.4]** in the DCO Application.

11.7 Assessment of Likely Impacts and Effects

11.7.1 The Scheme has the potential to affect Noise and Vibration (positively or negatively) during construction, operation and during decommissioning in the following ways:

a. Noise and vibration emissions due to construction and decommissioning activities, including noise from temporary increases in traffic on the local road network; and

b. Operational noise from solar farm plant.

11.7.2 The assessments have been undertaken following consideration of the embedded mitigation measures as described in section 11.6.

Construction and Decommissioning Noise Effects

11.7.3 For NGA1 (Construction of the Field Station Units and ground mounted solar PV panel arrays), as described in paragraph 11.4.44, construction noise predictions were undertaken at sensitive receptor locations identified in **Table 11-4**. For NGA2 (Cable installation (general works) at the Grid Connection Corridor and the Interconnecting Cable Corridor) and NGA3 (Cable installation (Horizontal Directional Drilling (HDD) activities) at the Grid Connection Corridor and the Interconnecting Cable Corridor), the potential distance from grid connection activities at which LOAEL and SOAEL are calculated to occur were used to screen receptors in the Grid Connection Corridor Study Area for adverse levels of noise and likely significant effects.

NGA1

11.7.4 Noise predictions have been undertaken for NGA1, which will be undertaken during core daytime working hours. It is likely that construction activities will be carried out in phases, however information on phasing is not known at this time. Noise predictions have assumed that all phases are being constructed at the same time which stipulates a worst-case scenario. The results of construction noise predictions are summarised in **Table 11-12**.

Table 11-12. Construction Noise Predictions for NGA1

Receptor Reference	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
Below LOAEL	
R1	60
R2	60
R3	60
R4	61
R5	57
R6	57

Receptor Reference	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
R7	59
R8	62
R9	60
R10	57
R11	59
R12	60
R13	61
R14	55
R15	56
R16	58
R17	59
R18	56
R19	57
R20	59
R21	63
R22	63
R23	60
R24	60
R25	63
R26	60
R27	61
R28	63
R29	59
R30	61
R31	56
R32	56
R33	56
R34	54
R35	52
R36	53
R51	54
R52	57

Receptor Reference	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
R53	59
R54	52
R55	59
Above or equal to LOAEL and below SOAEL	
No levels above or equal to LOAEL and below SOAEL have been predicted	
Above or equal to SOAEL	
No exceedances of SOAEL have been predicted	

11.7.5 For NGA1, noise predictions at sensitive receptors indicate that the LOAEL will not be exceeded and NGA1 construction noise will be **not significant**.

NGA2

11.7.6 For NGA2, noise predictions indicate that receptors within approximately 50 m of the Grid Connection Corridor and the Interconnecting Cable Corridor may experience noise levels exceeding the LOAEL and receptors within 15 m may experience noise levels exceeding the SOAEL. Receptors within the Grid Connection Corridor and the Interconnecting Cable Corridor and worst-case distances to potential locations of cable laying activities are identified in **Table 11-4**. Details on how noise predictions have been derived are detailed in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2].**

Table 11-13. Cable Laying Construction Noise Effects – NGA2

Effect Level	Receptor Locations
Below LOAEL	R7, R9, R10, R28, R37–R41, R43, R45, R47
Between LOAEL and SOAEL	R8, R17, R27, R44, R46, R48
Above SOAEL	R16, R26, R42

11.7.7 There is potential for significant noise effects due to the cable laying activities if they occur within 15 m of a sensitive receptor where exceedances of the SOAEL may occur. There are three locations along the Grid Connection Corridor and the Interconnecting Cable Corridor that meet this criterion and may potentially experience significant noise effects (R16, R26 and R42).

11.7.8 NGA2 will only take place during core daytime working hours. Occupants of nearby receptors can be more tolerant of high noise events if they are regularly communicated to and kept informed of timings and duration of high noise generating events. Paragraph 6.3 of BS5228-1 states that:

"*Local residents might be willing to accept higher levels of noise if they know that such levels will only last for a short time.*"

11.7.9 Consequently, the communication strategy, which will be secured through DCO process as part of the CEMP, will ensure that occupants of affected

properties will be notified of the timings and duration of works. Additionally, cable laying works within 15 m of a sensitive receptor would be avoided. Consequently, noise effects due to construction and decommissioning activities along the Grid Connection Corridor and the Interconnecting Cable Corridor are considered to be **not significant.**

NGA 3

11.7.10 For NGA3, HDD activities may last for up to three days and involve activities at a drill site and a reception pit. At this stage of the Scheme, eight locations that require trenchless cable installation methods have been identified at the Grid Connection Corridor and Interconnecting Cable Corridor. For the purposes of the noise assessment, HDD has been identified as worst-case trenchless cable installation method due to the potential requirement for night-time working. Potential HDD locations are listed in **Table 11-14** and shown on **Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas, ES Volume 3 [EN010143/APP/6.3]**.

Table 11-14. Potential HDD Locations and Distance to Nearest Receptor

HDD ID	Description	Distance to Nearest Receptor
HDD1	Featherbed Drain (boundary between Solar PV Areas 2f and 2g)	700 m
HDD2	Hull to Selby Railway line	490 m
HDD3	River Derwent	60 m
HDD4	A63/ Access track	45 m
HDD5	Unnamed drain (DE53)	450 m
HDD6	River Ouse	260 m
HDD7	Drax cooling discharge pipe	500 m
HDD8	Entry to Drax Substation	280 m

11.7.11 It is noted that HDD operations will only occur during the construction phase (cable installation) and will not occur during decommissioning. As the drilling activities at the entry pit will generate the highest level of noise, calculations of noise have been based on a reasonable worst-case assumption that all potential HDD sites are entry pits.

11.7.12 The most onerous noise criteria of 55 dB $L_{Aeq,T}$ for continuous HDD works is during the night-time period. Calculations of HDD noise (see **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2]**) indicate that significant effects (an exceedance of SOAEL) may occur at night at sensitive receptors within 200 m of activities. Adverse levels of noise may occur at receptors farther away; however, embedded mitigation measures satisfy NPSE requirements that allow adverse impacts to occur providing reasonable steps have been taken to reduce these effects. Consequently, the assessment of HDD noise focuses on receptors within 200 m of a potential drill site location.

11.7.13 Receptors within 200 m of the Grid Connection Corridor at likely HDD locations that may be subjected to significant effects have been selected.

Results of noise calculations at receptors within 200 m of the Grid Connection Corridor and Interconnecting Cable route boundaries are presented in **Table 11-15**.

Table 11-15. HDD Noise Effects – NGA3

HDD ID	Receptor	Approximate Distance (m)	Calculated Noise Level $L_{Aeq,T}$ dB
HDD3	R465	60	68
HDD4	R42	90120	603
HDD4	R43	4590	6371
HDD4	R44	45	71

11.7.14 HDD activities are not predicted to exceed the SOAEL during the daytime, weekday evening and weekend at any receptors; however, if works extend into the night, the SOAEL may be exceeded. Noise calculations indicate that the SOAEL would be exceeded during night works that occur within 200 m of a receptor. Consequently, HDD activities at all identified locations have the potential to result in significant noise effects if they extend into the night-time period.

11.7.15 For all works that are undertaken outside core work periods, a Section 61 consent (Control of Pollution Act, Ref. 11-3) would be applied for and will contain details on the methodology, mitigation, communication strategy and monitoring. If Section 61 consent is not applied for, it will be open for the local authority to serve a notice pursuant to Section 60 of that Act specifying actions to control noise if it considers it appropriate to do so, in accordance with the terms of that provision. It is not a pre-requisite for Section 61 consent to be in place at any time for the purposes of construction or operation of the Scheme although it is common practice for such applications to be made in advance.

11.7.16 The hierarchy of mitigation measures for HDD activities listed in paragraph 11.6.10 will ensure that HDD activity noise effects will be reduced as far as reasonably practicable. This hierarchy includes the use of acoustic fencing which, if required, could provide 10 dB of noise attenuation. Consequently, noise from HDD activities at locations R40 R42 and R41 R43 would reduce to below the night-time SOAEL of 55 dB $L_{Aeq,T}$ and would not experience significant effects. However, the night-time SOAEL would still be exceeded at R43, R45,4 and R46. These receptors would experience **significant** noise effects if HDD was required at night. However, it should be noted that this identification of a likely significant effect is precautionary as it is expected that HDD activities outside of the daytime period would only be required if there is a clear and obvious benefit, such as for safety reasons or to avoid daytime disruption to many people or, in the case of the Hull to Selby Railway if required by the asset owner.

Construction and Decommissioning Vibration Effects

NGA1

11.7.17 It is generally accepted that, without a highly detailed understanding of the media, waveform, and frequency distribution, ground-borne vibration prediction methods are “beset with complexities and uncertainties” (Ref. 11-28). However, it is unlikely that typical construction and decommissioning working routines would generate levels of vibration at local receptors at a level where cosmetic damage would be expected to be sustained or cause adverse effects for local residents. The level of impact at different receptors will be dependent upon several factors including distance between the works, ground conditions and the specific activities being undertaken. Consequently, vibration effects are defined with reference to information in guidance documents identified in the following paragraph.

11.7.18 Surface plant, such as cranes, compressors and generators, are not recognised as sources of high levels of ground-borne vibration. Reference to Figure C2 of ‘Control of Vibration and Noise During Piling’ (Ref. 11-29) confirms that PPVs significantly less than 5 mm/s are generated by such machinery, even at distances of only 10 m. For example, the indication is that a bulldozer would generate a PPV of approximately 0.6 mm/s and a ‘heavy lorry on [a] poor road surface’ would generate a PPV of less than 0.1 mm/s at 10 m. These values are well below levels at which cosmetic building damage are predicted to occur; the lower levels being 15 mm/s for predominantly transient vibrations and 7.5 mm/s for continuous vibrations at the base of residential or lighter framed commercial buildings. The aforementioned values are also below the 1.0 mm/s SOAEL (see **Table 11-7**) where it is likely that vibration in residential environments will result in complaints but can be tolerated if prior warning and explanation is given to residents.

11.7.19 Piling is assumed to be used for construction of PV modules as a worst-case scenario from the vibration perspective. The minimum distance between any piling works for the construction of PV modules and the nearest receptor is approximately 50 m. Appendix 11-4 contains details on levels of vibration from piling referenced from Table D.6 of BS 5228-1. ~~and, therefore,~~This data indicates that piling induced ground borne vibration is below the LOAEL at a distance of 50 m and not significant ~~during piling works~~.

11.7.20 Vibration at nearby sensitive receptors from construction of the Field Station Units and ground mounted solar PV panel arrays would be **not significant**.

NGA2

11.7.21 The highest levels of vibration that would be generated by cable laying activities would be the use of vibratory roller during reinstatement. Vibratory rollers may generate adverse levels of vibration (i.e., exceeding 0.3 mm/s) at receptors within 50 m and significant levels of vibration (i.e., exceeding 1.0 mm/s) at receptors within 25 m.

11.7.22 Receptors within 25 and 50 m of the Grid Connection Corridor or Interconnecting Cable Corridor are identified in **Table 11-4** as ~~R8,~~ R17, R21, R22, R25, R27, R32, R44 and R48.

11.7.23 Receptors within 25 m of the Grid Connection Corridor or Interconnecting Cable Corridor are identified in **Table 11-4** as R8, R16, R26, R42 and R46.

11.7.24 For PPV level above 1.0 m/s, BS 5228-2 (Ref. 11-19) states that:

"*It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents".*

11.7.25 For PPV vibration levels exceeding 1.0 mm/s, prior warning will be provided on the timings and duration of vibration generating activities. This will be secured through the **Framework CEMP,** which will be secured through the DCO. Given the short duration of these activities (i.e., less than a day) affecting individual receptors, prior warning is considered sufficient to offset significant effects.

11.7.26 Accordingly, at this stage, it is anticipated that vibration at nearby sensitive receptors would be **not significant** for cable laying activities.

NGA3

11.7.27 Similar levels of vibration to piling may be generated by HDD activities. As the nearest receptor (R43) to the potential HDD works is approximately 45 m away, ground borne vibration may be perceptible. Consequently, the LOAEL may be exceeded, but it is unlikely that the SOAEL would be exceeded. As such, vibration at nearby sensitive receptors from HDD activities would be **not significant**.

Construction and Decommissioning Traffic Noise Effects

11.7.28 The potential changes in road traffic noise from these roads as a result of the Scheme have been considered by calculating a CRTN BNL at 10 m next to roads within the CRTN prediction range and comparing the change. **Table 11-16** presents the results of the assessment. Refer to **Figure 13-2, ES Volume 3 [EN010143/APP/6.3]** for the locations of the road links shown in **Table 11-16**.

Table 11-16. Construction Traffic Noise Assessment

Link Reference	Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
ATC1	New Road	63.4	63.6	+0.2	Negligible
ATC5	Street Lane	65.7	66.2	+0.5	Negligible
ATC7	A263	67.5	67.6	+0.1	Negligible
ATC9	A163	66.9	67.4	+0.5	Negligible
ATC10	Howden Road	72.3	72.6	+0.3	Negligible
ATC14	Thorpe Road	71.5	71.7	+0.2	Negligible
ATC15	Station Road	66.6	66.9	+0.3	Negligible
ATC16	A632	69.8	70.0	+0.2	Negligible

Link Reference	Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
ATC17	A645	71.8	72.0	+0.2	Negligible
ATC18	A645	70.6	70.8	+0.2	Negligible
ATC19	Hull Road	70.8	71.0	+0.3	Negligible

11.7.29 Changes in noise due to construction traffic are identified as negligible and **not significant**.

11.7.30 Changes in road traffic noise have only been calculated from roads with flows of greater than 1,000 AAWT. This is because the CRTN (Ref. 11-24) calculations are unreliable for traffic flows below an AAWT of 1,000. Although construction traffic will not use roads of less than 1,000 AAWT during pipe set up and transport, low flow roads will be affected during construction of site access. Consequently, a qualitative assessment of potential construction traffic noise effects has been undertaken based on average hourly construction traffic flows.

11.7.31 The maximum number of average hourly vehicle movements along a low traffic flow road is three movements per hour. Whilst this level of construction traffic may cause disturbance, construction traffic flows are not considered of sufficient magnitude to result in a significant effect i.e., "*having to keep windows closed most of the time because of the noise*" (referenced from PPGN noise exposure hierarchy table – reproduced in **Appendix 11-1, ES Volume 2 [EN010143/APP/6.2]**). Consequently, construction traffic noise effects on low flow roads are considered to be, at worst, minor adverse and **not significant**.

Operational Effects

11.7.32 Plant will operate continuously so there will not be any noticeable impulsive or intermittent characteristics from plant noise emissions experienced at the surrounding receptors. Transformers can have tonal features, although noise emissions from central inverters will be dominated by the cooling fans such that any tonal features of the transformers will not be noticeable. However, overall plant noise emissions will likely be experienced at receptors as a distinctive continuous and steady hum; therefore a 3 dB correction to account for noise that is 'distinctive against the residual acoustic environment' has been applied in determining the rating level as per BS 4142 guidance in paragraph 11.4.67.

11.7.33 Details of the operational noise modelling methodology are provided in **Appendix 11-4, ES Volume 2 [EN010143/APP/6.2].**

11.7.34 As the night-time period provides the most onerous assessment criteria and operational noise is assumed to be consistent, the assessment presented in **Table 11-17** considers night-time noise only.

Table 11-17. Operational Noise Effects

Receptor Reference	Lowest Measured Background Level $L_{A90,1h}$ dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Level $L_{Ar,Tr}$ dB
Below LOAEL			
R5	25	30 / 40	28
R6	25	30 / 40	27
R11	35	35 / 45	30
R12	35	35 / 45	30
R14	27	30 / 40	26
R15	25	30 / 40	27
R16	35	32 / 42	27
R17	35	32 / 42	29
R18	25	30 / 45	29
R19	31	31 / 45	28
R20	31	31 / 41	30
R30	29	30 / 40	27
R31	38	38 / 48	27
R32	37	37 / 47	27
R33	37	37 / 47	26
R34	38	38 / 48	23
R35	38	38 / 48	24
R36	38	38 / 48	21
R51	28	30 / 40	26
R54	37	37 / 47	23
Above or equal to LOAEL and below SOAEL			
R1	28	30 / 40	34
R2	28	30 / 40	35
R3	23	30 / 40	33
R4	23	30 / 40	34
R7	26	30 / 40	34
R8	26	30 / 40	38
R9	26	30 / 40	38
R10	26	30 / 40	34
R13	24	30 / 40	34

Receptor Reference	Lowest Measured Background Level $L_{A90,1h}$ dB	LOAEL / SOAEL (Night-time) dB	Predicted Rating Level $L_{Ar,Tr}$ dB
R21	31	31 / 41	34
R22	31	31 / 41	32
R23	31	31 / 41	35
R24	25	30 / 40	33
R25	25	30 / 40	34
R26	25	30 / 40	32
R27	29	30 / 40	35
R28	29	30 / 40	33
R29	29	30 / 40	34
R52	24	30 / 40	31
R53	28	30 / 40	35
R55	23	30 / 40	32
Above or equal to SOAEL			
No exceedances of SOAEL have been predicted			

11.7.35 The SOAEL is not exceeded at any of the receptor locations so operational noise effects are **not significant**. However, the LOAEL is exceeded at some receptors locations (as detailed in **Table 11-17** above) and adverse levels of noise are identified. The NPSE (Ref. 11-6) states that:

"…*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development … This does not mean that such adverse effects cannot occur*".

11.7.36 Reasonable steps to reduce noise are covered in section 11.6 and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE requirements are complied with through provision of embedded mitigation.

Summary of Effects

11.7.37 A summary of effects for noise and vibration is presented in **Table 11-18**. Noise and vibration effects during the decommissioning phase are considered equivalent to those identified for the construction phase (paragraph 11.4.6).

Table 11-18. Summary of magnitude of impact and significance of effect – noise and vibration

Receptor	Type	Description of Impact	Effect Category	Significant effect (Yes / No)
R1–R36, R51–R54	Residential	Construction noise (NGA1)	Below SOAEL	Not significant
R55	Non-residential	Construction noise (NGA1)	Below SOAEL	Not significant
R1–R36, R51–R54	Residential	Construction vibration (NGA1)	Below SOAEL	Not significant
R55	Non-residential	Construction vibration (NGA1)	Below SOAEL	Not significant
R8, R17, R27, R44, R46, R48	Residential	Cable laying noise (NGA2)	Below SOAEL	Not significant
R16, R26, R42	Residential	Cable laying noise (NGA2)	Above SOAEL	Not significant (given prior warning of timings and durations) and application of a 15 m avoidance zone
~~R8, ~~R17, R21, R22, R25, R27, R32, R44, R48	Residential	Cable laying vibration (NGA2)	Below SOAEL	Not significant
R8, R16, R26, R42, R46	Residential	Cable laying vibration (NGA2)	Above SOAEL	Not significant (given prior warning of timings and durations)
~~R41~~R42, R4~~2~~3	Residential	HDD noise (NGA3)	Below SOAEL	Not significant
~~R43, ~~R4~~45~~, R46	Residential	HDD noise (NGA3)	Above SOAEL	Significant
R41, R42, R43, R45, R46	Residential	HDD vibration (NGA3)	Below SOAEL	Not significant
R1–R36, R51–R54	Residential	Operational noise	Below SOAEL	Not significant
R55	Non-residential	Operational noise	Below SOAEL	Not significant

11.8 Additional Mitigation, Enhancement, and Monitoring

11.8.1 Additional mitigation measures are only required where significant effects are identified following the application of embedded mitigation measures.

Additional Mitigation

11.8.2 The assessment identified potential for significant noise effects to occur at six residential properties due to cable laying (NGA2). However as noted in section 11.6, the assessment is based on a worst case where the closest distance of separation between the receptor and noise generating activities is assumed. The Site Boundary is specifically designed to allow spatial flexibility at detailed design, which would allow separation greater than 15 m to be achieved where practicable, and where this is not practicable the use of temporary/mobile acoustic barriers will ensure that noise levels were mitigated to below the SOAEL.

11.8.3 The assessment identified potential for significant night-time noise effects at three receptors during the construction phase due to HDD activities (NGA3). HDD activities outside of core working hours would only be required if there is a clear and obvious benefit, such as for safety reasons or to avoid daytime disruption to many people or, in the case of the Hull to Selby Railway, if required by the asset owner. Consequently, an assessment of likely significant effects due to night-time HDD activities represents a worst case.

11.8.4 For any construction activities required outside of core work hours, a Section 61 application will be made (Control of Pollution Act, Ref. 11-3) once a principal Contractor had been appointed and would secure the delivery of additional mitigation measures to reduce noise levels. Additionally, the Section 61 application would contain details on the methodology, communication strategy and monitoring. The hierarchy of mitigation measures for drilling activities will ensure that drilling activity noise effects will be reduced as far as reasonably practicable. This hierarchy includes maximising the distance from drill sites to sensitive receptors if required.

11.8.5 Despite the above, in the unlikely event that HDD still occurs at night-time, the effect at ~~R43, R45~~R44 and R46 will remain significant, albeit for short term duration during construction.

11.8.6 No additional mitigation measures are proposed for the operational phase following the above embedded measures, given that there are not expected to be any significant effects as a result of the Scheme.

11.9 Residual Effects

11.9.1 This section summarises the residual significant effects of the Scheme on Noise and Vibration following the implementation of embedded and additional mitigation.

11.9.2 Significant residual effects are defined in accordance with national noise policy as an exceedance of the SOAEL whilst taking into account duration, and frequency of exposure to noise. The SOAELs for each assessment topic are defined in **Table 11-6** (Scheme construction and decommissioning noise), **Table 11-7** (Scheme construction and decommissioning vibration)

and **Table 11-10** (Scheme operation). The exception to this is the assessment of construction traffic noise, which is assessed as the magnitude of change of road traffic noise (see **Table 11-9**).

11.9.3 No exceedances of the SOAEL are predicted during construction, decommissioning and operational phases within the Solar PV Site (NGA1) and therefore residual effects remain as in the assessment of likely effects – **not significant.**

11.9.4 Embedded mitigation measures are sufficient to reduce the potential for likely significant noise effects to occur during cable laying (construction) and decommissioning activities (NGA2). Consequently, residual noise effects are **not significant** in all cases.

11.9.5 Although this is unlikely to occur, the assessment accounts for a worst-case eventuality where HDD activities (NGA3) may occur continuously overnight due to safety reasons or to avoid daytime disruption to many people. The potential for sleep disturbance constitutes a likely significant effect at three receptors (~~R43, R45~~R44 and R46). In the event that HDD activities are required at night, additional mitigation measures for HDD activities would be identified once a Principal Contractor has been appointed, to lower the level of impact, but as these have not yet been defined, to present a worst case, the residual effect is considered to remain **significant.** This would only apply in the unlikely event that HDD occurs near these receptors during night-time.

11.9.6 There would be no exceedances of SOAEL due to daytime HDD activities and therefore the residual effects remain as presented in the assessment of likely effects – **not significant**.

11.9.7 Residual vibration effects remain as assessed in the assessment of likely effects – **not significant**.

11.9.8 Residual effects due to changes in noise because of construction traffic remain as assessed in the assessment of likely effects – **not significant**.

11.9.9 To summarise residual noise and vibration effects, no significant noise or vibration effects are predicted during the construction and decommissioning phases or the operational phase with the exception of night-time HDD activities in the construction phase. However, identification of likely significant effects is precautionary based on the worst-case assumption that 24-hour HDD working would be required.

Table 11-19. Residual effects – Noise and Vibration (construction and decommissioning)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Residential receptors: R1–R36, R51–R54	Temporary noise emissions due to construction activities (NGA1)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Non-residential receptors: R55	Temporary noise emissions due to construction activities (NGA1)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Residential receptors: R1–R36, R51–R54	Temporary vibration emissions due to construction activities (NGA1)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Non-residential receptors: R55	Temporary vibration emissions due to construction activities (NGA1)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Residential receptors: R7, R9, R10, R28, R37–R41, R43, R45, R47	Temporary noise emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Residential receptors: R8, R17, R27, R44, R46, R48	Temporary noise emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Above or equal to LOAEL and below SOAEL (not significant)	As set out in Section 11.8	Not significant
Residential receptors: R16, R26, R42	Temporary noise emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Above or equal to SOAEL (significant)	As set out in Section 11.8	Not significant
Residential receptors: R7, R9, R10, R20-R22, R25, R28, R37-R41, R43, R45, R47	Temporary vibration emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Residential receptors: R8, R17, R21, R22, R25, R27, R32, R44, R48	Temporary vibration emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Above or equal to LOAEL and below SOAEL (not significant)	As set out in Section 11.8	Not significant
Residential receptors: R16, R26, R42, R46	Temporary vibration emissions due to cable laying activities (NGA2)	As set out in Section 11.6	Above or equal to SOAEL (significant)	As set out in Section 11.8	Not significant

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Residential receptors: ~~R43,~~ ~~R45~~R44, R46	Temporary noise emissions in the unlikely event of evening/ night HDD activities (NGA3). Construction phase only.	As set out in Section 11.6	Above the SOAEL (significant)	As set out in Section 11.8	Significant

Table 11-20. Residual effects – Noise and Vibration (operation)

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Residential receptors: R5, R6, R11, R12, R14–R20, R30–R36, R51, R54	Permanent noise emissions from the Scheme infrastructure	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant
Non-residential receptors: R55	Permanent noise emissions from the Scheme infrastructure	As set out in Section 11.6	Below LOAEL (not significant)	As set out in Section 11.8	Not significant

Receptor	Description of impacts including duration	Embedded mitigation	Significance of effect with embedded mitigation	Additional mitigation/enhancement measures	Residual effect
Residential receptors: R1–R4, R7–R10, R13, R20–R29, R52, R53	Permanent noise emissions from the Scheme infrastructure	As set out in Section 11.6	Above or equal to LOAEL and below SOAEL (not significant)	As set out in Section 11.8	Not significant

11.10 Cumulative Effects

11.10.1 This section assesses the potential effects of the Scheme in combination with the potential effects of other proposed and committed plans and projects including other developments (referred to as 'cumulative schemes') within the surrounding area.

11.10.2 The cumulative schemes to be considered in combination with the Scheme have been agreed in consultation with relevant Local Planning Authorities and are listed in **Appendix 17-1: Cumulative Schemes ES Volume 2 [EN010106/APP/6.2].** The cumulative assessment methodology is presented within **Chapter 5: EIA Methodology, ES Volume 1 [EN010106/APP/6.1].**

11.10.3 Cumulative noise effects during construction and operation phases may occur when developments are located nearby to a common receptor. Based on professional judgement, at distances of greater than 500 m any interaction of noise emissions from multiple developments would be attenuated such that there would normally be no combined effect.

11.10.4 A list of relevant developments is presented in **Appendix 17-1, ES Volume 2 [EN010143/APP/6.2]**, and cumulative assessment methodology discussed within **Chapter 5: Environmental Impact Assessment Methodology, ES Volume 1 [EN010143/APP/6.1]**. The following developments in **Table 11-21** have been identified to be within 500 m of the Scheme.

Table 11-21. Cumulative Developments within 500 m of the Scheme

Scheme ID	Applicant	Project Name	Location Description
1	Enso Green Holdings D Limited	Helios Renewable Energy Project	Overlap with the Order Limits
2	National Grid Electricity Transmission	Scotland to England Green Link (SEGL2) (application to East Riding of Yorkshire Council)	0.03 km
3	National Grid Electricity Transmission	Scotland to England Green Link (SEGL2) (application to North Yorkshire Council)	Overlap with the Order Limits
4	Drax Power Limited	Drax Carbon Capture	Overlap with the Order Limits
5	National Grid Carbon	Humber Low Carbon Pipelines	Overlap with the Order Limits
6	Drax Power Limited	Drax Re-power	Overlap with the Order Limits
7	J G Hatcliffe And Howden Joinery Properties Ltd	Relief Road and Residential development at Land South Of Thorpe Hall Thorpe Road Howden	0.16 km

Scheme ID	Applicant	Project Name	Location Description
15	Ruston Eggs Ltd	Poultry buildings at Old Rush Farm Spaldington Road	0.01 km
25	Renewable Energy Systems Ltd	Lakeside Energy Storage	Overlap with the Order Limits
26	Lakeside Energy Storage Limited	Lakeside Energy Storage (application to vary conditions of permission in ID 25 under Section 73 of the Town and Country Planning Act 1990)	Overlap with the Order Limits
29	Mr Gibson	Industrial units at Land East of The Knoll Booth Ferry Road	0.5 km
51	N/A	HOW-G Mixed Use Allocation	0.17 km
61	R100 Energy Limited	Anaerobic Digestion Plant at Spaldington Airfield	0.29 km
68	Drax Power Station	Erection of additional buildings at the South Contractors Village within Drax Power Station (retrospective)	0.1 km
69	Drax Power Station	Prior notification for demolition of four bulk storage tanks and associated bunds	0.24 km
70	Drax Power Station	Demolition of Flue Gas Desulphurisation Plant and associated restoration works	0.3 km
75	Aura Power BESS Ltd	Battery Storage Facility at Land Off Hales Lane	0.05 km

11.10.5 In addition to the cumulative schemes covered in Table 11-21, the Scheme will need to connect to the national electricity transmission network at the National Grid Drax Substation where a new transformer will be installed by National Grid in an existing spare bay. This new development may result in cumulative construction effects if coinciding with cable laying activities.

11.10.6 The precise scale of additional noise effects will be dependent on the exact works taking place at each location at any one time; however, compliance with the mitigation measures detailed within the **Framework CEMP [EN010143/APP/7.7]** and **Framework DEMP [EN010143/APP/7.9]** will

reduce these effects as far as possible. It has been assumed that the other developments will also be required to adopt BPM as standard working practices during their construction phases and that noise and vibration levels will comply with set limits in accordance with guidance in BS 5228-1 and BS 5228-2.

11.10.7 The majority of the cumulative developments (4, 5, 6, 25, 26, 68, 69, 70, 75 and the new Drax substation) are located on or adjacent to the Drax Power Station site. Additionally, cumulative developments 1, 2, 3 and 5 would connect to Drax Power Station. Receptor R37 is located approximately 140 m from the Order Limits with cumulative developments 4 and 5 located approximately 10 m and 65 m away respectively. As the Scheme is a substantial distance away, it is likely that noise from cumulative developments would dominate and the contribution from the Scheme would be minimal. The next nearest sensitive receptor is located approximately 250 m away, with the nearest cumulative developments at a similar distance.

11.10.8 In addition to the receptors described above, the following receptors are located in close proximity to the Scheme and cumulative developments:

a. R27 is approximately 30 m from the Order Limits and approximately 300 m from cumulative development 2;

b. R28 is approximately 80 m from the Order Limits and approximately 440 m from cumulative development 2;

c. R32 is approximately 50 m from the Order Limits and approximately 25 m from cumulative development 2;

d. R33 is approximately 170 m from the Order Limits and approximately 45 m from cumulative development 2;

e. R34 is approximately 400 m from the Order Limits and approximately 200 m from cumulative development 2;

f. R35 is approximately 470 m from the Order Limits and approximately 70 m from cumulative development 2;

g. R38 is approximately 130 m from the Order Limits and approximately 70 m from cumulative development 5; and

h. R39 is approximately 140 m from the Order Limits and approximately 260 m from cumulative development 5.

11.10.9 Receptor R49 is between cumulative developments 7 and 51 and 940 m from the Order limits. If the construction programmes overlapped, it is anticipated that, as the cumulative developments are closer, noise emissions from those sites would dominate. However, no significant effects were identified in the planning application for cumulative development 7.

11.10.10 Receptor R23 is the closest receptor to cumulative development 15 at a distance of approximately 350 m and approximately 200 m from the Order limits. The nearest receptor to cumulative development 29 is approximately 700 m away. Receptor R17 is the nearest receptor to cumulative development 61 at a distance of approximately 700 m. At this distance, cumulative effects are unlikely. Consequently, no significant cumulative effects are identified for cumulative developments 15, 29 and 61.

11.10.11 Potential likely significant effects are identified at receptors ~~R43, R45~~R44 and R46 due to HDD works at night. However, no cumulative developments are located within 500 m of these receptors and therefore no cumulative effects are predicted to occur. ~~.~~

11.10.12 Based on the identified separation distances and requirements to implement BPM, it is considered that any overlapping of construction phases between the Scheme and the other nearby development schemes would not result in any in-combination cumulative effects at common noise-sensitive receptors. Cumulative effects due to construction noise will remain unchanged from the residual effects for those receptors where there is potential for cumulative effects to occur and, therefore, remain not significant. It is noted that for residential receptors ~~R43, R45~~R44, R46 a significant effect during night-time HDD operations remains, but this is due to the Scheme alone.

11.10.13 Operational noise emissions from nearby developments will be subject to the EIA Regulations and therefore designed to achieve appropriate operational noise limits that do not contribute to additional noise to the area (i.e., 'background creep', which could avoid any adverse effects to noise-sensitive receptors in the area). The control and mitigation of noise effects from surrounding development will be the responsibility of the developer. Given the requirement for new developments to achieve operational noise standards and the relative distance between cumulative developments and the Scheme, operational noise effects from the Scheme and cumulative developments will remain unchanged from the residual effects stated for the Scheme.

11.11 References

Ref. 11-1 British Standards Institute (2014 with 2019 amendments); BS 4142 – Methods for rating and assessing industrial and commercial sound, BSi, London.

Ref. 11-2 Highways England (2020); Design Manual for Road and Bridges LA111: Noise and Vibration, Revision 2.

Ref. 11-3 Her Majesty's Stationery Office (1974); Control of Pollution Act.

Ref. 11-4 Her Majesty's Stationery Office (1995); Environmental Protection Act.

Ref. 11-5 Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework.

Ref. 11-6 Department for Environment Food and Rural Affairs (2010); Noise Policy Statement for England.

Ref. 11-7 Department of Energy and Climate Change. (2011) Overarching National Policy Statement for Energy (EN-1).

Ref. 11-8 Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy Infrastructure (EN-3).

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