FENWICK SOLAR FARM

Fenwick Solar Farm
EN010152

Environmental Statement

Volume I Chapter 14: Other Environmental Topics

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14. Other Environmental Topics

14.1 Introduction

14.1.1 This chapter of the Environmental Statement (ES) presents the findings of an assessment of the likely significant effects from Other Environmental Topics (i.e. those that do not warrant individual chapters) as a result of the proposed Fenwick Solar Farm (hereafter referred to as the 'Scheme'). A description of the Scheme is provided in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

14.1.2 This chapter identifies and proposes measures to address the potential impacts and likely significant effects of the Scheme on Other Environmental Topics during the construction, operation and maintenance, and decommissioning phases.

14.1.3 This chapter is split into the following sections:

a. Air Quality (Section 14.2);

b. Glint and Glare (Section 14.3);

c. Ground Conditions (Section 14.4);

d. Major Accidents and Disasters (Section 14.2);

e. Telecommunications and Utilities (Section 14.6);

f. Electromagnetic Fields (Section 14.7); and

g. Materials and Waste (Section 14.8).

14.1.4 Where relevant, the legislation and guidance, baseline conditions, assessment methodology and mitigation measures are outlined in the following sections for each topic.

14.1.5 For the topics covered in this chapter, the assessments of potential effects do not strictly follow the approach and methodology outlined in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]**, where doing so is not necessary to reach a conclusion that there are no likely significant effects. For example, a detailed overview of current baseline conditions is not necessarily required if the effects can clearly be considered negligible, such that a more general overview of baseline conditions is sufficient; and, similarly, it is unnecessary to determine sensitivity of receptors and magnitude of impacts to define significance of effects if there are clearly no likely significant effects. The purpose of this chapter is to provide a high level assessment of other environmental topics where a full chapter adhering to the Chapter 5: EIA methodology is not considered necessary. Within this chapter, the alternative methodology used is clearly outlined for each topic.

14.1.6 This chapter is supported by **ES Volume II Figure 14-1: Dust Risk Assessment Zones [EN010152/APP/6.2]**:

14.1.7 This chapter is supported by the following appendices and supporting documents:

a. **Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3]**;

b. **Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]**;

c. **Appendix 14-3: Preliminary Risk Assessment (PRA) – Solar PV Site [EN010152/APP/6.3]**;

d. **Appendix 14-4: PRA – Grid Connection Corridor [EN010152/APP/6.3]**;

e. **Appendix 14-5: Pre-Desk Study Assessment for Unexploded Ordnance [EN010152/APP/6.3]**; and

f. **Framework Site Waste Management Plan (SWMP) [EN010152/APP/7.18]**.

14.1.8 A glossary and list of abbreviations are defined in **ES Volume I Chapter 0: Table of Contents, Glossary and Abbreviations [EN010152/APP/6.1]**.

14.1.9 A Non-Technical Summary is presented in **ES Volume IV Non-Technical Summary [EN010152/APP/6.4]**.

14.1.10 **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]** signposts to the relevant technical chapters that address potential effects to human health. Within this chapter, potential effects to human health are set out in the following sections:

a. Section 14.2 Air Quality;

a. Section 14.4 Ground Conditions and **ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Solar PV Site [EN010152/APP/6.3]** and **ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Grid Connection Corridor [EN010152/APP/6.3]**;

b. Section 14.5 Major Accidents and Disasters; and

c. Section 14.7 Electric and Electromagnetic Fields.

Development Parameters Assessed

14.1.11 **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** sets out the development parameters for the Scheme against which the effects covered in this chapter have been assessed. The assessment has been based on likely reasonable worst-case parameters, in accordance with the Rochdale Envelope approach (see Section 2.5 of **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]).** The actual impacts of the Scheme may therefore be less than predicted herein if the Scheme is built at a scale well within defined worst-case parameters.

14.1.12 The Grid Connection Line Drop would comprise of below ground cables connecting the On-Site Substation to a new cable sealing end compound at the base of an existing on-site 400 kV overhead line tower located within Field SE2, these works have also been considered as part of the below assessments.

14.2 Air Quality

Introduction

14.2.1 This section of the chapter presents the findings of the assessment of the likely effects to air quality as a result of the Scheme.

14.2.2 This section is supported by **ES Volume II Figure 14-1: Dust Risk Assessment Zones [EN010152/APP/6.2].**

Legislation, Policy and Guidance

Legislation

14.2.3 Legislation, planning policy, and guidance relating to air quality and pertinent to the Scheme comprises of the documents listed below.

a. Air Quality Standards Regulations (as amended 2016) (Ref. 14-1);

b. The Environment Act (1995) (Ref. 14-2);

c. The Environment Act (2021) (Ref. 14-3); and

d. The Environmental Targets (Fine Particulate Matter) (England) Regulations (2023) (Ref. 14-4).

National Policy

a. The UK National Air Quality Strategy 2007 (Ref. 14-5);

b. Clean Air Strategy (2019) (Ref. 14-6);

c. National Policy Statement (NPS) for Energy (EN-1) (November 2023) (Ref. 14-7); and

d. NPS for Renewable Energy Infrastructure (EN-3) (November 2023) (Ref. 14-8); and

e. National Planning Policy Framework (NPPF) (December 2023) (Ref. 14-9).

Local Policy

a. Doncaster Local Plan 2015 – 2035 (2021) (Ref. 14-12);

b. Doncaster Infrastructure Strategy (2020) (Ref. 14-13).

Guidance

a. Land-Use Planning and Development Control: Planning for Air Quality (Environmental Protection UK and Institute of Air Quality Management), (2017) (Ref. 14-14);

b. Environmental Improvement Plan (2023) (Ref. 14-15);

c. Institute of Air Quality Management (2023) Guidance on the assessment of dust from demolition and construction (Ref. 14-16); and

d. Department of Food and Rural Affairs: Local Air Quality Management Technical Guidance 2022 (LAQM TG22) (Ref. 14-17).

Consultation

Scoping Opinion

14.2.4 A scoping exercise was undertaken in the Spring of 2023 to establish the content of the assessment and the approach and methods to be followed.

14.2.5 The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on air quality.

14.2.6 The Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.2.7 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

14.2.8 The Preliminary Environmental Information Report (PEIR) issued in Spring 2024 outlines the engagement which occurred in the early pre-application stages. The formal statutory consultation period captured further responses to the information presented in the PEIR. Responses from statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1]**.

14.2.9 Seven comments were raised at Statutory Consultation regarding Air Quality. Responses to these can be seen in **Consultation Report Appendixes O1-O4 [EN010152/APP/5.2].**

Additional Consultation

14.2.10 No additional consultation beyond the Scoping Opinion has been undertaken with regard to air quality.

Assessment Methodology

Study Area

14.2.11 The Study Area includes features likely to be at risk from possible direct and indirect impacts that might arise from the Scheme, termed the Zone of Influence (ZoI). The potential ZoI for Air Quality includes sensitive receptors within 250 m of the Order limits, following IAQM guidance (Ref. 14-16), as shown on **ES Volume II Figure 14-1: Dust Risk Assessment Zones [EN010152/APP/6.2]**), up to 250 m from the Scheme access points, and within 50 m of the roads expected to be affected by the construction phase traffic. It is noted that a detailed access strategy is presented in the **ES Volume III Appendix 13-4: Transport Assessment [EN/010152/APP/6.3]** and discussed in **ES Volume I Chapter 13: Transport and Access**

[EN010152/APP/6.1], and site access points are shown in **ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.3]**. Sensitive receptors were chosen to reflect locations of potential worst-case exposure to potential impacts from the development.

14.2.12 The Order limits is surrounded by several ecological sites, which are potential receptors for impacts on air quality. These have been screened for sensitivity to construction dust impacts and nitrogen deposition and included as receptors as appropriate.

14.2.13 The assessment relates to dust generation, as well as additional road traffic and plant emissions during the construction and decommissioning phases.

14.2.14 Through the scoping opinion it has been confirmed that operation and maintenance impacts do not require further assessment in order to conclude that a significant effect would not occur, due to the small magnitude of the emissions from road traffic and emergency generator. They are therefore scoped out of this assessment.

14.2.15 The potential impact of the Scheme on local air quality has been determined at the sensitive receptors (human and ecological) identified in the vicinity of the Order limits.

Sources of Information

14.2.16 The following sources of information have been used to inform the baseline and assessment presented within this section:

a. City Doncaster Council Annual Status Report (2023) (Ref. 14-18);

b. Selby District Council Air Quality Annual Status Report (2022) (Ref. 14-19);

c. East Riding of Yorkshire Council Air Quality Annual Status Report (2022) (Ref. 14-20);

d. Defra's Multi-Agency Geographic Information for the Countryside (MAGIC) Map (Ref. 14-21); and

e. Defra Modelled Background Maps (Ref. 14-22).

Scope of the Assessment

14.2.17 The following potential impacts have been considered as part of the EIA for the Scheme for which an assessment is provided in this section:

14.2.18 During the construction phase:

a. Dust soiling;

b. Impact of dust on human health; and

c. Impact of dust on sensitive ecological habitats.

Impact Assessment Methodology

14.2.19 There is currently no statutory guidance on the methodology for air quality impact assessments. Several non-statutory bodies have published their own guidance relating to air quality and development control, such as that jointly issued by EPUK/IAQM (Ref. 14-14). This assessment has been undertaken based on this guidance.

14.2.20 Due to the nature of the Scheme, a significant change to traffic flows is not anticipated to occur during the operation and maintenance phase of the Scheme, meaning there are no likely significant air quality impacts predicted during operation and maintenance. A detailed assessment of emissions from operational road traffic and the subsequent impact upon local air quality is therefore not required and has been scoped out from further assessment.

14.2.21 This section therefore details the methods used to assess the potential effects on air quality during the construction and decommissioning phases of the Scheme.

14.2.22 Construction phase traffic has been modelled as outlined in **ES Volume I Chapter 13: Transport and Access [EN010152/APP/6.1]** and compared against the relevant screening criteria. The EPUK/IAQM indicative criteria for requiring an air quality assessment are as follows:

a. A change in Light Duty Vehicle (LDV) flow of:
    i. More than 100 Annual Average Daily Traffic (AADT) within or adjacent to an Air Quality Management Area (AQMA); or
    ii. More than 500 AADT elsewhere.
b. A change in Heavy Duty Vehicle (HDV) flow of:
    i. More than 25 AADT within or adjacent to an AQMA; or
    i. More than 100 AADT elsewhere.

14.2.23 It has been estimated that the Scheme would lead to an increase in LDVs by a maximum of 280 AADT and HDV by a maximum of 36 AADT across the modelled road links. As the Scheme is not located within or adjacent to an active AQMA, these increases fall well below the screening criteria of 500 AADT for LDV and 100 AADT for HDV.

14.2.24 As construction phase road traffic volumes are not expected to meet the thresholds above for which detailed modelling is required, an assessment of impacts related to construction phase traffic has not been undertaken. The potential for fugitive emissions of particulate matter from construction and decommissioning phase activities has been qualitatively assessed via a Dust Risk Assessment (DRA) (Table 14-5 to Table 14-8).

14.2.25 As set out in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1],** the duration of, and activities required for decommissioning are similar to those required for construction and consequently the effects of decommissioning are expected to be similar to, or of a lesser magnitude than, construction effects. Therefore, the assessment of construction phase effects on air quality also represents the likely significant effects which would be experienced at decommissioning. It should be noted that prior to decommissioning, there will likely be a requirement for a dust risk assessment and dust management plan to be agreed with the planning authority prior to any works taking place which would be secured through the Decommissioning Environmental Management Plan (DEMP). However, due to the estimated lifespan of the Scheme (40 years) the process may be different than that currently undertaken in the UK.

14.2.26 The DRA follows IAQM guidance (Ref. 14-16), which does not follow the standard EIA methodology set out in **ES Volume I Chapter 5:**

Environmental Impact Assessment Methodology [EN010152/APP/6.1]. Instead, the magnitude of emission is combined with the sensitivity of the area to establish the level of risk that an impact may occur. This risk level is used to guide the choice of appropriate good practice measures.

Sensitive Receptors

14.2.27 Receptors of interest for the air quality assessment are those which represent locations where people are likely to be present, as the assessment is most concerned with human health. For the purposes of the DRA, potentially affected air quality sensitive receptors have been identified through a review of Ordnance Survey (OS) mapping and aerial photography.

14.2.28 Following IAQM guidance (Ref. 14-16), the presence of sensitive ecological receptors holding a National or European designation within 50 m of the Order limits has also been established. Sites with the following designations have been explicitly considered within the DRA – as stated above or within 50 m from a route used by construction vehicles on the public highway (up to 250 m from the Scheme access point):

a. Sites of Special Scientific Interest;
b. Special Protection Areas;
c. Special Areas of Conservation;
d. Ramsar Sites;
e. National Nature Reserves; and
f. Local Nature Reserves.

14.2.29 Sites possessing the following designations have also been reviewed; however, explicit consideration as part of the DRA is not required in accordance with the IAQM guidance (Ref. 14-16):

a. Ancient woodland; and
b. Local wildlife sites.

14.2.30 Ammonia-emitting developments, such as intensive livestock and poultry units, in close proximity to ancient woodland sites can cause nutrient deposition leading to a greater abundance of nitrogen tolerant plant species which out-compete and impact on many characteristic ancient woodland plants. Ammonia can be released in small quantities from engine exhausts; however, because of the low volume of construction traffic, vehicles movements associated with the Scheme will not result in significant emissions of ammonia, and additionally any impacts would be temporary. Therefore, this impact has not been considered further within this assessment as significant effects are not anticipated.

Significance Criteria

14.2.31 When assessing the significance of dust impacts during the construction phase, IAQM recommends that significance is only assigned to an effect after considering the construction activity with good practice measures (Ref. 14-16).

14.2.32 Appropriate good practice measures commensurate with the level of risk identified in the DRA will be defined in and implemented through the detailed

Construction Environmental Management Plan (CEMP), secured through the requirements of the DCO. A Framework CEMP is included within the ES. (**Framework CEMP [EN010152/APP/7.7]**). Implementation of these measures prevent significant effects on receptors, thereby resulting in a residual effect that can be considered **'not significant'**. Where this is not practicable, it is important to consider the specific characteristics of the Order limits and the surrounding area to determine whether construction phase dust impacts are likely to be significant in the context of the Scheme (Ref. 14-16).

Methodology for Assessment of Fugitive Emissions of Particulate Matter during Construction and Decommissioning Phases

14.2.33 A qualitative risk-based assessment has been undertaken to assess the significance of any effects on sensitive receptors associated with the construction and decommissioning phases. The assessment is based on IAQM guidance (Ref. 14-16) and considers potential sources of emissions from four main activity groupings:

a. Demolition;

b. Earthworks;

c. Construction; and

d. Track-out.

14.2.34 The emphasis within the IAQM guidance (Ref. 14-16) is on clarifying the risk of dust impacts from the Scheme.

14.2.35 For each activity group, the following steps are applied with respect to identifying the potential effects, before coming to an overall conclusion about the significance of the effects predicted:

a. Identify the nature, duration and the location of activities being undertaken;

b. Establish the risk of significant effects occurring as a result of these activities;

c. Review the proposed or embedded good practice measures against good site practice;

d. Identify additional mitigation measures, if necessary, to reduce the risk of a significant adverse effect occurring at receptors; and

e. Summarise the overall effect of the works with respect to fugitive emissions of particulate matter and report the significance of the effects.

14.2.36 A DRA has been undertaken based on the IAQM Guidance (Ref. 14-16) and the findings are presented within Table 14-5 to Table 14-8. Construction of the Scheme will take place sequentially (as described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**). As such, potential fugitive emissions may be lower than expected compared to the size of the Order Limits (when considering the Order limits in reference to the IAQM Guidance (Ref. 14-16)) as construction will not be occurring across the entire Site at one time.

Emissions from Non-Road Mobile Machinery (NRMM)

14.2.37 Construction Non-Road Mobile Machinery (NRMM) includes construction machinery such as excavators, loaders and bulldozers. Emissions from construction NRMM will have the potential to increase pollutants such as Nitrogen Dioxide (NO_2) and inhalable particles, with diameters of 10 micrometres (µm) or less (PM_{10}), concentrations locally when in use during construction. However, IAQM guidance (Ref. 14-16) states that *"Experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed."*

14.2.38 Emissions from NRMM will be temporary and localised and will be controlled through best-practice measures. Additionally, exhaust emission rates from NRMM are controlled through the NRMM regulations (Ref. 14-23) which defines performance levels that new NRMM must achieve after specified dates.

14.2.39 As older, retired NRMM are lost from the fleet, they are progressively replaced by new NRMM that achieve ever more stringent emission rate standards. The IAQM approach is based on the previous experience of likely impacts from NRMM and as time passes this guidance becomes increasingly precautionary. In this assessment, the IAQM qualitative approach has been applied as part of DRA.

Assumptions, Limitations and Uncertainties

14.2.40 For the aspects of air quality that have been scoped in there are no material limitations or uncertainties associated with this work.

Baseline Conditions

14.2.41 This section describes the baseline environmental characteristics for the Scheme and surrounding areas as relevant to Air Quality.

14.2.42 City of Doncaster Council undertake routine ongoing monitoring of ambient air quality as part of their Local Air Quality Management (LAQM) responsibilities under Part IV of the Environment Act (1995) (as amended by the Environment Act 2021) and subsequent Regulations (Ref. 14-2, Ref. 14-4). At the time of the assessment, the most recent available monitoring was for 2022. City of Doncaster Council has carried out automatic (continuous) monitoring at eight locations in 2022, with eight sites monitoring for NO_2 and four sites monitoring for particulate matter (PM_{10} and $PM_{2.5}$) (Ref. 14-16). Particulate matter concentrations at these continuous monitoring sites have remained below the annual mean objectives for PM_{10} and $PM_{2.5}$ since 2018. Annual mean NO_2 concentrations recorded at the continuous monitors were below the annual mean NO_2 objective of 40 micrograms per cubic metre (µg/m^3) in 2022. It should be noted the continuous monitors which measure particulate matter are located within Doncaster and Conisbrough, approximately 5 km and 17 km from the Order limits, respectively, and may not be representative of concentrations within the Order limits.

14.2.43 While Selby District has now been incorporated into North Yorkshire, many of the statistical sources reflect the pre-existing administrative boundaries

and therefore data for Selby District is presented below. Neighbouring Selby District Council and East Riding of Yorkshire Council did not undertake automatic (continuous) monitoring using reference methods for any pollutants during 2022 hence there are no available measurements of any pollutants from reference methods (Ref. 14-19, Ref. 14-20). East Riding of Yorkshire Council has conducted monitoring of NO_2, PM_{10}, $PM_{2.5}$ and ozone with two low-cost monitors. Whilst these are not reference-grade monitoring methods, the results from 2022 indicate that there are no exceedances of any relevant air quality objectives.

14.2.44 City of Doncaster Council also conducts monitoring using a network of 75 diffusion tubes located along principal traffic routes across the borough to quantify NO_2 concentrations in the vicinity of sensitive receptors (Ref. 14-18). Selby District Council undertakes NO_2 monitoring at 28 diffusion tube locations, whilst East Riding of Yorkshire Council has 92 diffusion tube locations. Amongst these monitoring sites, there were four exceedances of the annual mean NO_2 objective in 2022, located primarily in the town centre of Doncaster and are not likely to be representative of concentrations within the Order limits. East Riding of Yorkshire Council provide an online map showing the location and results of current continuous monitoring locations (Ref. 14-24). The closest diffusion tubes to the Order limits are in Stainforth (approximately 4.5 km southeast of the Solar PV Site) and Snaith (approximately 5.5 km northeast of the Solar PV Site). Concentrations are well below the air quality objective of 40 µg/m^3 for NO_2.There are no diffusion tube monitoring locations within 1 km of the Order limits.

14.2.45 There are eight AQMAs within the administrative area of City of Doncaster Council, and there is one AQMA within the administrative area of Selby District Council. The AQMAs are generally located in city and town centres or along major traffic routes. East Riding of Yorkshire Council does not have any designated AQMAs. All AQMAs are at least 5 km from the Order limits. Due to the distance of the AQMAs from the Order limits, they are not considered likely to be affected by the Scheme.

Background Pollutant Concentrations

14.2.46 The total concentration of a pollutant comprises those contributions from explicit local emission sources such as roads, chimney-stacks, etc, and those that are transported into an area from indeterminate sources by wind from further away. If all the explicit local sources were removed, all that would remain is that which comes from indeterminate sources; it is this component that is called ‘background’. A good understanding of background concentrations is important when completing air quality assessments as it allows for a better understanding of local pollutant sources.

14.2.47 Background data for the relevant 1 km x 1 km grid squares (related to the Study Area) was sourced from Defra’s 2018-based Background Maps for the assessment year of 2023 (Ref. 14-22); these data are presented in Table 14-1. These data represent the most current data source. The modelled background concentrations for NO_2, PM_{10} and $PM_{2.5}$ in 2023 are well below the relevant objective values for each pollutant, annual averages concentrations of 40 µg/m^3, 40 µg/m^3 and 20 µg/m^3 respectively.

Table 14-1: Background Pollutant Concentrations 2023, µg/m^3 (Ref. 14-22)

X Coordinate	Y Coordinate	NO_2	PM_{10}	$PM_{2.5}$
458500	414500	7.5	13.7	7.6
459500	417500	7.4	13.6	7.5
459500	416500	7.0	12.8	7.3
459500	415500	7.0	14.1	7.6
459500	414500	7.1	13.1	7.4
460500	417500	6.9	13.3	7.5
460500	416500	6.9	12.9	7.4
460500	415500	6.9	13.4	7.5
460500	414500	7.0	13.4	7.5
461500	417500	7.1	13.3	7.5
461500	416500	6.8	13.0	7.4
461500	415500	6.9	12.6	7.3
	MAX	7.5	14.1	7.6
	MIN	6.8	12.6	7.3
	MEAN	7.0	13.3	7.5

Future Baseline

14.2.48 The future baseline scenarios are set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1].**

14.2.49 In the absence of the Scheme, background data for the relevant 1 km x 1 km grid squares (covering the Study Area) was sourced from Defra's 2018-based Background Maps for 2030, the proposed first operational year of the Scheme; these data are presented in Table 14-2. These data represent the most current and up to date data source. The modelled background concentrations for NO_2, PM_{10} and $PM_{2.5}$ in 2030 are well below the relevant objective values for each pollutant, annual averages concentrations of 40 µg/m^3, 40 µg/m^3 and 20 µg/m^3 respectively.

Table 14-2: Background Pollutant Concentrations 2030, µg/m^3

X Coordinate	Y Coordinate	NO_2	PM_{10}	$PM_{2.5}$
458500	414500	6.5	13.4	7.3
459500	417500	6.4	13.3	7.3
459500	416500	6.0	12.5	7.1
459500	415500	6.0	13.8	7.4

X Coordinate	Y Coordinate	NO_2	PM_{10}	$PM_{2.5}$
459500	414500	6.1	12.8	7.2
460500	417500	6.0	12.9	7.3
460500	416500	6.0	12.6	7.2
460500	415500	6.0	13.1	7.3
460500	414500	6.1	13.1	7.3
461500	417500	6.1	13.0	7.3
461500	416500	5.9	12.7	7.2
461500	415500	5.9	12.3	7.1
	MAX	6.5	13.8	7.4
	MIN	5.9	12.3	7.1
	MEAN	6.1	13.0	7.3

Baseline Dust Climate

14.2.50 A background level of dust exists in all urban and rural locations in the UK. Dust can be generated on a local scale from vehicle movements and from the action of wind on exposed soils and surfaces. Dust levels can be affected by long range transport of dust from distant sources into the local vicinity.

14.2.51 This baseline rate of soiling is considered normal and varies dependent on prevailing climatic conditions. The tolerance of individuals to deposited dust is therefore shaped by their experience of baseline conditions.

14.2.52 Existing local sources of particulate matter include wind-blown dust from agricultural activities, exhaust emissions from energy plant and road vehicles, brake and tyre wear from road vehicles and the long-range transport of material from outside the Study Area.

Embedded Mitigation

14.2.53 The adoption of good site practice will be implemented through measures to control dust as outlined within the IAQM guidance. It is proposed that the measures from the IAQM ‘High Risk Site’ category are adopted where relevant, regardless of the level of risk identified in the assessment and the construction phase activities for the Scheme (Ref. 14-16). As decommissioning activities are predicted to be similar to construction, the same good practice measures are predicted to apply.

14.2.54 Implementation of these measures will be secured through the provision of a detailed CEMP as part of the requirements of the DCO and are included in the **Framework CEMP [EN010152/APP/7.7]),** as appropriate. Similarly, a Framework DEMP is included alongside this ES (**Framework DEMP [EN010152/APP/7.9])**, with the detailed DEMP to be prepared prior to the start of decommissioning, again secured via a DCO Requirement.

14.2.55 Table 14-3 presents the industry good practice measures proposed to be adopted by the Scheme to control impacts on air quality. These measures are taken from the IAQM's 'highly recommended' and 'desirable' list of measures for a high risk category site, but represent good practice as widely employed across most large construction sites in the UK.

Table 14-3: Proposed Good Practice Measures

Activity	Measure
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on the Scheme.
	Display the name and contact details of person(s) accountable for air quality and dust issues within the Order limits. This may be the environment manager/engineer or the Site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority (City of Doncaster Council). The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the Order limits. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the Local Authority (City of Doncaster Council) when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500 m of the Order limits (If applicable), to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.
Monitoring	Undertake daily on-site and off-site visual inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority (City of Doncaster Council) when asked. This should include regular dust soiling checks of road surfaces and road cleaning to be provided when necessary.

Activity	Measure
	Carry out regular Site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority (City of Doncaster Council) when asked.
	Increase the frequency of Site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Preparing and maintaining the Order limits	Plan Site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being reused within the Order limits. If they are being reused on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel.	Ensure all vehicles switch off engines when stationary – no idling vehicles
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced work areas.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Implement a Travel Plan (as part of the **Construction Traffic Management Plan [EN010152/APP/7.17])** that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).
Equipment	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply within the Order limits for effective dust/particulate matter suppression/mitigation, using non-potable water where practicable and appropriate.
	Use enclosed chutes and conveyors and covered skips.

Activity	Measure
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste management	Avoid bonfires and burning of waste materials.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once
Construction	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Order limits. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport
	Inspect internal access tracks for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections internal access tracks and any subsequent action in a Site log book.
	Access gates to be located at least 10 m from receptors where practicable.

Assessment of Likely Impacts and Effects

Dust Risk Assessment

14.2.56 This DRA considers the potential magnitude of dust emissions at each stage of the Scheme in conjunction with the sensitivity of the surrounding area,

following IAQM guidance (Ref. 14-16). Based on these parameters, the Order limits will be classified as low, medium or high risk. The DRA is not an impact assessment, but an assessment of the risk of adverse amenity effects being caused.

14.2.57 The assessment considers the potential dust risk across a set of predefined zones, up to 250 m from the Order limits. These zones are presented in **ES Volume II Figure 14-1: Dust Risk Assessment Zones [EN010152/APP/6.2]**.

14.2.58 The chosen representative dust risk receptors are shown Table 14-4. Dust receptor locations were chosen to represent residential areas in proximity of the Order limits. Receptors R1 and R2 represent properties to the south of the Order limits, R5, R6 and R7 represent properties on the eastern side of the development. R 3 and R8 represent properties on the west of the development. R4 represents properties located within the area in the centre of the Order limits. All properties are located within 250 m of the Order limits. The location of these representative receptors are illustrated within **ES Volume II Figure 14-1: Dust Risk Assessment Zones [EN010152/APP/6.2])**. The chosen receptor locations are representative of other receptors within the wider community and would experience larger magnitude impacts than receptors located further from the source of emissions. For example, the selected representative receptors are all residential properties but are equally representative of other high sensitive receptors such as places of worship and Moss and Fenwick Village Hall.

Table 14-4: Representative Dust Risk Receptors.

Receptor ID	X Coordinate	Y Coordinate	Location
R1	458719.1	414338.1	2 Moss Road
R2	459531.6	414502.2	Lilac Cottage
R3	459554.0	416148.0	Victoria Cottage
R4	460760.0	416329.7	Lawn Lane
R5	461491.4	415814.9	West End Farm
R6	461809.0	416079.7	Meadow view, 2 West Lane
R7	461977.4	417283.0	Topham Ferry Farm
R8	459841.0	416181.3	Lawn Lane

14.2.59 The DRA is provided in Table 14-5.

Table 14-5: Dust Risk Assessment

STEP 1 – SCREENING		
1 a.	Is a human receptor site within:	Y/N
	(a) 50 m of site boundary, or;	Y
	(b) 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s)	Y
1 b.	Is an ecological receptor site within:	Y/N
	(a) 50 m of the site boundary, or;	Y
	(b) 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s)	Y
IF ANSWERS TO 1 A OR 1 B ARE 'YES' COMPLETE 1 C AND COMPLETE THE ASSESSMENT		
1 c.	Provide a description of the proposed demolition and construction activities, their location and duration and any phasing of the development, including: The proximity and number of receptors; The specific sensitivity of the receptor(s), e.g. a primary school or hospital; The duration for which the sources of dust emissions may be close to the sensitive receptors; and In the case of PM_{10} the local background concentration. *Subject to being granted consent and following a final investment decision, the earliest construction could start is in 2028. Construction of the Solar PV Site and Grid Connection Cables would start in tandem. The Grid Connection Cables would require approximately 12 months, and the construction of the Solar PV Site would require an estimated 24 months, with operation and maintenance anticipated to commence in 2030. Sources of dust emissions are likely to occur during this period. The greatest potential for dust effects is likely to occur during the excavation and earthworks phases, in addition to the substructure construction phase.*	

	The Order Limits are located in a rural area but close to a number of villages, and consequently there are receptors in proximity to the Order Limits that may be affected by the works. This includes high sensitivity receptors such as residential properties, as well as medium sensitivity receptors such as commercial and warehouse units. A selection of representative receptors has been presented in Table 14-4. *Defra background maps indicate an average background PM_{10} concentration of 13.3 µg/m^3 across the Study Area in 2023. This is well below the annual average objective value of 40 µg/m^3.*	
STEP 2 – ASSESS THE RISK OF DUST IMPACTS		
STEP 2A – Define the Potential Dust Emission Magnitude		
DEMOLITION PHASE		
2 a(i)	Is the volume of demolition:	
	Large Total volume of building to be demolished (>75,000 m^2); or Potential dusty construction material (e.g. concrete); or On-site crushing and screening; or Demolition activities >12 m above ground level.	*N/A*
	Medium Total volume of building to be demolished 12,000 m^3 – 75,000 m^3; or Potential dusty construction material; or Demolition activities 6-12 m above ground level.	*N/A*
	Small Total volume of building to be demolished <12,000 m^3; or Construction material with low potential for dust release (e.g. metal cladding or timber); or Demolition activities <6 m above ground level and demolition during wetter months.	*N/A*
	No demolition is anticipated to occur prior to construction.	
EARTHWORKS PHASE		

	Is the scale of the earthworks:	
2 a(ii)	Large Total site area >110,000 m^2; or Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); or >10 heavy earth moving vehicles active at any one time on-site; or Formation of bunds >6 m in height;	*N*
	Medium Total site area 18,000 m^2-110,000 m^2; or Moderately dusty soil type (e.g. silt); or 5-10 heavy earth moving vehicles active at any one time on-site; or Formation of bunds 3-6 m in height;	N
	Small Total site area <18,000 m^2; or Soil type with large grain size (e.g. sand); or <5 heavy earth moving vehicles active at any one time onsite; Formation of bunds <4 m in height;	Y
	Whilst the total site area is large, due to the small area of earthworks and the fact that there will likely be no heavy earth moving vehicles and small stockpile, the Potential Dust Emission Magnitude has been categorised as small.	
CONSTRUCTION PHASE		
2 a(iii)	Is the scale of the works:	
	Large Total construction volume >75,000 m^3; or	*N*

	On-site concrete batching; or Sandblasting.	
	Medium Total building volume 12,000 m^3-75,000 m^3; or Potentially dusty construction material (e.g. concrete); or On-site concrete batching.	N
	Small Total building volume <12,000 m^3; or Construction material with low potential for dust release (e.g. metal cladding or timber).	Y
	Whilst the construction is taking [place across a large area, the total building volume would be small and materials would be pre-assembled. The Potential Dust Emission Magnitude has been categorised as small.	
TRACKOUT		
	Only receptors within 50 m of the route(s) used by vehicles on the public highway and up to 250 m from the site entrance(s) are considered to be at risk from the effects of dust. Will the trackout be:	
	Large >50 Heavy Duty Vehicle (HDV; >3,5 t) outward movements in one day; Potentially dusty surface material (e.g. high clay/silt content); or Unpaved road length >100 m.	*N*
2 a(iii)	Medium 20-50 HDV (>3,5 t) outward movements in any one day; Moderately dusty surface material (e.g. high clay content); or Unpaved road length 50-100 m (high clay content)	N
	Small <20 HDV (>3.5 t) trips in any one day; Surface material with low potential for dust release; or	Y

	Unpaved road length <50 m.	
	It is estimated that there would be a maximum of 18 outward movements of heavy duty vehicles daily during construction. The site access will be through a short section of unpaved road. and as such the Potential Dust Emission Magnitude for the trackout phase is categorised as Small.	
STEP 2B – Define the Sensitivity of the Area		
Define the Receptor Sensitivity		
	Sensitivity of People to Dust Soiling Effects	
	Is the location a:	
2 b(i)	High sensitivity receptor Locations where users can reasonably expect enjoyment of a high level of amenity; or Appearance, aesthetics or value of property would be diminished by soiling; and People/property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. e.g. residential dwellings, museums, medium/long-term car parks, car showrooms.	*Y*
	Medium sensitivity receptor Locations where users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or Appearance, aesthetics or value of property could be diminished by soiling; or People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work.	*N*
	Low sensitivity receptor Enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or	*N*

	There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land e.g. playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	
2 b(ii)	Sensitivity of People to Health Effects of PM_{10}	
	Is the location a:	
	High sensitivity receptor Locations where members of the public are exposed over a time period relevant to the 24-hour objective for PM_{10} (a relevant location would be where individuals may be exposed for 8 hours or more in a day). e.g. residential dwellings, schools, residential care homes.	*Y*
	Medium sensitivity receptor Locations where the people exposed are workers, and exposure is over a time period relevant to the 24-hour objective for PM_{10} (a relevant location would be where individuals may be exposed for 8 hours or more in a day). e.g. office and shop workers, generally excludes workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	N
	Low sensitivity receptor Locations where human exposure is transient, e.g. public footpaths, playing fields, parks and shopping streets.	N
	Residential properties are considered a high sensitivity receptor. There are a number of residential properties in the vicinity of the Order Limits.	
2 b(iii)	Sensitivity of Receptors to Ecological Effects	
	Is the location a:	
	High sensitivity receptor locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain	N

indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	
Medium sensitivity receptor locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition. indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	Y
Low sensitivity receptor locations with a local designation where the features may be affected by dust deposition. indicative example is a local Nature Reserve with dust sensitive features.	N
Sensitivity of Receptors to Ecological Effects – *No nationally designated ecological sites have been identified within 1 km of the Order Limits.* *In terms on other ecological site types, several Local Wildlife Sites are located in the vicinity of the Order Limits. Additionally, Bunfold Shaw Ancient Woodland is located within 15 m of the Order Limits.* *Due to their presence within 1 km of the Order Limits, the risk of dust effects at ecological sites will be considered further in this assessment.*	

Identify the presence of receptors and estimate the distance from the Site boundary:

There are residential dwellings within 20 m of the Order Limits, with additional receptors within the full 250 m Study Area. Including the Solar PV Site and Grid Connection Corridor.

Following the sensitivity tables in the IAQM guidance:

Combined Sensitivity of the area for Dust Soiling Effects:

HIGH Sensitivity: *The presence of high sensitivity receptors (i.e. residential dwellings) within 20 m of the Order Limits results in a combined HIGH sensitivity for Dust Soiling Effects.*

Combined Sensitivity of the area to Human Health Impacts

LOW Sensitivity: *Annual mean PM_{10} concentrations of <24 across the Study Area in conjunction with the presence of <100 sensitive receptors within 20 m of the Order Limits result in a combined LOW sensitivity for Human Health Impacts.*

Combined Sensitivity of the area to Ecological Impacts

MEDIUM Sensitivity: *Potentially sensitive ecosystems are situated within 20 m of the Order Limits, thus a combined MEDIUM sensitivity of the Study Area to Ecological Impacts has been determined.*

14.2.60 A summary of the magnitude of emissions and area sensitivity is provided in Table 14-6 and Table 14-7.

Table 14-6: Summary of Potential Dust Emission Magnitudes for Construction Phase Activities

Activity	Potential Dust Emission Magnitude
Earthworks	Small
Construction	Small
Trackout	Small

Table 14-7: Summary of Area Sensitivity to Construction Phase Activities

Potential Effect Type	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	High	High	High
Human Health	Low	Low	Low
Ecology	Medium	Medium	Medium

14.2.61 The magnitude of emissions and area sensitivity are combined to determine the risk of effects (assuming the use of good practice measures) as shown in Table 14-8. IAQM recommends that *significance* is only assigned to the effect after considering the construction activity with good practice measures in place.

Table 14-8: Summary of Risk of Dust Effects for Construction and Decommissioning Phase Activities

Potential Effect Type	Summary of Dust Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	Low Risk
Human Health	Negligible	Negligible	Negligible
Ecology	Medium Risk	Medium Risk	Low Risk

14.2.62 The overall risk level is Low Risk for Dust Soiling, Negligible Risk for Human Health, and Medium Risk for Ecology. Using a conservative approach, the Order limits has been assigned an overall **Medium Risk** for Dust Effects.

14.2.63 The overall risk level guides which of the IAQM (2024) good practice measures are recommended for implementation during construction. It is recommended that a conservative approach is taken and good practice measures from the ‘High Risk’ category are applied at the Order limits. These measures are good practice for minimising the impact of dust impacts during construction.

14.2.64 In line with IAQM (2024) guidance, with the implementation of the good practice measures, any impacts relating to dust soiling or human health from construction dust would be **not significant**.

14.2.65 Table 14-9 provides a summary of the assessment of effects for air quality with the embedded good practice measures.

Table 14-9: Assessment of Effects – Air Quality (Construction and Decommissioning)

Receptor	Potential Impacts, Details and Evidence	Duration	Mitigation	Likely Significance of Effect
Human Health	Emissions of air pollutants, including dust, from construction and decommissioning activities affecting human health	Short-term Temporary (During the construction or decommissioning phase only)	As presented in Table 14-3 (Embedded IAQM recommended good practice measures).	**Not significant**
Dust Soiling	Emissions from construction and decommissioning activities affecting public amenity.	Short-term Temporary (During the construction or decommissioning phase only)	As presented in Table 14-3 (Embedded IAQM recommended good practice measures).	**Not significant**

Receptor	Potential Impacts, Details and Evidence	Duration	Mitigation	Likely Significance of Effect
Sensitive Ecosystems	Emissions of air pollutants, including dust, from construction and decommissioning activities affecting sensitive ecosystems	Short-term Temporary (During the construction or decommissioning phase only)	As presented in Table 14-3 (Embedded IAQM recommended good practice measures).	**Not significant**

Additional Mitigation and Enhancement Measures

14.2.66 There are no additional mitigation measures proposed as the Scheme would not give rise to significant effects.

Residual Effects

14.2.67 As no significant adverse effects were identified (as presented in Table 14-9), there will be no residual effects on air quality associated with the Scheme.

Cumulative Effects

14.2.68 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 developments') within the surrounding area.

14.2.69 The cumulative developments to be considered in combination with the Scheme have been prepared and agreed with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology**.

14.2.70 This cumulative effect assessment identified for each receptor those areas where the predicted effects of the Scheme could interact with effects arising from other plans and, or projects on the same receptor based on a spatial and, or temporal basis.

14.2.71 There are potential cumulative effects where any cumulative development will be in the construction phase at the same time as the Scheme. Dust nuisance from on-site activities of the identified cumulative developments should not be significant, as with the adoption of good practice measures by all developments, impacts will be negligible. It is therefore considered there are **no significant cumulative effects** arising in respect of dust.

14.2.72 The cumulative developments that could potentially result in a cumulative impact of construction traffic impacts are set out in Table 14-10. These cumulative developments have been selected based on the potential for construction phase overlap. It should be noted that not all the cumulative developments may come forward.

14.2.73 Should an overlap in traffic routing and timing be identified at the ES stage the Applicant will endeavour to engage with the other cumulative developments on considerate traffic routing. It is noted that all cumulative developments have a shared responsibility to reduce traffic and air quality impacts. It is noted that **ES Volume I Chapter 13: Transport and Access** identified that impact of cumulative developments is unlikely due to limited overlap of Study Areas and limited levels of traffic being generated by the cumulative developments, but without estimating link based flows at this time.

Table 14-10: Potential Cumulative Effects (Air Quality) – Construction Phase

Scheme ID	Application Reference	LPA	Distance from Order Limits
2	23/00793/FULM	City of Doncaster	0.1 km
4	21/02567/FULM	City of Doncaster	4.4 km
5 and 6	22/01537/LBC	City of Doncaster	0.2 km
7	23/01746/FULM	City of Doncaster	0.5 km
8	19/03034/FULM	City of Doncaster	0.6 m
10	20/01774/TIPA	City of Doncaster	1.7 km
12	23/01082/SCRE	City of Doncaster	1.7 km
42	22/02088/FULM	City of Doncaster	3.9 km

Summary

14.2.74 The DRA (Table 14-8) has concluded that the Order limits is considered '**medium risk'** for dust impacts. As such, the good practice measures such as those outlined in Table 14-3 will be incorporated into the environmental management of the Scheme at construction and decommissioning. Delivery of these measures will be secured through the provision of a detailed CEMP, and DEMP via Requirements in the DCO (Development Consent Order). A **Framework CEMP [EN010152/APP/7.7]** and **Framework DEMP [EN010152/APP/7.9]** have been prepared and submitted as part of this DCO Application.

14.2.75 Through the implementation of the aforementioned mitigation measures, the effects of construction and decommissioning phase dust on sensitive receptors will be **negligible** and **not significant**.

14.3 Glint and Glare

Introduction

14.3.1 This section of the chapter presents the assessment of the likely effects of glint and glare associated with the Scheme on the surrounding receptors.

14.3.2 This section is supported by **ES Volume II Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3].**

14.3.3 The definition of glint and glare for the purposes of this assessment is the effect of reflected sunlight causing harm or discomfort to a sensitive receptor. A glint is further defined as the momentary receipt of a bright light and a glare as the receipt of a bright light over an extended or continuous time period. This widely accepted definition is taken from US Federal Aviation Authority (FAA) guidance (Ref. 14-29).

14.3.4 The full study on glint and glare, undertaken for the Scheme by Neo Environmental, is available in **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3].** The Glint and Glare Assessment

assumes a south facing fixed tilt panel system with panels fixed between a tilt angle of 15 – 35 degrees at a height of 3.5 m. As fully described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1].**

14.3.5 The Glint and Glare Assessment **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]** has been based on the Indicative Site Layout Plan (**ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.2]**) so that a specific solar PV setup can be modelled. However, the flexibility to the layout of the solar panels at detailed design allowed by the design parameters and Rochdale Envelope described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** would not change the conclusions of the assessment as the footprint of the developable area (extent of solar panel placement) will not increase in size at detailed design. Therefore, a worst-case scenario has been assessed within the Glint and Glare Assessment, ensuring there would be no change of conclusions should there be any minor alterations in panel layout at the detailed design stage.

Legislation, Policy and Guidance

Legislation

14.3.6 There is no relevant legislation relevant to Glint and Glare specifically. Planning policy and guidance relating to Glint and Glare which is pertinent to the Scheme comprises of the documents listed below. More detailed information can be found in **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3].** In summary, it comprises:

National Policy

a. NPS for Energy (EN-1) (November 2023) (Ref. 14-7); and

b. NPS for Renewable Energy Infrastructure (EN-3) (November 2023) (Ref. 14-8).

Local Policy

a. Doncaster Local Plan (LP) 2015 – 2035 (Ref. 14-12).

Guidance

b. National Planning Practice Guidance – Renewable and Low Carbon Energy (Ref. 14-25);

c. Interim Civil Aviation Authority (CAA) guidance – Solar Photovoltaic Systems (Ref. 14-26);

d. CAA – CAP738: Safeguarding Aerodromes 3rd Edition (Ref. 14-27);

e. US Federal Aviation Authority (FAA) Administration Policy (Ref. 14-28);

f. FAA Policy: Review of Solar Energy Systems Projects on Federally Obligated Airports (Ref. 14-29);

g. Overview of Rail Safety and Standards Board Guidance (RSSB) (Ref. 14-30); and

h. BRE (2014). Planning guidance for the development of large scale ground mounted solar PV systems (Ref. 14-31).

Consultation

Scoping Opinion

14.3.7 A scoping exercise was undertaken in Spring 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on glint and glare.

14.3.8 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.3.9 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3].** This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

14.3.10 Further consultation in response to formal pre-application engagement was undertaken through the PEIR which was issued in Spring 2024. Responses to statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1].**

Additional Consultation

14.3.11 No additional consultation has been undertaken with regard to glint and glare.

Assessment Methodology

14.3.12 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on Glint and Glare.

14.3.13 The assessment methodology is fully detailed within the Glint and Glare Assessment (**ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]**).

14.3.14 In summary, the assessment methodology is a multi-step process of elimination to determine which receptors have the potential to experience the effects of glint and glare, which includes the following:

a. Identifying receptors in a Study Area surrounding the Solar PV Site. The Study Area varies on the type of receptor:

   i. Ground-based receptors, including residential, road, railway and Bridleway, within 1 km of the Solar PV Site; and

i. Aviation receptors within 30 km, with detailed assessment for large international aerodromes within 20 km, military aerodromes within 10 km and 5 km for small aerodromes;

b. Considering direct solar reflections from the Scheme towards the identified receptors by undertaking geometric calculations;

c. Considering the visibility of the panels from the receptor's location. If the panels are not visible from the receptor, then no reflection can occur;

d. Based on the results of the geometric calculations, determining whether a reflection can occur, and if so, at what time will it occur;

e. Considering both the solar reflection from the Scheme and the location of the direct sunlight with respect to the receptor's position;

f. Considering the solar reflection with respect to published studies and guidance – including intensity calculations where appropriate; and

g. Determining whether a significant detrimental effect is expected in line with the significance criteria set out below.

Receptor Impact Criteria

14.3.15 Although there is no specific guidance set out to identify the magnitude of impact from solar reflections, the following Residential receptors criteria has been set out for the purposes of this report:

a. High – Solar reflections impacts of over 30 hours per year or over 30 minutes per day;

b. Medium – Solar reflections impacts above 20 hours but below 30 hours per year or above 20 minutes but below 30 minutes per day;

c. Low – Solar reflections impacts up to and including 20 hours per year or up to 20 minutes per day; and

d. None – Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening.

14.3.16 The following criteria has been set out for Road, Rail, Boat and Bridleway receptors:

a. High – Solar reflections impacts with yellow glare (potential for after-image);

b. Low – Solar reflections impacts with only green glare (low potential for after-image); and

c. None – Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening or being outside horse riders' field of view.

14.3.17 The following criteria has been set out for Aviation receptors:

a. High – Solar reflections impacts with yellow glare on approach paths/any glare impacts upon Air Traffic Control Towers (ATCT) (potential for after-image);

b. Low – Solar reflections impacts with only green glare on approach paths (low potential for after-image); and

c. None – Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening (ATCT only) or being outside pilots' field of view.

14.3.18 As there are no specific guidelines on how the impact criteria should be set out for glint and glare impacts, the above criteria has been based on the industry standard and professional experience of working on similar sized solar NSIPs (such as East Yorkshire Solar Farm, Longfield Solar Farm and Gate Burton Energy Park).

Approach

14.3.19 The modelling is based on worst-case principles, not considering obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, vegetation, hills, buildings, etc, and assuming clear skies at all times, therefore not accounting for meteorological effects such as cloud cover, fog, or any other weather event which may screen the sun. The model is therefore setup conservatively and is likely to overestimate the real-life impacts.

Baseline Conditions

14.3.20 This section describes the existing baseline conditions for the Glint and Glare assessment.

Residential Receptors

14.3.21 Residential receptors located within 1 km of the Solar PV Site have been considered in the assessment. Glint was assumed to be possible if the receptor is located within the ground-based receptor zones outlined in the Glint and Glare Assessment (**ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]).**

14.3.22 Where there are a number of residential receptors within close proximity, a representative dwelling or dwellings was chosen for detailed analysis as the impacts will not vary to any significant degree. Where small groups of receptors are evident, the receptors on either end of the group have been assessed in detail. A total of 124 residential receptors have been assessed as shown in Figure 1 of the Glint and Glare Assessment (**ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]**).

Road, Rail, Boat and Bridleway Receptors

14.3.23 Roads that are within 1 km of the Solar PV Site and have potential views of the panels are considered in the assessment. 14 roads within the Study Area require a detailed assessment and these include: Lowgate, Moss Road, Flashley Carr Lane, West Lane, Broad Lane, Fenwick Lane, Shaw Lane, Fenwick Common Lane, Trumfleet Lane, Bate Lane, Starkbridge Lane, Pinfold Lane, Brick Kiln Lane and Heyworth Lane. The assessment of these includes 68 receptor points along the 14 assessed roads within the Study Area. These points are 200 m apart to ensure that each road is sufficiently covered within the assessment.

14.3.24 There are some minor roads which have been screened out of the assessment as they only serve dwellings so the densities on these roads/access tracks will be very low. Therefore, there is a negligible risk of safety impacts resulting from glint and glare of the Scheme.

14.3.25 There is one railway line, the East Coast Main Line, that is west of the Scheme which will require assessment. This includes 21 rail receptor points considered in the detailed assessment. These points are 200 m apart to ensure that railway line is sufficiently covered within the assessment.

14.3.26 All Bridleways within 1 km of the Scheme have been considered. This includes four Bridleway receptor points for assessment.

14.3.27 There are no navigable waterways located within 1 km of the Solar PV Site, therefore impacts can upon boat receptors be considered to be **None**.

Aviation Receptors

14.3.28 There are 17 aerodromes within 30 km of the Solar PV Site. However, only Doncaster Sheffield Airport, Sherburn-in-Elmet Airport, Church Farm and Bridge Cottage Airfield require a detailed assessment as the Solar PV Site is located within their safeguarding buffer zones. Whilst Doncaster Sheffield Airport is closed, it remains in the glint and glare assessment as a reasonable worst case in the event that the airport reopens in future.

Assessment of Likely Impacts and Effects

14.3.29 This section sets out the likely Glint and Glare impacts and effects of the Scheme, and the mitigation measures identified.

14.3.30 Solar reflections are possible at 52 of the 124 residential receptors assessed within the 1 km Study Area. The initial bald-earth scenario identified potential impacts as **High** at seven receptors, **Medium** at three receptors, including one residential area, **Low** at 42 receptors, including five residential areas, and **None** at the remaining 72 receptors, including six residential areas. Upon reviewing the actual visibility (that is, with shielding from existing buildings, vegetation and other obstacles in place) of the receptors, impacts reduce to **Low** at three receptors and to **None** at all remaining receptors. Once mitigation measures were considered, impacts reduce to **None** at all receptors. Therefore, overall impacts on residential receptors are considered to be **None**.

14.3.31 Solar reflections are possible at 59 of the 68 road receptors assessed within the 1 km Study Area. The initial bald-earth scenario identified potential impacts as **High** at 42 receptors, **Low** at 18 receptors and **None** at the remaining eight receptors. Upon reviewing the actual visibility of the receptors, glint and glare impacts reduce to **None** for all road receptors. Therefore, overall impacts are considered to be **None**.

14.3.32 Solar reflections are possible at 14 of the 21 rail receptors assessed within the 1 km Study Area. The initial bald-earth scenario identified potential impacts as **High** at 11 receptors, **Low** at three receptors and **None** at the remaining seven receptors. Upon reviewing the actual visibility of the receptors, glint and glare impacts reduce to **None** for all rail receptors. Therefore, overall impacts on rail receptors are considered to be **None**.

14.3.33 Solar reflections are possible at one of the four bridleway receptors assessed within the 1 km Study Area. The initial bald-earth scenario identified potential impacts as **Low** at one receptor and **None** at the remaining three receptors. Upon reviewing the actual visibility of the receptors, glint and glare impacts reduce to **None** for all bridleway receptors. Therefore, overall impacts on bridleway receptors are considered to be **None**.

14.3.34 16 runway approach paths and two ATCTs were assessed in detail at Doncaster Sheffield Airport, Sherburn-in-Elmet Airport, Church Farm and Bridge Cottage Airfield. Green glare and yellow glare impacts were predicted for Runway 08 at Church Farm Airfield. Green glare is an acceptable impact upon runways according to FAA guidance. Upon inspection of the type of aircraft using Church Farm, time of impact, position of the sun and use of existing pilot mitigation strategies when landing in the direction of the sun, as well as the likely landing direction for the runway and Google Earth aerial imagery indicating the airfield is not in use, all impacts at Church Farm can be deemed **acceptable**. Overall impacts on aviation assets are **acceptable** and **Not Significant**.

Additional Mitigation, Enhancement and Monitoring

14.3.35 **Low** and **No Impacts** were found for aviation and ground-based (residential, road, rail and bridleway) receptors respectively, and therefore no additional mitigation measures are required to reduce glint and glare impacts. However, a conservative approach to mitigation has been applied, to bring **Low** impacts down for three residential receptors.

14.3.36 These mitigation measures include native hedgerows to be planted/infilled and maintained to a height of at least 3.5 m along the southern boundary of the Central Array and along a southwest section and a southern section of the South Array in the Solar PV Site. This will screen views from Residential Receptors 74, 79 and 88. Therefore, the impacts reduce to **None.** These measures are provided in the **Framework Landscape and Ecological Management Plan (LEMP) [EN010152/APP/7.14]** provided with this DCO Application.

Cumulative Effects

14.3.37 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 developments’) within the surrounding area.

14.3.38 The cumulative developments to be considered in combination with the Scheme have been prepared and shared with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2].** The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1].**

14.3.39 This cumulative effect assessment identified, for each receptor, the areas where the predicted effects of the Scheme could interact with effects arising from other plans and/or projects on the same receptor based on a spatial and/or temporal basis.

14.3.40 For a cumulative effect to occur in relation to Glint and Glare, another solar farm is required to be located within 2 km of the Solar PV Site as the Study Area is 1 km for Glint and Glare Assessments. No plans or projects identified in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** are considered in combination to impact important Glint and Glare features identified in this assessment as all other potential solar farm developments are located further than 2 km from the Solar PV Site. Therefore, there are no cumulative effects in respect of Glint and Glare.

Residual Effects

14.3.41 The effects of glint and glare and their impact on local receptors has been analysed in detail and there is predicted to be **Low** impacts at one runway approach path , whilst the remaining aviation receptors are predicted to have **No Impacts**. Impacts upon ground-based receptors are predicted to have **No Impacts**. Therefore, overall impacts are **Negligible**.

14.4 Ground Conditions

Introduction

14.4.1 Separate Phase 1 Preliminary Risk Assessment (PRA) reports have been prepared for the Solar PV Site and for the Grid Connection Corridor and are provided as **ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Solar PV Site [EN010152/APP/6.3]** and **ES Volume III Appendix 14-4: Phase 1 Preliminary Risk Assessment – Grid Connection Corridor [EN010152/APP/6.3].** The findings are summarised in this section. A Phase 1 PRA is equivalent to a Stage 1 Tier 1 level of assessment, as defined by the Environment Agency's Land Contamination Risk Management (LCRM) (2023) guidance (Ref. 14-32). The objective of the PRA is to identify and evaluate potential land quality risks and development constraints associated with the Scheme and to construct an initial conceptual site model that can be used to inform future decision making and the design of any future ground investigation which may be required.

14.4.2 The Phase 1 PRA reports were prepared in March 2024 and are included in the **ES Volume III Appendices 14.3 and 14.4 [EN010152/APP/6.3**]. The Phase 1 PRA reports assessed the land within the Order limits at PEIR. The Order limits considered in the Phase 1 PRA reports and associated mapping therefore differs slightly from the Order Limits adopted in the ES. The boundary changes between the PEIR (as reflected in the Phase 1 PRA reports) and the ES are further discussed in **ES Volume I Chapter 3: Alternatives and Design Evolution [EN010152/APP/6.1].** Areas of land have been added and removed from the Order limits since the Phase 1 PRA reports were prepared. However, the additional areas of land take are sufficiently covered by the buffer zone applied in the Phase 1 PRA reports. Therefore, the Phase 1 PRA reports cover all relevant land within the Order

Limits and these boundary changes do not alter the conclusion of the assessment presented in the Phase 1 PRA reports.

14.4.3 The Phase 1 PRA reports include the following:

a. Description of the geology, hydrogeology and shallow mining potential;

b. Description of the environmental setting/sensitivity and current/historical land use of the Order limits and surrounding area;

c. The observations from a site reconnaissance visit;

d. An initial Conceptual Site Model (CSM) for the prevailing ground conditions; and

e. A preliminary qualitative risk assessment of potential land contamination risks to human (chronic), environmental, and controlled water receptors from contamination sources on or in the vicinity of the Order limits using the source-pathway-receptor model.

Legislation, Policy and Guidance

14.4.4 Legislation, planning policy, and guidance relating to ground conditions and pertinent to the Scheme comprises of the documents listed below. More detailed information can be found in **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3]**.

Legislation

14.4.5 There are six key legislative drivers for dealing with risks to human health and the environment from ground conditions, namely:

a. Part 2A of the Environmental Protection Act (EPA) 1990 (the Contaminated Land Regime) (Ref. 14-35);

b. The Water Resources Act 1991 (Ref. 14-36);

c. Water Act 2003 (Ref. 14-37);

d. Building Act 1984 (Ref. 14-38);

e. The Building Regulations & c (Amendment) Regulations 2015 (Ref. 14-39); and

f. Planning Act 2008 (Ref. 14-40).

14.4.6 Other legislation of relevance to this topic includes:

a. Environmental Permitting (England and Wales) Regulations 2016 (Ref. 14-41) (as amended);

b. Hazardous Waste (England and Wales) Regulations 2005 (Ref. 14-42);

c. Contaminated Land (England) (Amendment) Regulations 2012 (Ref. 14-43);

d. Environmental Damage (Prevention and Remediation) Regulations 2015 (Ref. 14-44); and

e. Anti-Pollution Works Regulations 1999 (Ref. 14-45).

National Policy

f. Overarching NPS for Energy (EN-1) (November 2023) (Ref. 14-7); and

g. NPPF (December 2023) (Ref. 14-9).

Local Policy

a. Doncaster Local Plan 2015 – 2035 (Ref. 14-12).

Guidance

b. Environment Agency's Land Contamination Risk Management (LCRM) (2023) guidance (Ref. 14-32).

Consultation

Scoping Opinion

14.4.7 A scoping exercise was undertaken in the spring of 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3])** which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on ground conditions.

14.4.8 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.4.9 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within the ES.

14.4.10 Further consultation was undertaken through the PEIR which was issued in April 2024. Responses to statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1]**.

Statutory Consultation

14.4.11 Further consultation in response to formal pre-application engagement was undertaken through the PEIR which was issued in Spring 2024. Responses to statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1].**

Additional Consultation

14.4.12 No additional consultation has been undertaken in relation to Ground Conditions.

Phase 1 Phase 1 Preliminary Risk Assessment Findings – Ground Conditions

14.4.13 The principle of risk assessment for land contamination is outlined in the Statutory Guidance to Part 2A (Ref. 14-35) and LCRM (Ref. 14-32).

14.4.14 The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

a. Source: hazardous substance that has the potential to cause adverse impacts;

b. Pathway: route whereby a hazardous substance may come into contact with the receptor. Examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and

c. Receptor: target that may be affected by contamination. Examples include human occupants/users of site, water resources (surface waters or groundwater), or structures.

14.4.15 For a risk to be present, there must be a relevant/viable contaminant linkage i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

14.4.16 The following sources, pathways and receptors have been identified in Table 14-11 (relevant to the Solar PV Site) and Table 14-12 (relevant to the Grid Connection Corridor).

Table 14-11: Sources, Pathways and Receptors (Ground Conditions) (Relevant to the Solar PV Site)

Sources	Pathways	Receptors
1: On-site, current and former farm buildings and yards where fuel and agricultural materials were/are stored. Made Ground (infilled ponds/infilled land). **2:** Off-site, current and former farm buildings and yards where fuel and agricultural materials were/are stored. Current trucking company. Current shooting range. **3**: Off-site, former railway line.	**1**: Direct Pathway: direct contact, dermal absorption or ingestion of soil. **2**: Indirect Pathway: inhalation of soil particulates or vapour derived from soils. **3**: Indirect Pathway: migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/explosion). **4**: Indirect Pathway: leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater. **5**: Indirect Pathway: lateral migration in groundwater and baseflow into surface waters. **6**: Indirect Pathway: uptake via root system and ingestion. **7**: Direct Pathway: direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate). **8**: Direct Pathway: direct contact of services and supply pipes with contaminated soils.	**1**: Current Site Users: farmers/site visitors/general public on the Order limits using PRoW. **2**: Future Site Users: farmers/site visitors/trespassers/general public on the Order limits using the PRoW. **3**: Secondary A Aquifers of superficial deposits (Breighton Sand Formation and Alluvium). Principal Aquifer of the bedrock (Sherwood Sandstone Group). **4**: River Went and drains. **5**: Bunfold Shaw Designated Ancient Woodland. **6**: Future proposed infrastructures (Solar PV Mounting Structure and On-Site Cables). **7**: Proposed structures. **8**: Potable water supply pipes and other services.

Sources	Pathways	Receptors
		9: Property: crops and sheep grazing.
	9: Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches.	

Table 14-12: Sources, Pathways and Receptors (Ground Conditions) (Relevant to the Grid Connection Corridor)

Sources	Pathways	Receptors
1: On-site, the Existing National Grid Thorpe Marsh Power Station. **2:** On-site, current and former railway lines. **3**: on-site, Made Ground (associated with former pits/ponds). **4**: Off-site, farm buildings and yards where fuel and agricultural materials were/are stored. Off-site, former good station, railway buildings and railway sidings Off-site, current distribution and haulage. Off-site, Existing Trumfleet Power Station.Electrical Substation.	**1**: Indirect Pathway: leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater. **2**: Direct Pathway: spillage/loss/run off from surface direct to receiving water. **3**: Indirect Pathway: lateral migration in groundwater and baseflow into surface waters. **4**: Direct Pathway: direct contact of the Grid Connection Cables with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate). **5**: Direct Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches.	**1**: Secondary A Aquifers of superficial deposits (Breighton Sand Formation and Alluvium). Principal Aquifer of the bedrock (Sherwood Sandstone Group). **2**: Water courses associated with the Bramwith Drain from Source to River Don water body; Don from Mill Dyke to River Ouse water body; and Ea Beck from the Skell to River Don water body. **3**: Future proposed infrastructures (cables). **4**: Proposed structures.

14.4.17 Using criteria broadly based[1] on those presented in the Annex 4 of the National House Building Council/Environment Agency/Chartered Institute of Environmental Health (NHBC/EA/CIEH) R&D Publication 66, 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (Ref. 14-48), the magnitude of the risk associated with potential contamination at the Order limits was assessed. To do this an estimate was made of:

a. The magnitude of the potential consequence (i.e. severity); and

b. The magnitude of probability (i.e. likelihood).

14.4.18 The classifications of severity and likelihood, and the risk rating based on the comparison of severity and likelihood, are presented in the Phase 1 PRA reports (**ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Solar PV Site [EN010152/APP/6.3]** and **ES Volume III Appendix 14-4: Phase 1 Preliminary Risk Assessment – Grid Connection Corridor [EN010152/APP/6.3]**).

14.4.19 The key findings of the risk assessment are detailed below. Full details outlining all the source-pathway-receptor linkages for all the sources, pathways and receptors detailed above are provided in the Phase 1 PRA reports (**ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Solar PV Site [EN010152/APP/6.3]** and **ES Volume III Appendix 14-4: Phase 1 Preliminary Risk Assessment – Grid Connection Corridor [EN010152/APP/6.3]**).

14.4.20 Risks to human health, controlled waters and other sensitive receptors have been identified as between very low to low within the Phase 1 PRA reports.

14.4.21 The Phase 1 PRA reports (**ES Volume III Appendix 14-3: Phase 1 Preliminary Risk Assessment – Solar PV Site [EN010152/APP/6.3]** and **ES Volume III Appendix 14-4: Phase 1 Preliminary Risk Assessment – Grid Connection Corridor [EN010152/APP/6.3]**) propose limited intrusive investigation to confirm the findings of the assessment, which may be included as part of geotechnical scope of works. An intrusive site investigation and Quantitative Risk Assessment (GQRA) is proposed to be undertaken prior to construction, in the areas of potential contamination.

14.4.22 A Pre-Desk Study Assessment for Unexploded Ordnance (UXO) was obtained from Zetica, as the possibility of UXO within the Order limits identified in the Phase 1 PRA reports was unlikely, but it was not entirely dismissed. The Pre-Desk Study Assessment for UXO confirmed that a detailed desk survey "*is not essential in this instance*" and therefore is not included in this DCO application. The Pre-Desk Study Assessment for UXO is included as **ES Volume III Appendix 14-5: Pre-Desk Study Assessment for UXO [EN010152/APP/6.3].**

Conclusion – Ground Conditions

14.4.23 Following implementation of the recommendations of the GQRA (to be completed post-consent) into the detailed CEMP, along with the environmental design and management measures, for the construction, operation and maintenance, and decommissioning phases, the risk to

[1] R&D Publication 66 was used to create the assessment criteria, however, the terminology has been altered slightly for example through the use of likelihood rather than probability.

human health, controlled waters and other sensitive receptors is considered acceptable. Therefore, the Scheme is not considered to pose an unacceptable risk to human health or the environment either during construction, operation and maintenance or decommissioning. There is not expected to be any likely significant effects associated with Ground Conditions.

14.4.24 During construction, the works will be undertaken in compliance with the CDM 2015 regulations (Ref. 14-44). Mitigation to prevent surface runoff, discharge into watercourses and dust generation will form part of the construction phase obligations and requirements.

Cumulative Effects

14.4.25 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 developments') within the surrounding area.

14.4.26 The cumulative developments to be considered in combination with the Scheme have been agreed in consultation with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]**.

14.4.27 This cumulative effect assessment identified, for each receptor, the areas where the predicted effects of the Scheme could interact with effects arising from other plans and/or projects on the same receptor based on a spatial and/or temporal basis.

14.4.28 There are six cumulative developments in the vicinity (within a 1 km buffer) of the Order Limits relevant to ground contamination identified in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]**, which have the potential to result in cumulative ground contamination effects. These include developments for the installation of a battery energy storage, substation, and associated infrastructures (23/00793/FULM), demolition of an existing building and construction of a residential dwelling and associated works (22/01537/LBC and 22/01536/FUL), installation of a battery energy facility and associated works (23/01746/FULM), material excavation and flood plain reinstatement (19/03034/FULM), reclamation through construction and operation of Energy Hub which (23/00537/FULM) and installation of underground cable (23/01241/FULM). These will result in some degree of excavation or ground disturbance.

14.4.29 Provided that the requirements of relevant policy and legislation relating to land contamination and remediation are integrated within the design, and that appropriate mitigation measures are applied during the construction and decommissioning phases of each development, impacts to Ground Conditions will be controlled, and it is considered that the cumulative effect on Ground Conditions will be **negligible** and **not significant**.

14.4.30 Therefore, the potential for Ground Conditions impacts during the construction, operation and maintenance, and decommissioning phases of the Scheme is considered within the Order Limits. Other schemes are not likely to contribute to the effects on Ground Conditions receptors identified in this chapter and therefore the effects are not significant.

14.5 Major Accidents and Disasters

Introduction

14.5.1 This section provides a description of the potential effects of the Scheme on the environment deriving from the vulnerability of the Scheme to risks of major accidents and/or disasters.

14.5.2 As set out in the Institute for Environmental Management and Assessment (IEMA) guidance document 'Major Accidents and Disasters in EIA: A Primer' (Ref. 14-49):

a. 'Accidents' are an occurrence resulting from uncontrolled developments in the course of construction, operation and maintenance, and decommissioning (e.g. a major emission, fire or explosion); and

b. 'Disasters' are naturally occurring extreme weather events or ground related hazard events (e.g. subsidence, landslide, earthquake).

14.5.3 This section should be read in conjunction with**:**

a. **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1];**

b. **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1];**

c. **ES Volume I Chapter 13: Transport and Access [EN010152/APP/6.1];**

d. **and ES Volume I Chapter 10: Landscape and Visual Amenity [EN010152/APP/6.1];** and

e. **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3].**

Legislation, Policy and Guidance

14.5.4 The EIA Regulations (Ref. 14-50) require consideration to be given to the risks of major accidents and disasters. The Scheme is not subject to the Control of Major Accident Hazards (COMAH) Regulations (2015) (Ref. 14-54).

14.5.5 No specific provisions for the major accidents and disasters assessment are made within the NPSs. NPS EN-1 (November 2023) sets out matters relating to safety; however, this mainly applies to schemes which are subject to the COMAH Regulations.

14.5.6 Although not directly relevant to energy developments, the NPPF (December 2023) does refer, at Paragraph 101, to the fact that "*planning policies and decisions should promote public safety and take into account wider security and defence requirements*".

14.5.7 There are no relevant local policy provisions in relation to major accidents and/or disasters.

14.5.8 The IEMA guidance document 'Major Accidents and Disasters in EIA: A Primer' (Ref. 14-49) has been taken into account in the assessment of major accidents or disasters.

14.5.9 Further details of the legislation policy and guidance relevant to this topic is presented in **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3]**.

Consultation – Major Accidents and Disasters

Scoping Opinion

14.5.10 A scoping exercise was undertaken in the Spring of 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on major accidents and disasters.

14.5.11 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.5.12 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

14.5.13 Correspondence was undertaken with South Yorkshire Fire and Rescue Service who shared a guidance and recommendations letter for the Solar PV Site, including the BESS Area. This letter covered what should be included in the Emergency Response Plan and design measures to be considered which would assist operation crews in carrying out their role. This letter was taken into account by the Applicant when designing the BESS Area and preparing the **Framework Battery Safety Management Plan [EN010152/APP/7.16].**

14.5.14 Five comments were raised relating to Major Accidents and Disasters at Statutory Consultation (see **Consultation Report, Appendix O4 [EN010152/APP/5.1]**). These largely related to the safety of the BESS Area and associated potential for fire hazards. These issues have been addressed in the production of the **Framework Battery Safety Management Plan [EN010152/APP/7.16]** which will form part of the DCO application. Individual comments and the Applicant's responses can be found in **Consultation Report Appendix O4 [EN010152/APP/5.1]**

Assessment Methodology

14.5.15 This section sets out the scope and methodology for the major accidents and disasters assessment. In general, major accidents or disasters, as they relate to the Scheme, fall into three categories:

a. Events that could not realistically occur, due to the nature of the Scheme or its location;

b. Events that could realistically occur, but for which the Scheme, and associated receptors, are no more vulnerable than any other development; and

c. Events that could occur, and to which the Scheme is particularly vulnerable, or which the Scheme has a particular capacity to exacerbate.

14.5.16 An initial exercise was undertaken and presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report, [EN010152/APP/6.3]**) to identify all possible major accidents or disasters that could be relevant to the Scheme. This list was drawn from several sources, including the UK Government's National Risk Register 2020 (Ref. 14-55). Major accidents or disasters with little relevance in the UK, such as volcanic eruptions, were not included.

14.5.17 The long list of major accidents or disasters is presented in Appendix D of the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**). This initial scoping exercise showed the potential vulnerability of the Scheme to the risk of a major accident and/or disaster associated with a variety of different events. Appendix D of the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) also provides further clarity on the topics and events which have been scoped into the EIA, and those which have been scoped out, with suitable justification provided.

14.5.18 The long list was then screened within the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report, [EN010152/APP/6.3]**) to identify the third group of major accidents or disasters listed above and form a short list of events to be taken forward for further consideration. The short list of events and the list of relevant chapters and assessments in which they have been scoped in are summarised in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]**.

14.5.19 Although the majority of the major accidents or disasters on the long list are already considered under other legislative or design requirements, this is not considered to be sufficient reason to automatically eliminate them from any further consideration. This is consistent with the approach for other topics: for example, that the need to comply with nature conservation legislation does not mean that ecology and nature conservation does not need to be considered in the EIA. However, where it is concluded that the need for compliance is so fundamental, and the risk of any receptors being affected differently so remote, major accidents or disasters on the long list are not included on the short list.

14.5.20 Likewise, it is considered reasonable and proportionate to exclude certain receptor groups from the outset. Construction workers, as a receptor, can be excluded from the assessment, because existing legal protection is considered to be sufficient to minimise any risk from major accidents or disasters to a reasonable level. Legislation in force to ensure the protection of workers in the workplace includes:

a. Health and Safety at Work etc. Act 1974 (Ref. 14-56);

b. The Management of Health and Safety at Work Regulations 1999 (Ref. 14-57);

c. The Workplace (Health, Safety and Welfare) Regulations 1992 (Ref. 14-58); and

d. Construction Design and Management (CDM) 2015 Regulations (Ref. 14-59).

Study Area

14.5.21 The Study Area for the assessment of major accidents and disasters is 5 km from the Order Limits which is based on the largest Zone of Influence shown in **ES Volume II Figure 15-1: ZoI Extents for Assessment of Potential Cumulative Effects [EN010152/APP/6.2]**.

Baseline Conditions

14.5.22 The Scheme is not located within a safeguarding zone of an explosives site licensed under the Explosives Regulations 2014 or the Dangerous Goods in Harbour Areas Regulations 2016. The Scheme is also not located within HSE's land use planning consultation zones for major accident hazard pipelines and hazardous substances consented sites.

14.5.23 There are several sensitive receptors present in the vicinity of the Scheme which could be vulnerable to major accidents or disasters including towns, villages, farms and residential homes, roads, designated ecological sites and underground utilities and services.

Assessment of Effects and Mitigation Measures

14.5.24 This section sets out the likely impacts and effects of the Scheme on major accidents and disasters and the mitigation measures identified.

14.5.25 Table 14-13 details which potential major accidents or disasters have been captured within the scope of the ES chapters.

Table 14-13: Assessment of likely Effects of Major Accidents or Disasters and location within the ES

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
Floods	Property and people in areas of increased flood risk.	Parts of the Order limits are located within Flood Zones 2 and 3. Flood events can result in damage to property, pollution to land or water and impact communities through displacement. Both the vulnerability of the Scheme to flooding, and the potential for the Scheme to exacerbate flooding, are covered in the Flood Risk Assessment (FRA) **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]**, both in terms of the risk to the Scheme and increased risk caused by the Scheme. Mitigation has been considered and, where necessary, incorporated into the Scheme design. The assessment of effects presented in **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]** and reported in **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1]**, assesses the impact of flooding and flood risk from all sources (to the Scheme to other developments outside of the Order limits) and concludes that the effects are **not significant.**	a. **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1];** b. **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]; and** c. **Framework CEMP [EN010152/APP/7.7].**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		A **Framework CEMP [EN010152/APP/7.7]**) has been prepared which identifies measures to prevent an increase in flood risk during the construction phase and also provide details of the response to an impending flood.	
Fire	Local residents, human health, habitats, species and heritage features.	There may be potential for fire due to the battery storage element of the Scheme. However, the BESS Containers will include cooling systems designed to regulate temperatures to within safe conditions, which minimises the risk of fire. In addition, the Scheme design includes adequate separation between battery containers to ensure an isolated fire would not become widespread and lead to a major incident. The battery containers will be located more than 30 m from the nearest PRoW and more than 500 m from any residential receptors. Fire detection and suppression features will be installed to detect (e.g. multispectral infrared flame detectors) and suppress (e.g. water based suppression systems) fires to minimise this risk. The requirements for battery safety will be secured in the DCO through the	a. **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]; and** b. **Framework Battery Management Plan (FBMP) [EN010152/APP/7.16].**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		implementation of a **Framework Battery Management Plan (FBMP)** [**EN010152/APP/7.16].** The development of the FBMP has been considered in the iterative design of the Scheme ensuring that design requirements to ensure fire safety (such as ensuring adequate provision of land for water storage, and the location of the BESS Area away from trees and hedgerows to minimise risk of fire spreading) and management of any firewater runoff are captured. The development of the FBMP has been discussed with South Yorkshire Fire and Rescue Service. The FBMP also covers the life safety, welfare and property protection fire safety requirements of the battery banks and demonstrate that their location does not give rise to a significant increase in fire risk and that any risk that does exist is managed by constructing, operating and maintaining, and decommissioning the Scheme in accordance with the approved FBMP.	
Road accidents	Road users and the aquatic environment.	An assessment of road accidents and safety has been fully addressed within **ES Volume I Chapter 13: Transport**	a. **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1];**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		and Access [EN010152/APP/6.1]. The assessment concludes there will be **no significant effects** on road safety during construction, operation and maintenance and decommissioning phases of the Scheme. The assessment of the risk posed by chemical spillage during construction or decommissioning is presented within **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1]**, which concludes that with the implementation of the detailed CEMP the Scheme would result in **no significant effects**. Chapter 9 includes a description of measures proposed to reduce pollutant runoff to nearby watercourses, both during construction, secured within the **Framework CEMP ([EN010152/APP/7.7]**), and operation and maintenance within **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3].** As assessed in **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]** and summarised in Section 14.3 of this chapter, there will not be any significant effects from glint and glare to any receptors. It is therefore	b. **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3];** c. **ES Volume I Chapter 13: Transport and Access [EN010152/APP/6.1];** d. Section 14.3 of this chapter; e. **ES Volume I Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.1]; and** f. **Framework CEMP [EN010152/APP/7.7]**.

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		assessed that glint and glare effects will be **negligible** on sensitive receptors and **not significant** in EIA terms.	
Rail accidents	Rail users	The nearest railway is located 700 m from the Order Limits to the east of the East Coast Main Line railway, from Shaftholme Junction to Temple Hirst Junction. As assessed in **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]** and summarised in Section 14.3 of this chapter, there would be no significant effects from glint and glare on rail users. The risk of glint and glare has been addressed within the iterative design of the Scheme. The Grid Connection and On-Site Cables need to be routed beneath the railway (HDD.10 in **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**). This will be undertaken using HDD. The detailed design for the HDD will be informed by geotechnical site investigation and assessment (to be undertaken post-consent) Protective Provisions for the for the protection of railway interests (Network	a. Section 14.3 of this chapter. b. **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3]**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		Rail) have been included within the **Draft DCO [EN010152/APP/3.1]**. This includes that the methodology for the HDD works will be agreed with Network Rail. It is therefore considered that there would be no impact to the integrity of rail infrastructure or the safety of rail users as a result of these works.	
Aircraft disasters	Aircraft users	There are two small airfields located within 5km of the Scheme – Church Farm and Bridge Cottage (also known as Great Heck). Church Farm is located 2.26km south of the Solar PV Site and Bridge Cottage is located 3.28km to the north of the Solar PV Site. Both of these airfields are considered to be disused based on satellite imagery. The potential for glint and glare to affect aircraft is considered within **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3].** This assessment concluded there were no significant effects at either of the above airfields.	a. Section 14.3 of this chapter; and b. **ES Volume III Appendix 14-2: Glint and Glare Assessment [EN010152/APP/6.3].**
Flood defence and reservoir (dam) failure	Property and people in areas of increased flood risk.	Parts of the Order limits may be at risk of flooding from reservoirs. The assessment of effects are presented in **ES Volume III Appendix 9-3: Flood Risk Assessment**	a. **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1];**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		[**EN010152/APP/6.3]** and reported in **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1]**, assesses the impact of flooding and flood risk from all sources (to the Scheme and to other developments outside of the Order limits) to be **not significant.** The consequences from a reservoir failure could be severe, however, the Environment Agency note that this is a worst-case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail. An Emergency Response Plan will be produced by the Contractor following the grant of DCO and prior to construction which will provide details of the response to an impending flood. Both the vulnerability of the Scheme to fluvial flooding, and the potential for the Scheme to exacerbate flooding are covered in **ES Volume III Appendix 9-1 Flood Risk Assessment [EN010152/APP/6.3].** Mitigation has been considered and, where necessary, incorporated into the Scheme design.	b. **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]; and** c. **Framework CEMP [EN010152/APP/7.7]**.

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
Utilities failure (gas, electricity, water, sewage, oil, communications)	Employees and local residents.	To identify any existing infrastructure constraints, both consultation and a desk-based study has been undertaken as part of this ES so that appropriate mitigation such as buffers can be incorporated into the design. The Applicant has also engaged with the utilities providers relevant to the Scheme. It is known that there are existing overhead electricity and telecommunication lines and buried pipelines present within the Order Limits. The Scheme therefore has the potential to affect existing utility infrastructure above and below ground. Impacts to or failure of this infrastructure could potentially lead to a major accident and potential impacts to human health. **The Framework CEMP [EN010152/APP/7.7]** and **Framework DEMP [EN010152/APP/7.8]** outline the appropriate mitigation that will be followed to prevent such incidents such as: a. Locating the Scheme outside of utilities protected zones; b. Reviewing available utilities data/mapping and the use of ground	a. Section 14.6 of this chapter. b. **Framework CEMP [EN010152/APP/7.7];** and c. **Draft DCO [EN010152/APP/3.1].**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		penetrating radar before excavation to identify any unknown utilities; and c. Agreement of construction/demobilisation methods prior to works commencing. Engagement with relevant statutory undertakers is ongoing. Additionally, measures in relation to safe working beneath overhead lines will be in place at all stages of the Scheme, for example ensuring adequate clearances are in place when plant and equipment is being moved beneath the overhead lines. Similarly, measures in relation to safe working near buried utilities, particularly gas pipelines, will be in place at all stages of the Scheme. The **Draft DCO [EN010152/APP/3.1]** includes protective provisions for the protection of electronic communication networks and utilities.	
Mining and extractive industry	Employees.	There is the potential for current or past quarrying activity in the vicinity to lead to unstable ground conditions due to nearby active quarries. However, the risk will be considered as part of the geotechnical design, at detailed design ensuring that the risk is designed out.	a. Section 14.4 of this chapter; and b. **Framework CEMP [EN010152/APP/7.7]**.

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		As stated in **ES Volume III Appendix 14-3: Solar PV Site Phase 1 Preliminary Risk Assessment (PRA) [EN010152/APP/6.3]** and **ES Volume III Appendix 14-4: Cable Corridor Phase 1 PRA [EN010152/APP/6.3]** the Order limits is located within a Coal Mining Reporting Area and, as recommended in the Phase 1 PRAs, a coal mining report will be obtained for these areas to inform the detailed design as secured through the **Framework CEMP [EN010152/APP/7.7].**	
Plant disease	Habitats and species.	New planting may be susceptible to biosecurity issues, such as the increased prevalence of pests and diseases due to climate change. Phytophthora species (which cause the decay of living plant material) need water to infect and their spread is limited by low temperatures. The predicted wetter warmer winters could therefore increase their prevalence. The planting design will take account of biosecurity risks through a wider mix of species and the omission of any species for which there is a known increased risk of disease or pathogen – for example the use of Ash (*Fraxinus excelsior*) will likely be avoided due to the current outbreak of	a. **ES Volume I Chapter 8: Ecology [EN010152/APP/6.3];** b. **ES Volume I Chapter 10: Landscape and Visual Amenity [EN010152/APP/6.3]; and** c. **Framework SMP [EN010152/APP/7.10].**

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		the fungal pathogen Ash Dieback (*Hymenoscyphus fraxineus*). There is the potential for disease and pathogen transfer (including undesirable weed species) between different areas of agricultural land. The loss of soil resource is considered as the main cause of disease and pathogen transfer, due to the transfer of soil (and incorporated seed/spore bank) from infected to uninfected areas. The Soil Management Plan (SMP) to be prepared prior to construction (and secured through the DCO) will set out appropriate measures to minimise soil loss and hence biosecurity risk. A **Framework SMP [EN010152/APP/7.10]** has been prepared for this ES**.** A Biosecurity Plan will also be prepared prior to construction, secured through the CEMP. This may include measures such as appropriate cleaning and/or disinfection of machinery and equipment in areas considered to be at high risk. The UK Government's website advertising current occurrences and imposed restrictions with regards to animal and plant diseases would be	

Major Accident or Disaster	Potential Receptor	Comments	Location in ES
		checked both pre-construction and at regular intervals throughout construction.	

14.5.26 Given the nature of accidents and disasters, there is the potential for significant effects if an event does occur, however, the assessment has concluded that the risk of such events occurring is low for the Scheme and significant effects on the environment are therefore not anticipated. On the rare possibility that a major accident and disaster does occur, the significance of the effect would correlate to the scale of the major accident and disaster event. The focus is on prevention of major accidents and disasters, and mitigation if an event does occur. Taking into account the good industry practice and additional mitigation measures discussed above, the risk of accidents and disasters is considered low. The assessment has considered the likely effects resulting from an event, should one occur, and has concluded there would be no significant effects on the environment or people.

Cumulative Effects

14.5.27 This section presents an assessment of cumulative effects between the Scheme and other proposed and committed plans and projects including other developments.

14.5.28 This assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: EIA Methodology [EN010152/APP/6.1]** and shortlist of cumulative developments listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**.

14.5.29 The potential for the increased traffic during construction and decommissioning phases of the Scheme in combination with other developments is assessed in **ES Volume I Chapter 13: Transport and Access [EN010152/APP/6.1]**. This assessment concludes that there are unlikely to be significant effects arising from cumulative development, due to limited overlap of the traffic Study Areas for the Scheme with the other developments and limited levels of traffic being generated by cumulative sites that could interact with the traffic generated for the Scheme.

14.5.30 With the mitigation measures listed in Table 14-13 above to reduce the risk of fire and other shortlisted events for the Scheme, it is not expected that any cumulative developments would increase the risk or severity of the residual effects associated with major accidents and disasters affecting the Scheme.

14.6 Telecommunications, Television Reception and Utilities

Introduction

14.6.1 This section evaluates the effects of the Scheme on Telecommunications, Television Reception, and Utilities. For a description of the Scheme, refer to **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1].**

Legislation, Policy and Guidance

14.6.2 Effects relating to existing infrastructure are not environmental effects and there is no requirement to include an assessment of these effects under the EIA Regulations (Ref. 14-50). However, given the nature of solar farm

developments, there may be the potential to affect existing utility infrastructure above and/or below ground.

14.6.3 There is no other legislation, policy or guidance specifically related to the Telecommunications, Television Reception, and Utilities assessment.

Consultation

14.6.4 This section sets out the consultation undertaken to date for the telecommunications and utilities assessment.

Scoping Opinion

14.6.5 A scoping exercise was undertaken in the Spring of 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on Telecommunications, Television Reception and Utilities.

14.6.6 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.6.7 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Additional Consultation

14.6.8 Further consultation in response to formal pre-application engagement was undertaken through the PEIR issued in Spring 2024. Responses to this statutory consultation are presented in the **Consultation Report, Appendix O4 [EN010152/APP/5.1]**.

Assessment Methodology

Assumptions, Limitations and Uncertainties

14.6.9 To identify any existing infrastructure constraints, both consultation and a desk-based study has been undertaken. Consultation with relevant Telecommunication and Utilities providers is a routine part of solar development.

14.6.10 Consultees include water, gas and electricity utilities providers and telecommunications providers. Telecommunications and television providers are unlikely to be affected by electromagnetic interference unless transmitters are near electrical infrastructure associated with the Solar PV Site.

14.6.11 A desk-based search has been undertaken for the presence of Telecommunications, Television Reception and Utilities infrastructure within the Order Limits and within the vicinity. A qualitative approach was used to

assess the likelihood of significant effects on Telecommunications, Television Reception and Utilities.

14.6.12 The assessment of effects on Telecommunications, Television Reception and Utilities is based on the maximum parameters set out in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1].** This includes the anticipated maximum depth of construction activities and infrastructure, the maximum area allowed to be disturbed during construction and developed by the Scheme, and the maximum heights and massing allowed by the application.

Study Area

14.6.13 The Study Area for Telecommunications, Television Reception and Utilities comprises the Order Limits (see **ES Volume II Figure 1-2: Site Boundary Plan [EN010152/APP/6.3]**), as potential interactions with existing infrastructure are considered to be limited to the location of Scheme activities only.

Baseline Conditions

14.6.14 Existing infrastructure constraints identified at and adjacent to the Order Limits include the following:

a. Existing National Grid Thorpe Marsh Substation and associated cables located at the southern extent of the Order Limits;

b. Overhead lines:

i. 275 kV overhead line (OHL) Thorpe Marsh – West Melton 1 and Thorpe Marsh – West Melton 2 located southwest of the southern extent of the Order Limits;

i. 400 kV OHL Eggborough – Thorpe Marsh and Stalybridge – Thorpe Marsh located west of the southern extent of the Order Limits;

ii. 400 kV OHL Drax – Keadby – Thorpe Marsh which crosses the Order Limits in the eastern extent of the Solar PV Site, across the Grid Connection Corridor and at the Existing National Grid Thorpe Marsh Substation;

iii. 400 kV OHL Brinsworth – Thorpe Marsh 1 and Brinsworth – Thorpe Marsh 2 which crosses the Order Limits at the Existing National Grid Thorpe Marsh Substation.

c. Overhead line towers including five towers located in the eastern extent of the Solar PV Site, two located in the Grid Connection Corridor and three located at the Existing National Grid Thorpe Marsh Substation.

14.6.15 Records provided by Doncaster Council indicate that there are two private water supply abstraction boreholes located within 1 km of the Order Limits. These are shown as PWS1 and PWS2 on **ES Volume II Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]** and are discussed in further detail in **ES Volume I Chapter 9: Water Environment [EN010152/APP/6.1]**.

14.6.16 The Order limits are crossed by a four-inch live water main serving the central settlements of Riddings Farm and Fenwick Hall. This asset follows the route of the highway network of Lawn Lane and Bunfold Shaw Lane.

Telecommunications

14.6.17 There are several mobile phone masts present within or in the vicinity of the Order limits.

Television Reception

14.6.18 The area surrounding the Scheme receives television signals from the Emley Moor transmitter, located approximately 37 km west of the Scheme at the closest point.

Embedded Mitigation – Telecommunications, Television Reception and Utilities

14.6.19 Precautionary measures are included as part of the embedded mitigation for the Scheme, which include locating the Scheme outside of utilities protected zones; the use of ground penetrating radar before excavation to identify any unknown utilities; and consultation and agreement of construction/demobilisation methods prior to works commencing.

14.6.20 Additionally, measures in relation to safe working beneath overhead lines will be in place at all stages of the Scheme for example measures set out in National Grid's technical guidance note 287 (Ref. 14-51) such as ensuring adequate clearances are in place when plant and equipment is being moved beneath the overhead lines.

14.6.21 Similarly, measures in relation to safe working near buried utilities, particularly gas pipelines, will be in place at all stages of the Scheme. For example mitigation set out in National Grid and Northern Gas Networks guidance documents for third parties working in the vicinity of high pressure gas pipelines and associated installations (Ref. 14-52 and Ref. 14-54).

14.6.22 These measures have been further refined within the **Framework CEMP [EN010152/APP/7.7], Framework Operational Environmental Management Plan (OEMP) [EN010152/APP/7.8]** and **Framework DEMP [EN010152/APP/7.9],** with the production of these management plans secured through the requirements of the DCO.

14.6.23 The **Draft DCO [EN010152/APP/3.1]**) includes Protective Provisions for the protection of electricity, gas, water and sewerage undertakers (Part 1 of Schedule 14), for the protection of electronic communications code networks (Part 2 of Schedule 14), and for the protection of National Grid Electricity Transmission Plc as electricity undertaker (7 of Schedule 14). Engagement with relevant statutory undertakers in this respect is ongoing.

Assessment of Likely Impacts and Effects

14.6.24 This section sets out the likely impacts and effects of the Scheme on Telecommunications, Television Reception and Utilities and the mitigation measures identified.

Telecommunications

14.6.25 The Scheme is unlikely to interfere with telecommunications infrastructure due to the relatively low height of the panels and other project infrastructure, which would not provide an obstacle for telecommunication waves. Therefore, no effects are anticipated during the Scheme construction, operation and maintenance, and decommissioning phases.

Television Reception

14.6.26 The Scheme consists of fixed low-lying infrastructure and is therefore unlikely to interfere with digital television signals. Therefore, no effects are anticipated during the Scheme construction, operation and maintenance, and decommissioning phases.

Utilities

14.6.27 The potential exists for utilities within the Order Limits to be affected during the construction of the Scheme through inadvertent damage caused as a result of excavation and engineering activities. However, with embedded mitigation (such as that outlined in 14.6.19 to 14.6.23) in place to identify, avoid and manage utilities interactions, there will not be any significant adverse effects.

14.6.28 No effects on utilities are predicted as a result of the operation and maintenance phase of the Scheme because no below-ground works will be required during operation and maintenance phase, and embedded mitigation measures in relation to safe working beneath overhead lines will be in place. In the unlikely event that maintenance works (for example to repair a cable) require excavation near to below ground utilities infrastructure, appropriate mitigation measures will be in place, as for construction.

14.6.29 Effects during the decommissioning phase on utilities are dependent on several factors. As explained in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**, the future of the Grid Connection Cables or Grid Connection Line Drop, would be agreed with National Grid Electricity Transmission (NGET) and/or the asset owners Independent Distribution Network Operators (IDNO) Eclipse Power prior to the commencement of decommissioning. The mode of decommissioning for the Grid Connection Cables would be dependent upon government policy and good practice at that time. Currently, the most environmentally acceptable option is considered to be leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the Grid Connection Cables can be removed by opening up the ground at regular intervals and pulling the cables through to the extraction point, avoiding the need to open up the entire length of the Grid Connection Cables. In this case, the works would be undertaken within the footprint excavated during construction. Additionally, the embedded mitigation measures used during construction would also apply during decommissioning. With the implementation of such measures, no significant adverse effects on utilities are predicted during Scheme decommissioning.

14.6.30 The draft DCO will include protective provisions for the protection of electronic communication networks and utilities, and engagement with relevant statutory undertakers which is currently ongoing.

14.6.31 The assessment presented above is not influenced by the timing of the construction/decommissioning phases of the Scheme or the operational lifespan of the Scheme.

Cumulative Effects

14.6.32 The Scheme has been assessed to have no effect on Telecommunications, Television Reception and Utilities. It is expected that the other developments included within the cumulative developments shortlist would also have no

effect on telecommunications and television reception and would adhere to the same mitigation as set out above to reduce the risk of damaging utilities. It is assumed that all other developments will conform to good practice measures and their environmental impacts will be managed through a CEMP (or similar) and would include mitigation measures to reduce the risk of damaging utilities during construction. Therefore, no cumulative effects are expected on Telecommunications, Television Reception and Utilities.

14.7 Electric and Electromagnetic Fields

Introduction

14.7.1 This section summarises the potential for Electric and Electro-Magnetic Fields (EMF) effects resulting from the Scheme. This includes any significant effects which are likely and the potential for cumulative impacts.

14.7.2 Electric fields are the result of voltages applied to electrical conductors and equipment. Fences, shrubs, and buildings easily block electric fields. Electromagnetic fields are produced by the flow of electric current; however, unlike electric fields, most materials do not readily block electromagnetic fields. The intensity of both electric fields and electromagnetic fields diminishes with increasing distance from the source.

14.7.3 With the exception of relatively short lengths of On-Site Cables and the Grid Connection Line Drop option, all cables would be buried underground. The dimension of the trenches will vary depending on the number of cables or ducts they contain as are further described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**. Underground cables eliminate the electric field altogether as it is screened out by the sheath around the cable, and therefore the assessment only considers electromagnetic fields.

14.7.4 On-Site Electrical Cabling is required to connect the Solar PV Panels and BESS Containers to inverters, and the inverters to transformers. These low voltage cables (all less than 1.0 kV alternating current (AC) or 1.5 kV direct current (DC)) are anticipated to have a typical maximum installation depth of up to 1.4 m.

14.7.5 Medium voltage On-Site (33 kV) cables then transfer electricity between Field Stations and the 33 kV/400 kV On-Site Substation. The typical installation depth is expected to be 1.4 m (although potentially deeper at crossings), this is further described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1].** The routes of the On-Site Cables have been designed to avoid sensitive receptors as far as possible.

14.7.6 The electricity is then exported from 33 kV/400 kV On-Site Substation to the Existing National Grid Thorpe Marsh Substation. There are two options for connection to the Existing National Grid Thorpe Marsh Substation currently under consideration. Subject to further discussion with National Grid, and to further assessment and consultation, these options and the respective connection routes will be refined. How these are assessed within the EMF section is discussed in the methodology below.

Legislation, Policy and Guidance

14.7.7 Whilst there are no statutory regulations in the UK that limit the exposure of the general public to power-frequency EMFs, responsibility for implementing

appropriate measures for the protection of the public lies with the UK Government, which has a clear policy incorporated in the NPS for Electricity Networks Infrastructure (EN-5) (November 2023) with specific attention to Paragraph 2.11.8 to 2.11.15 (Ref. 14-60). An overview is provided below, whilst further detail can be found in **ES Volume III Appendix 14-1 Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3].**

Legislation

a. The Control of Electromagnetic Fields at Work Regulations 2016 (Ref. 14-61).

National Policy

a. NPS for Electricity Networks Infrastructure (EN-5) (November 2023) (Ref. 14-60).

Local Policy

14.7.8 There are no relevant local policy provisions in relation to EMFs.

a. Guidance

b. National Grid (2015). Undergrounding high voltage electricity transmission lines (Ref. 14-62);

c. DECC (2012). Power Lines: Demonstrating Compliance with EMF public exposure guidelines (Ref. 14-63);

d. Energy Networks Association (2012). Electric and Magnetic Fields: The Facts (Ref. 14-64);

e. Energy Networks Association (2017). Electric and Magnetic Fields (Ref. 14-67);

f. International Commission on Non-Ionizing Radiation Protection (ICNIRP) (1998). Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz) (Ref. 14-68);

g. ICNIRP (2020). Guidelines for limiting exposure to Electromagnetic Fields (100 kHz to 300 GHz) (Ref. 14-69); and

h. Department of Transport (2002) The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas) Direction (updated 2016) (Ref. 14-70).

Scoping Opinion and Additional Consultation

Scoping Opinion

14.7.9 A scoping exercise was undertaken in the Spring of 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on EMF.

14.7.10 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.7.11 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

14.7.12 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report, issued in March 2024. Responses to this statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1].** No responses from Statutory Consultees were received at statutory consultation relating to Electric and Electro-Magnetic Fields.

Assessment Methodology

14.7.13 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on EMF.

14.7.14 There are two options for connection to the Existing National Grid Thorpe Marsh Substation currently under consideration that may involve above-ground infrastructure with the potential to have EMF effects. The arrangement of the grid connection will be determined after the DCO is submitted. However, for the purpose of this assessment and as detailed in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** the options being considered are:

a. The installation of 400 kV and associated cables in the Grid Connection Corridor, connecting the On-Site Substation to the Existing National Grid Thorpe Marsh Substation; and

b. 400 kV Grid Connection Line Drop to connect the On-Site Substation to the existing overhead power lines within the Solar PV Site. This option would comprise of below ground cables connecting the On-Site Substation to a new cable sealing end compound at the base of an existing on-site 400 kV overhead line tower.

14.7.15 All works to establish the cable sealing end compound and works within the cable sealing end compound to modify the tower and connect the Scheme's cables to the NETS would remain under National Grid's control and do not form part of the Scheme. Although not part of the Scheme, the timing of these works may coincide with the timing of the cable laying in the Grid Connection Corridor and therefore has potential for cumulative effects. The Line Drop option has therefore been considered in the cumulative effects section of this assessment.

14.7.16 The Control of Electromagnetic Fields at Work Regulations 2016 (Ref. 14-61) sets out the duties of employers in relation to controlling the risks of EMF to employees. This includes a requirement to assess employees' potential exposure to EMF with reference to action levels and exposure limit values. Therefore, as the effects of EMF on workers for the Scheme would be controlled and mitigated to acceptable levels through the legislative framework, impacts to workers are not considered within the assessment.

This assessment therefore focusses on the potential EMF effects to the public.

14.7.17 During construction and prior to energisation, transmission equipment would not produce any significant EMFs. Therefore, construction effects are not considered further. Additionally, transmission equipment would not produce any significant EMFs at the decommissioning stage, given there would be no solar farm from which to transmit energy from. Therefore, decommissioning effects are not considered further.

14.7.18 Similarly, as noted in NPS EN-5 (November 2023) Paragraph 2.11.14 (Ref. 14-60), electric and magnetic fields have the potential to have adverse impacts on aviation. NPS EN-5 (November 2023) states that the Secretary of State should take account of statutory technical aviation safeguarding zones when assessing DCO applications. These safeguarding zones are defined in Planning Circular 01/0318: Safeguarding Aerodromes, Technical Sites and Military Explosive Storage Areas (Ref. 14-71). The Order limits is not within the safeguarding zone of any safeguarded civil aerodrome as listed on Annex 3 of the planning circular: Officially safeguarded civil aerodromes. It is noted that Doncaster Safeguarded aerodrome listed on Annex 3 is located approximately 17 km south of the Scheme. However, at the distances of separation between the existing 400 kV overheard cables and the Grid Connection Corridor and potential aviation receptors, the levels of EMF experienced by potential aviation receptors is considered to be negligible and therefore aviation receptors are not included in the assessment.

14.7.19 NPS EN-5 (November 2023) (Paragraph 2.9.58) (Ref. 14-60) recognises that "*there is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMF has any agriculturally significant consequences*". Consequently, consideration of the potential impacts of EMFs to agriculture and natural ecosystems (such as entire habitats) has not been included within the assessment. NPS EN-5 does however recognise the direct and indirect effect EMFs can have to *"aquatic and terrestrial organisms"* (Paragraph 2.9.46), therefore this has been included in the assessment where relevant.

14.7.20 The low voltage On-Site Cables (less than 1.0 kV) are not considered in the assessment as they would have a very low voltage of less than 1 kV and therefore would not significantly contribute to any increase in electromagnetic fields.

14.7.21 The Government sets guidelines for exposure to EMFs in the UK on advice from the UK Health Security Agency. In March 2004 the UK decided to adopt the 1998 guidelines published by ICNIRP and this policy was reaffirmed by a Written Ministerial Statement in October 2009 (Ref. 14-68). These guidelines also form the basis of a European Union Recommendation on public exposure and a Directive on occupational exposure (Ref. 14-72). NPS EN-5 (November 2023) (Ref. 14-60) updates the recommended reference levels to those set out in the 2020 ICNIRP guidelines (Ref. 14-69).

14.7.22 The ICNIRP 'reference levels' for the public are 100 microteslas for magnetic fields and 5,000 volts per metre for electric fields (Ref. 14-69). The reference levels are not in themselves limits but provide guidance for assessing compliance with the basic restrictions and reducing the risk of indirect effects. The reference level is the level above which more investigation is needed if this level of exposure is likely to occur. The permitted levels of

exposure are somewhat higher, 360 microteslas and 9000 volts per metre. They apply where the time of exposure is significant, for instance in a residence. As a worst-case the lower 'reference level' of 100 microteslas and 5,000 volts per metre is used in the assessment as the threshold at which potentially significant effects could occur.

Study Area

14.7.23 The EMFs produced by the electrical assets of the Scheme would have a given magnitude at a given distance from the asset. Therefore, the Study Area of the assessment includes all areas around the assets where the EMFs could potentially be significant. The Study Area for the assessment is therefore the Order Limits, as shown in **ES Volume II Figure 1-2: Site Boundary Plan [EN010152/APP/6.3]**).

Baseline Conditions

14.7.24 The Order limits is located within a mixture of primarily rural and semi-rural areas, which accommodate existing electrical assets. There is approximately 2 km of 400 kV overhead line in the eastern part of the Solar PV Site with a further 320 m intersecting the Grid Connection Corridor, there are five towers located within the Solar PV Site associated with the overhead lines. This infrastructure would produce electric and magnetic fields. Electric and magnetic fields both occur naturally. The Earth's magnetic field, which is caused mainly by currents circulating in the outer layer of the Earth's core, is roughly 50 microteslas in the UK. This field may be distorted locally by ferrous minerals or by steelwork such as in buildings.

14.7.25 The Earth's natural fields are static, and the power system produces alternating fields. In homes in the UK that are not close to high-voltage overhead lines or underground cables, the average 'background' power-frequency magnetic field (the field existing over the whole volume of the house) ranges typically from 0.01 microteslas – 0.2 microteslas with an average of approximately 0.05 microteslas, normally arising from currents in the low voltage distribution circuits that supply electricity to homes. The highest magnetic fields to which most people are exposed arise close to domestic appliances that incorporate motors and transformers. For example, close to the surface, fields can be 2,000 microteslas for electric razors and hair dryers, 800 microteslas for vacuum cleaners, and 50 microteslas for washing machines. The electric field in most homes is in the range 1-20 volts per metre (V/m), rising to a few hundred V/m close to appliances.

Assessment of Likely Impacts and Effects

14.7.26 The National Grid document 'Undergrounding high voltage electricity transmission lines' (Ref. 14-62) states that for a 400 kV cable buried at 0.9 m depth, the typical magnetic field is 24 microteslas when on top of the cable, three microteslas at 5 m from the cable centreline, and 0.9 microteslas at 10 m the cable centreline, with the maximum known by National Grid being 96 microteslas on top of the cable, 13 microteslas at 5 m, and 3.6 microteslas at 10 m. The maximum recorded levels of electro-magnetic field directly above an underground 400 kV cable are therefore less than 30% of the permitted levels and 96% of the reference levels set by ICNIRP (Ref. 14-66).

14.7.27 For context, the Energy Networks Association publication 'Electric and Magnetic Fields' (Ref. 14-67) states that in 'the vast majority of homes in the UK, the magnetic field, averaged over 24 hours, is between 0.01 and 0.2 microteslas', but goes on to note that exposure to electro-magnetic fields from a vacuum cleaner is 800 microteslas, reducing to two microteslas at 1 m away, and for a TV, washing machine or microwave exposure is 50 microteslas next to these appliances and 0.2 microteslas at 1 m distance.

14.7.28 Using National Grid's maximum known levels of electro-magnetic field generation for 400 KV cables, the assessment considers that as a worse case a residential receptor would need to be within 5 m of the centreline of a 33 kV On-Site Cables or 400 kV Grid Connection Cable, and for the cable to be overlapped by other electricity infrastructure, for the 100 microteslas threshold to be approached and for potentially significant effects to occur.

14.7.29 Taking into account this guidance and the UK limits set for safety of members of the public, the maximum reported electromagnetic for HV cables buried at a minimum depth of 1.4 m would comply with the ICNIRP limits even if the cabling were directly under a human receptor. Therefore, no significant impacts are expected to arise from electromagnetic fields as result of the underground cables that form part of the Scheme.

14.7.30 As stated in Paragraph 14.7.20, the On-Site Cables are not considered in the assessment as they would have a voltage of less than 1 kV and therefore would not significantly contribute to any increase in electromagnetic fields should they overlap with other infrastructure. As noted in NPS EN-5 (November 2023) (Ref. 14-60) this assessment also considers the potential for direct or indirect effects of EMFs on aquatic and terrestrial organisms as a result of the Scheme, for example the potential for electromagnetic fields from cables running under watercourses to impact migratory fish.

14.7.31 **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]** describes the following migratory fish species being present in the River Went: European eel (*Anguilla anguilla*). Though this is an historical record from 2012. There is also one record of sea lamprey (*Petromyzon marinus*) within the New Junction Canal which is connected to the River Went approximately 6 km downstream of the Scheme. The Species Audit of City of Doncaster Council, produced for the Doncaster Biodiversity Action Plan (BAP) in 2007 also listed twenty-two records of European eel, six records of Atlantic Salmon (*Salmo salar)*, four records of Brown Trout (*Salmo trutta)* located at various unconfirmed locations. Records of European eel were also found in the River Don, 2 km downstream from its confluence. River lamprey (*Lampetra fluviatilis*) and sea lamprey are also qualifying species for the Humber Estuary SAC and Humber Estuary RAMSAR and have potential to be present in connected waterbodies. Data provided on the EMFs.info website (which is run by National Grid on behalf of the UK electricity industry) identifies salmon and trout as being sensitive to Direct Current (DC) electro-magnetic fields[2], noting that they are expected to be 'much less sensitive' to Alternating Current (AC) fields. The 400 kV Grid Connection Cables are AC.

14.7.32 There is limited evidence regarding the impacts of electro-magnetic fields on fish and the major studies which have been undertaken are for subsea

[2] It is noted that salmon and lamprey are also sensitive to electric fields, but as stated, the electric field of the Grid Connection Cables is screened out by the cable sheath and therefore there will be no impact of the Scheme due to electric fields.

cabling[3] rather than inland (fresh or brackish) waters. However, in its consideration of off-shore wind developments NPS EN-3 (November 2023) (Ref. 14-8) states (at paragraph 2.6.76) that electro-magnetic fields from subsea cabling "*may be mitigated by use of armoured cable for inter-array and export cables which should be buried at a sufficient depth. Some research has shown that where cables are buried at depths greater than 1.5 m below the sea bed impacts are likely to be negligible. However sufficient depth to mitigate impacts will depend on the geology of the sea bed*". Paragraph 2.6.75 states that where the mitigation set out in Paragraph 2.6.76 is followed "*the residual effects of EMF on sensitive species from cable infrastructure during operation are not likely to be significant. Once installed, operational EMF impacts are unlikely to be of sufficient range or strength to create a barrier to fish movement*".

14.7.33 Therefore, considering the below following factors:

a. Salmon and trout are less sensitive to AC than DC electro-magnetic fields;

b. The AC Grid Connection Cables are sheathed; and

c. The installation depth of the cables will be at least 5 m below the watercourse bed (secured through the detailed CEMP).

It is considered that there would be no significant effects to the migratory fish species using the River Went as a result of the generation of electro-magnetic fields by the Grid Connection Cables. There no significant effects are identified from the Scheme on receptors arising from EMFs.

Cumulative Effects

14.7.34 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 developments') within the surrounding area.

14.7.35 The cumulative developments shortlisted to be considered in combination with the Scheme have been prepared and shared with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]**.

14.7.36 This cumulative effect assessment identified, for each receptor, the areas where the predicted effects of the Scheme could interact with effects arising from other plans and/or projects on the same receptor, based on a spatial and/or temporal basis.

14.7.37 One project, the potential Grid Connection Line Drop option associated with the Scheme, has been identified as having the potential for cumulative effects in combination with the Scheme during the operation and maintenance phase. This project would involve works to establish the cable

[3] Saltwater conducts electricity more efficiently than freshwater meaning that electro-magnetic effects are greater in the marine environment.

sealing end compound and works within the cable sealing end compound to modify the tower and connect the Scheme's cables to the NETS. Although not part of the Scheme, the timing of these works may coincide with the timing of the cable laying in the Grid Connection Corridor and therefore has potential for cumulative effects.

14.7.38 This section assesses the potential EMF effects from the above ground cables between the potential cable sealing end compound and the existing overhead line tower within the Solar PV Site.

14.7.39 Table 14-14 provides a comparison of typical UK field levels experienced from overhead powerlines that are comparable to the above ground cables between the potential cable sealing end compound and the existing overhead line tower.

Table 14-14: Typical Ground-level UK Field Levels from Overhead Powerlines

Infrastructure	Distance	Magnetic Field (Microteslas)	Electric Field (Volts Per Metre)
The largest steel pylons (275 kV and 400 kV)	0 m (under line, maximum field)	100	11,000
	0 m (under line, typical field)	5 – 10	3,000 – 5,000
	Displaced 25 m to side (typical field)	1 – 2	200 – 500
	Displaced 100 m to side (typical field)	0.05 – 0.1	10 – 40

Source: Energy Networks Association 2012. Electric and magnetic fields: the facts (Ref. 14-64).

14.7.40 As illustrated in Table 14-14, the potential maximum EMFs produced by the Grid Connection Line Drop would be less than the relevant public exposure limits. There are no residential properties within the Order Limits, with the nearest properties more than 100 m away from the line drop. As per the information in Table 14-14, this puts the residential properties in the lowest threshold of microteslas/electric fields. Therefore, no significant cumulative effects to residential receptors are predicted to occur. Thus, the proposed overhead lines would meet the relevant exposure limits, the ICNIRP general public guidelines (Ref. 14-69).

14.7.41 Public access will be limited within 30 m of the Grid Connection Line Drop should this be the option that is selected for the final design. Some PRoW do cross over the Grid Connection Corridor, and may also pass over the On-Site Cables and Grid Connection Line Drop where they are routed within the Order Limits. PRoW are shown on **ES Volume II Figure 2-2: Public Rights of Way [EN010152/APP/6.2])**. The presence of the public either directly above or adjacent to the cables would be transient, with the individuals using the PRoW exposed to electromagnetic fields from the cables for only very short periods of time. It is considered that the level of exposure to users of PRoW would be similar to that associated with general household appliances (and noticeably less than associated with the exposure when

using a vacuum cleaner). Therefore, no significant cumulative effects to users of PRoW are predicted to occur.

14.7.42 It is expected that the EMF associated with other developments included within the cumulative developments shortlist would also have no significant effect on receptors and would adhere to the same relevant Government policy as set out above to ensure all EMF is below the relevant exposure limits. Therefore, no cumulative effects are expected due to EMFs.

Summary and Next Steps

14.7.43 Government, acting on the advice of authoritative scientific bodies, has put in place appropriate measures to protect the public from EMFs. These measures comprise compliance with the relevant exposure limits as outlined in Energy Networks Association 2012. Electric and magnetic fields: the facts and one additional precautionary measure, optimum phasing, applying to high voltage power lines (Ref. 14-64). This policy is incorporated in NPS EN-5 (November 2023) (Ref. 14-60).

14.7.44 The assets associated with the Scheme would be fully compliant with the relevant Government policy. Specifically, all the EMFs produced would be below the relevant exposure limits. Therefore, no significant EMF effects are anticipated as a result of the Scheme.

14.8 Materials and Waste

Introduction

14.8.1 This section of the ES presents the findings of an assessment of the likely significant effects from materials and waste as a result of the proposed Fenwick Solar Farm (hereafter referred to as the 'Scheme'). A description of the Scheme is provided in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

14.8.2 This section discusses the expected waste streams from the Scheme and how they will be managed. Design life, replacement frequency and recycling of key Scheme components are also considered.

14.8.3 This section identifies and proposes measures to address the potential impacts and likely significant effects of the Scheme on Materials and Waste during the construction, operation and maintenance, and decommissioning phases.

14.8.4 This section follows the methodology set out in the Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (referred from herein as the 'IEMA Guidance' (Ref. 14-73).

14.8.5 This section discusses the expected waste streams from the Scheme and how they will be managed. Design life, replacement frequency and recycling of key Scheme components are also considered. The assessment has been undertaken in accordance with the IEMA Guidance.

14.8.6 This section is supported by the following appendices in **ES Volume I [EN010152/APP/6.3]** and other supporting documents **[EN010152/APP/7.18]**:

a. **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Other Environmental Topics) [EN010152/APP/6.3]**; and

b. **Framework SWMP [EN010152/APP/7.18]**.

14.8.7 A glossary and list of abbreviations are defined in **ES Volume I Chapter 0: Table of Contents, Glossary and Abbreviations [EN010152/APP/6.1]**.

14.8.8 A Non-Technical Summary is presented in **ES Volume IV Non-Technical Summary [EN010152/APP/6.4]**.

14.8.9 For the purpose of this assessment, materials and waste comprise:

a. The consumption of materials (key construction materials only); and

b. The generation and management of waste.

14.8.10 Materials are defined in the IEMA Guidance as "*physical resources that are used across the lifecycle of a development. Examples include key construction materials such as concrete, aggregate, asphalt and steel"*.

14.8.11 Other material assets considered include built assets such as landfill void capacity and allocated/safeguarded mineral and waste sites.

14.8.12 Impacts on Mineral Safeguarding Areas (MSAs) are not assessed in a materials and waste assessment in accordance with the IEMA Guidance. **ES Volume I Chapter 12: Socio-Economics and Land Use [EN010152/APP/6.1]** scopes out socio-economic impacts to MSAs (as agreed with the Local Mineral Planning Authority) due to the non-sterilisation of these reserves resulting from the temporary nature of the solar development. The correspondence with the Local Mineral Planning Authority in this regard is contained in **ES Volume III Appendix 12-2: Minerals Safeguarding Report [EN010152/APP/6.3]**.

14.8.13 There are no allocated/safeguarded waste and mineral sites, or historic and permitted landfills within the Order Limits. There is one permitted (currently closed) landfill site within 150 m of the Order Limits, located at the Existing National Grid Thorpe Marsh Substation. The Grid Connection Corridor is outside of this landfill site. Impacts on mineral and waste sites are not considered further in the assessment.

14.8.14 Waste is defined as per the Waste Framework Directive (Ref. 14-74) as *"any substance or object which the holder discards or intends or is required to discard"*.

14.8.15 The legal definition of waste covers substances or objects which fall outside of the commercial cycle or out of the chain facility. In particular, most items that are sold or taken off-site for recycling are wastes, as they require treatment before they are reused or resold.

14.8.16 In practical terms, wastes include surplus spoil, scrap, recovered spills, unwanted surplus materials, packaging, office waste, broken, worn-out, contaminated or otherwise spoiled plant, equipment, and materials.

Legislation, Policy and Guidance

14.8.17 Legislation, planning policy, and guidance relating to Materials and Waste and pertinent to the Scheme comprises the documents listed below. More detailed information regarding the above legislation, policy and guidance can

be found in **ES Volume III Appendix 14-1: Legislation, Policy and Guidance (Materials and Waste) [EN010152/APP/6.3]**.

Legislative Framework

a. The Infrastructure Planning (Environment Impact Assessment (EIA) Regulation 2017 (Ref. 14-50);
b. The Waste Framework Directive (Ref. 14-74);
c. The Waste (England and Wales) Regulations 2011 (Ref. 14-75);
d. The Environmental Protection Act 1990 (Ref. 14-76);
e. The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 14-41);
f. The Hazardous Waste Regulations (England and Wales) 2005 (amended in 2016) (Ref. 14-42); and
g. The Environment Act 2021 (Ref. 14-3).

National Planning Policy

a. NPPF (December 2023) (Ref. 14-9); and
b. National Planning Policy for Waste (Ref. 14-81);
c. Overarching National Policy Statement for Energy (EN-1) (November 2023) (Ref. 14-7);
d. The Waste Management Plan for England 2021 (Ref. 14-78);
e. A Green Future: Our 25 Year Plan to Improve the Environment 2018 (Ref. 14-79);
f. Environmental Improvement Plan 2023 (Ref. 14-15);
g. Our Waste, Our Resources, A Strategy for England 2018 (Ref. 14-80);

Local Planning Policy

a. Doncaster Local Plan 2015-2035 (adopted 2021) (Ref. 14-12); and
b. Barnsley, Doncaster and Rotherham Joint Waste Plan (adopted 2012) (Ref. 14-88).

Guidance

14.8.18 Supporting guidance that has been considered includes:

a. National Planning Policy Guidance (NPPG) for Waste (Ref. 14-82) and Minerals (Ref. 14-83);
b. IEMA Guide to: Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (Ref. 14-73);
c. Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice (Ref. 14-84);
d. Waste and Resources Action Programme (WRAP) Designing Out Waste: A Design Team Guide for Civil Engineering (Ref. 14-85);
e. Waste Duty of Care Code of Practice (Ref. 14-86); and
f. Applying the Waste Hierarchy (Ref. 14-87).

Consultation

14.8.19 This section provides a summary of the consultation undertaken to date regarding the Scheme. Further detail on consultation can also be found in **ES Volume I Chapter 4: Consultation [EN010152/APP/6.1]**.

Scoping Opinion

14.8.20 A scoping exercise was undertaken in spring 2023 to establish the content of the assessment and the approach and methods to be followed.

14.8.21 The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good practice, and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on materials and waste.

14.8.22 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

14.8.23 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

14.8.24 Further consultation in response to formal pre-application engagement was undertaken through the PEIR which was issued in Spring 2024. Responses to statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1]**.

Additional Consultation

14.8.25 No additional consultation has been undertaken to date in relation to materials and waste.

Assessment Methodology

14.8.26 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on materials and waste.

Study Area

14.8.27 The Study Areas for the materials and waste assessment is defined in line with the IEMA Materials and Waste Guidance (). Two types of Study Areas are defined as follows:

a. A Scheme Study Area – for construction, operation and maintenance, and decommissioning waste generation, use of construction, operation and maintenance, and decommissioning materials, and consideration of impacts on allocated/safeguarded mineral and waste sites. The Study Area is defined as the land within the Order Limits.

b. An expansive Study Area – within which waste is managed and materials are sourced:

i. For non-hazardous and inert waste management this is the Yorkshire and the Humber region as defined by the Environment Agency (Ref. 14-89);

ii. For hazardous waste management this is England;

iii. For the availability of key construction materials, crushed rock, sand and gravel, ready-mixed concrete and asphalt, this is Yorkshire and the Humber and the UK; and

iv. For the availability of steel as a key construction material, this is the UK.

Sources of Information

14.8.28 In preparation of this section, the following sources of published information have been referenced:

g. Environment Agency's 2022 Waste Summary Tables for England – Version 2 (Ref. 14-89);

h. Environment Agency's Historic Landfill Sites (Ref. 14-90);

i. Environment Agency's Permitted Waste Sites – Authorised Landfill Site Boundaries (Ref. 14-91);

j. Environment Agency's Environmental Permitting Regulations Waste Sites (Ref. 14-92);

k. UK Steel's Key Statistics Guide May 2023 (Ref. 14-93);

l. The Mineral Products Association's (MPA) Profile of the UK Mineral Products Industry, 2023 Edition (Ref. 14-94);

m. Doncaster Local Plan 2015-2035 (adopted 2021) (Ref. 14-12);

n. Barnsley, Doncaster and Rotherham Joint Waste Plan (adopted 2012) (Ref. 14-88);

o. IEMA Guide to: Materials and Waste in Environmental Impact Assessment, Guidance for a Proportionate Approach (Ref. 14-73);

p. WRAP's Designing Out Waste: A Design Team Guide for Civil Engineering (Ref. 14-85);

q. Applying the Waste Hierarchy (Ref. 14-87);

r. Recycle Solar 2023 (Ref. 14-96);

s. British Metals Recycling Association 2022 (Ref. 14-97);

t. RS Bruce Metals and Machinery Ltd 2023 (Ref. 14-98);

u. East Yorkshire Solar Farm ES (Ref. 14-99); and

v. Sunnica Energy Farm ES (Ref. 14-100).

Methodology

14.8.29 The IEMA Materials and Waste Guidance (Ref. 14-73) methodology for assessing the magnitude of impact from materials comprises a percentage-based approach that determines the influence of the Scheme's construction materials consumption on the national and regional availability (consumption/sales).

14.8.30 When a low material sensitivity is selected, a significant effect would occur at a magnitude of moderate, which is where construction materials are more than 10% by volume of the baseline availability. Low sensitivity is selected as on balance, the key materials required for the construction and/or operation of a development are generally free from known issues regarding supply and are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials and stock.

14.8.31 The IEMA Materials and Waste Guidance (Ref. 14-73) offers two methods to assess waste effects:

a. W1 – Void Capacity, a detailed methodology where the magnitude of impact from waste is assessed by determining the percentage of the remaining landfill void capacity that will be depleted by waste produced during construction and/or operation and maintenance of a Scheme. In a reasonable worst case, where landfill sensitivity is very high, a significant effect would occur at a magnitude of minor, which for non-hazardous and inert waste is more than 1% of landfill capacity and for hazardous waste is more than 0.1% of landfill capacity. A very high sensitivity is selected for void capacity (as a worst case scenario).

b. W2 – Landfill Diversion, a simpler approach where developments are compared to a good practice landfill diversion rate of 90%. The IEMA Guidance does not provide guidance on how to allocate sensitivity in method W2 therefore a medium sensitivity is used in the assessment. A significant effect would occur at a magnitude of moderate which is a landfill diversion of less than 60%.

14.8.32 Both methods are considered in the assessment.

14.8.33 The IEMA Guidance states “Due to uncertainties relating to future technologies and infrastructure, this first edition of the guidance does not incorporate a proposed methodology to assess impacts and effects during decommissioning or end of first life”. However methods W1 and W2 have also been considered for decommissioning of the Scheme.

Matters Scoped In and Scoped Out

14.8.34 Table 14-15 provides the outline scope of the materials and waste assessment.

Table 14-15: Outline of Scope of the Materials and Waste Assessment

Scheme Phase	Effects	Scope for Study
Construction	Changes in availability of key construction materials	In scope
	Changes in available landfill void capacity	In scope
	Changes to allocated/safeguarded mineral sites	Out of scope (there are none within the Scheme)
	Changes to allocated/safeguarded waste sites	Out of scope (there are none within the Scheme)

Operation and maintenance	Changes in availability of materials	In scope
	Changes in available landfill void capacity	In scope
Decommissioning	Changes in availability of materials	In scope
	Changes in available landfill void capacity	In scope

Assumptions, Limitations and Uncertainties

14.8.35 The material and waste assessment has been undertaken based on the following assumptions:

a. The future baseline is assumed to be same as the current baseline.

b. Material and waste estimates are based upon other similar Solar Nationally Significant Infrastructure Project (NSIP) schemes.

c. The solar panels, inverters, transformers, switchgear and other supporting equipment will be manufactured off-site to specified sizes.

d. The landfill diversion rate for the Scheme will be more than 60%.

14.8.36 Waste arising from extraction, processing and manufacture of construction components and products are not included in the assessment. This is based on the assumption that these products and materials are being developed in a manufacturing environment with their own waste management plans, facilities and supply chains which are potentially in different regions of the UK or the world. As such, matters cannot be accurately predicted and assessed and are therefore outside of the scope of the materials and waste assessment.

14.8.37 Other environmental impacts associated with the management of waste from the Scheme (e.g. on water resources, air quality, noise or traffic resulting from the generation, handling, on-site temporary storage or off-site transport of materials and waste) are addressed separately in other relevant chapters of this ES.

Baseline Conditions

14.8.38 This section describes the existing and anticipated future baseline conditions for the materials and waste assessment.

Existing Baseline

14.8.39 Baseline information for materials and waste has been reviewed and consists of:

a. National and regional availability (inferred from requirement/sales) for key construction materials as detailed in Table 14-16:;

b. Non-hazardous and inert landfill void capacity in Yorkshire and the Humber (41.8 million m3 and 24.9 million m3, respectively) (Ref. 14-89);

c. Hazardous merchant landfill void capacity in England (9.9 million m3) (Ref. 14-89); and

d. National non-hazardous construction and demolition (C&D) waste recovery rate. In 2020, the UK generated 59.1 million tonnes of non-hazardous C&D waste, of which 54.8 million tonnes was recovered. This represents a recovery rate of 92.6% (Ref. 14-95) and exceeds the good practice landfill diversion target of 90% for major UK developments, as outlined in the IEMA Materials and Waste Guidance (Ref. 14-73).

Table 14-16: Availability of Key Construction Materials

Material		Study Area	Availability (tonnes)
Steel (requirement, 2022, Ref. 14-94)		National	17 million
Aggregates (sales, 2022, Ref. 14-94)	**Crushed rock**	Regional	9.2 million
	Sand and gravel	Regional	2.1 million
Asphalt (sales, 2022, Ref. 14-94)		Regional	1.9 million
Ready mixed concrete (sales, 2022, Ref. 14-94)		Regional	2.6 million (converted from 1.1 million m^3 using a density of 2.4 t/m^3)

14.8.40 Standard, good and best practice recovery rates by material are provided by WRAP (Ref. 14-85). Recovery rates for key construction materials and other construction wastes relevant to the Scheme are provided in Table 14-17.

Table 14-17: Standard, Good and Best Practice Recovery Rates by Material

Material	Standard Practice Recovery (%)	Good Practice Recovery (%)	Best Practice Recovery (%)
Metals	95	100	100
Packaging	60	85	95
Concrete	75	95	100
Inert	75	95	100
Plastics	60	80	95
Miscellaneous	12	50	75
Electrical equipment	Limited information	70	95
Cement	Limited information	75	95
Liquids and oils	100	100	100
Hazardous	50	Limited information, cannot be 100% since some hazardous waste e.g. asbestos must be landfilled.	

Future Baseline

14.8.41 This section considers those changes to the baseline conditions, described above, that might occur in the absence of the Scheme and during the time period over which the Scheme would have been in place.

14.8.42 The future baseline scenarios are set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]** and described for materials and waste below.

14.8.43 There is no publicly available information on any potential changes to national or regional construction material availability by the time of Scheme construction. Construction material demand such as ready mixed concrete is closely aligned to both the amount of construction taking place and the general economy. It is deemed inappropriate to forecast future demand as the demand is unlikely to be linear and it is not possible to set a future baseline for construction materials. Therefore, based on professional judgement future availability is assumed to remain the same as the current baseline.

14.8.44 There is no publicly available information regarding any potential changes to landfill capacity by the time of the Scheme's construction, operation and maintenance, or decommissioning. Due to the cyclic nature of inert and hazardous landfill capacity (e.g. landfill capacity decreasing, and then new sites or landfill cells being opened with landfill capacity increasing), it is not realistic to forecast future landfill capacity. Therefore, based on professional judgement inert and hazardous landfill capacity is assumed to remain the same as the existing baseline.

14.8.45 For non-hazardous waste, using the current rate of decline of landfill capacity and forecasting into the future would lead to the inevitable conclusion that there would be no void space remaining. However, this is not a credible scenario as if there is still a need for landfill, the Waste Planning Authority (WPA) will need to consent new landfill capacity to replace that which has been used up. Therefore, based on professional judgement non-hazardous landfill capacity is assumed to remain the same as the existing baseline.

Embedded Mitigation

14.8.46 The Scheme has been designed, as far as practicable, to avoid and reduce impacts and effects on materials and waste through the process of design development, and by embedding measures into the Scheme design. In addition, how the Scheme is constructed, operated and maintained, and decommissioned would be appropriately controlled in order to manage and minimise potential environmental effects (required as a result of legislative requirements and/or standard sectoral practices).

14.8.47 The delivery of these embedded mitigation measures will be secured through the detailed CEMP, detailed OEMP and detailed DEMP via Requirements in the DCO. A **Framework CEMP [EN010152/APP/7.7], Framework OEMP [EN010152/APP/7.8]**, and **Framework DEMP [EN010152/APP/7.9]** have been prepared and submitted as part of this ES.

14.8.48 Embedded measures are taken into account prior to the assessment of effects in order to avoid considering assessment scenarios that are unrealistic in practice i.e. effects do not take account of measures even

though they are likely to be standard practice and/or form part of the Scheme design. These have been followed through into the assessment to ensure that realistic likely environmental effects have been identified.

Measures Embedded into the Scheme Design

14.8.49 The following embedded mitigation measures have been incorporated into the Scheme design.

Construction Phase

14.8.50 The Scheme will aim to prioritise waste prevention, followed by preparing for reuse, recycling, recovery and as a last resort, disposal to landfill as per the waste hierarchy, illustrated in Plate 14-1.

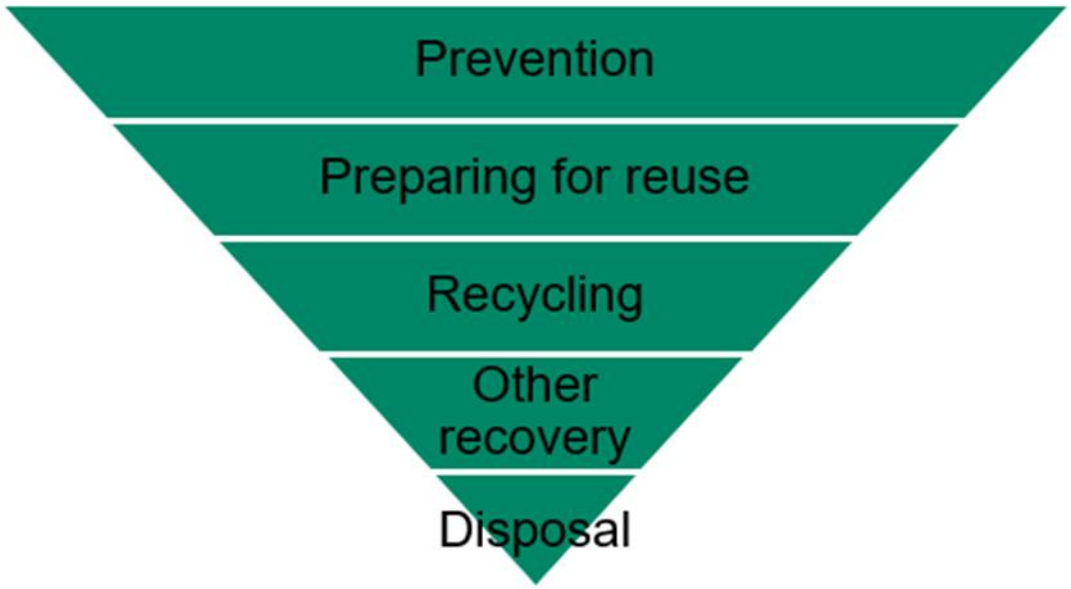

Plate 14-1: The Waste Hierarchy, from Defra's Guidance on Applying the Waste Hierarchy, Recreated by AECOM (Ref. 14-87)

14.8.51 All management of waste would be in accordance with the relevant regulations and waste would be transported by licensed waste hauliers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

14.8.52 The construction of the Scheme will be subject to measures and procedures defined within a detailed CEMP. The CEMP will include the implementation of industry standard practice and control measures for environmental impacts arising during construction, such as the control of dust and the approach to material and waste management on-site. A **Framework CEMP [EN010152/APP/7.7]** and **Framework SWMP [EN010152/APP/7.18]** are include alongside the ES which set out:

a. The waste streams that will be generated;

b. How the waste hierarchy will be applied to these wastes;

c. Good practice measures for managing waste; and

d. Roles and responsibilities for waste management

14.8.53 The construction contractor will use these documents to produce their CEMP and SWMP prior to works commencing on-site.

14.8.54 If required, a Materials Management Plan (MMP) would be developed under the CL:AIRE Definition of Waste: Development Industry Code of Practice (Ref. 14-84) by the appointed construction contractor to support the reuse of excavated materials, minimise off-site disposal, and to demonstrate the necessary lines of evidence to support the proper reuse/off-site disposal of materials and ensure compliance with regulatory guidance.

Operation and Maintenance Phase

14.8.55 During operation, the Scheme will aim to prioritise waste prevention, followed by preparing for reuse, recycling and recovery and lastly disposal to landfill as per the waste hierarchy, illustrated in Plate 14-1.

14.8.56 All management of waste will be in accordance with the relevant regulations and waste will be transported by licensed waste hauliers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

14.8.57 These measures are set out in the **Framework OEMP [EN010152/APP/7.8]** secured through the DCO.

Decommissioning Phase

14.8.58 During decommissioning, the Scheme will aim to prioritise waste prevention, followed by preparing for reuse, recycling and recovery and lastly disposal to landfill as per the waste hierarchy, illustrated in Plate 14-1.

14.8.59 All management of waste will be in accordance with the relevant regulations and waste will be transported by licensed waste hauliers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

14.8.60 The decommissioning of the Scheme will be subject to measures and procedures defined within a DEMP as secured through the DCO; a **Framework DEMP [EN010152/APP/7.9]** is included alongside the DCO Application.

14.8.61 The **Framework OEMP [EN010152/APP/7.8]** and the **Framework DEMP [EN010152/APP/7.9]** set out that the Applicant is committed to maximise recycling and reuse of the Scheme components at the end of their life. There are already organisations around the UK and Europe specialising in solar recycling, such as PV Cycle and the European Recycling Platform. They are working with solar developers to minimise electrical waste and recycling old panels in line with the WEEE Regulations (Ref. 18-18). In addition, companies like SECONDSOL offer a marketplace service for the purchase and selling of second-hand Solar PV Panels and equipment, where there is still a good level of life in the equipment remaining. Panels that have developed faults or damage can also be refurbished and repowered by specialist companies and the manufacturers and resold or reinstalled. The Applicant will adhere to the industry good practice outlined in Solar Power Europe's Lifecycle Quality Best Practice Guidance (Ref. 18-19).

Assessment of Likely Impacts and Effects

14.8.62 The Scheme has the potential to affect materials and waste (negatively), during construction, operation and maintenance and during decommissioning, in the following ways:

a. Changes in demand for construction materials; and

b. Changes in available landfill void capacity.

14.8.63 This section sets out the likely impacts and effects of the Scheme on materials and waste, taking account of the embedded mitigation measures as detailed in Section 14.8.43

Construction Effects

Materials

14.8.64 A summary of the effects for materials from the Scheme during the construction phase is provided in Table 14-18. The material estimates are

based on 40 tonnes per MW for steel based on industry estimates (mounting structures) and the dimensions of Scheme elements for aggregates and concrete. No significant effects are anticipated in relation to materials.

Table 14-18: Material effects during the construction phase

Material Type	Quantity (tonnes)	Baseline material availability (tonnes)	Percentage of national material consumption (%)	Sensitivity	Magnitude	Effect	Significance
Concrete	98,298	2,600,000 (regional)	3.78	Low	Minor	Slight	Not significant
Aggregate	83,666	11,300,000 (regional)	0.74	Low	Negligible	Slight	Not significant
Steel	13,318	17,000,000 (UK)	0.08	Low	Negligible	Slight	Not significant

Waste

14.8.65 The type of waste generated during construction is likely to comprise:

a. General waste from site offices and welfare facilities;

b. Small quantities of waste from the maintenance of construction vehicles;

c. Packaging waste from incoming materials e.g. cardboard, wood and plastic); and

d. Other waste from construction of fencing, internal tracks, substations and Field Stations, construction compounds and other supporting infrastructure.

14.8.66 The Solar PV Panels, BESS Containers, Solar PV Mounting Structures, inverters, transformers, switchgear and other supporting equipment will be manufactured off-site to the specified sizes, and therefore wastage during installation is expected to be minimal.

14.8.67 Table 14-19 summarises the anticipated waste streams from construction; this information is based upon other similar solar NSIP schemes (Sunnica Energy Farm factored proportionally based on MW capacity) and wastage from construction materials.

Table 14-19: Estimated construction waste

Waste Type	Estimated Waste Quantity (tonnes)	Estimated Waste Quantity (m^3)	Recyclable/Recoverable
General waste from site offices and welfare facilities	Minimal	Minimal	Yes
Waste from the maintenance of construction vehicles	Minimal	Minimal	Yes
Hazardous waste (e.g. chemicals, batteries, solvents, oils, aerosols etc.)	Minimal	Minimal	Yes
Paperboard (packaging)	2,950	21,094	Yes
Wood (pallets, cables, drums)	3,558	28,125	Yes
Plastic (packaging)	262	2,813	Yes
Construction material wastage (assumed a 5% wastage rate for non-assembled components including concrete, aggregates, aluminium and plastic from cables)	9,132	3,935	Yes

Total construction waste	**15,902**	**55,967**

14.8.68 Excavated material is not included in a construction waste estimate or when calculating the overall waste recovery rate, since where practicable, the material would be reused on-site and hence would not be categorised as a waste. Waste recovery targets do not include excavated material (uncontaminated excavated soil and stones, European Waste Catalogue (EWC) code 17 05 04). This approach is consistent with the waste hierarchy and the objectives of minimising waste generation and reusing materials.

14.8.69 As the area within the Order Limits is relatively flat, large-scale earthworks are not expected to be required and therefore there is not expected to be either a large surplus or shortfall of fill material requiring either export from or import to the Order Limits. It is expected that all materials removed by cable trenching activities or in the creation of working or laydown/compound areas would be reinstated again with no import or export of materials being required. At this stage the potential for generation of some surplus excavated material cannot be ruled out, but the quantities involved would be not significant in the context of regional landfill capacity. Total excavated material based on cable route trench dimensions is approximately 42,000 m^3, which is below 1% of regional inert and non-hazardous landfill capacity (418,000 m^3 and 249,000 m^3, respectively). Furthermore, disposal to landfill would be the last resort, with reuse or deposit for recovery being preferred options.

14.8.70 In assessment method W1, with the embedded mitigation measures in place, the overall quantities of construction waste disposed of to landfill are anticipated to be below 1% of regional inert and non-hazardous landfill capacity (418,000 m^3 and 249,000 m^3, respectively) and less than 0.1% of national hazardous landfill capacity (9,900 m^3) as outlined in paragraph 14.8.39 (b and c). Therefore, the magnitude of impact is **negligible** at a very high sensitivity, and the effect is slight adverse, which is considered to be **not significant.**

14.8.71 As set out in Table 14-17 good practice waste recovery (landfill diversion) for the Scheme is likely to be above 90% for the majority of construction wastes (excluding excavated material).

14.8.72 In assessment method W2, therefore, the magnitude of impact is **negligible** at a medium sensitivity, and the effect is **slight** adverse, which is considered to be **not significant**.

14.8.73 Considering the above, it is concluded that significant waste effects are not expected during construction of the Scheme.

Table 14-20: Summary of Assessment of Effects – Materials and Waste (Construction Phase)

Receptor	Potential Impacts	Duration	Mitigation	Significance of Effect
Materials	Changes in availability of construction materials	Temporary	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)
Waste	Changes in available non-hazardous (including inert) and hazardous landfill void capacity	Permanent	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)

Operation and Maintenance Effects

14.8.74 Construction materials required during Scheme operation and maintenance are unlikely to be required in large quantities i.e. more than 1% of regional or national construction material availability. Therefore, no significant effects are anticipated.

14.8.75 As set out in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** during operation and maintenance there are expected to up to two permanent Full Time Equivalent (FTE) staff with up to four additional staffing/visitors such as maintenance workers and deliveries attending site per month.

14.8.76 Waste arisings from day-to-day Scheme operation and maintenance would include:

a. Welfare facility waste; and

b. General waste (e.g. paper, cardboard, wood).

14.8.77 All management of waste would be in accordance with relevant regulations and any waste generated would be transported by licensed waste carriers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

14.8.78 During operation and maintenance, waste generation is expected to be negligible, since Solar PV Panels and other components do not generate any waste as part of the energy production process.

14.8.79 During the operation and maintenance of the Scheme, it is expected that there would be ad hoc replacement of any components that fail or reach the end of their lifespan.

14.8.80 Waste arisings associated with maintenance activities such as component replacement during the operation and maintenance of the Scheme would be managed in the same way as waste from the final decommissioning of the Scheme.

14.8.81 Table 14-21 summarises the anticipated design life and replacement frequency for the main elements of the Scheme.

Table 14-21: Expected Design Life and Replacement Frequency for Key Scheme Components

Component	Comment	Design Life/Replacement Frequency	Recyclable
Solar PV Panels	It is expected that throughout this period faulty or damaged Solar PV Panels will require replacement as part of normal maintenance operations. There will be no wholesale replacement of solar panels.	As required	Yes
Solar PV panel mounting structures	Replacement is not anticipated during the Scheme operation and maintenance.	Entire operation and maintenance phase	Yes

Component	Comment	Design Life/Replacement Frequency	Recyclable
On-Site Cables (low and medium voltage)	It is not anticipated that the low voltage On-Site Cables would need to be replaced during operation and maintenance, although an allowance has been made for up to 20% of the low voltage On-Site Cables to be replaced during Scheme operation and maintenance due to damage or defects.	Entire operation and maintenance phase	Yes
BESS Containers and inverters	Assumed design life of 15 years.	10–15 years	Yes
Transformers	Assumed design life of 20 years, although replacement would only be carried out if required for performance or health and safety reasons.	20+ years	Yes
Switchgear	Assumed design life of 20 years, although replacement would only be carried out if required for performance or health and safety reasons.	20+ years	Yes
Grid connection cables	Replacement of the grid connection cables is not anticipated during Scheme operation and maintenance.	Entire operation and maintenance phase	Yes
On-site substation	Replacement of the on-site substation is not anticipated during Scheme operation and maintenance.	Entire operation and maintenance phase	Yes

14.8.82 Recycling routes are generally available for materials at present, and it is likely that there will be even greater opportunities for recycling in the future, not least because the market will have expanded to meet demand as solar PV installations increase.

14.8.83 The company ‘Recycle Solar’, based nearby in North Lincolnshire, reports that 90% of the glass and 95% of the semiconductor materials in end-of-life solar panels can be extracted for use in new solar panels (Ref. 14-96).

14.8.84 The UK market for Lithium-ion (Li-ion) battery recycling is under development (Ref. 14-97), as the fleet of electric vehicles and other Li-ion battery users rapidly increases. A number of new investments have been announced and an 80% recovery rate is reported (Ref. 14-98).

14.8.85 It is likely that the solar PV panel waste generated by the Scheme during operation and maintenance and decommissioning would be managed by specialist regional or national recycling facilities, and that such facilities would be developed over the operation and maintenance phase in response to demand generated by the UK-wide solar panel industry. The capacity of such facilities is not expected to be influenced by other non-solar farm projects in the surrounding area because the facilities will only be managing solar panel waste.

14.8.86 Private sector waste companies will develop these facilities to respond to market demands. Current solar panel waste generation is low, so there is little demand for facilities, hence the limited available capacity presently. Therefore, it is expected that facilities which reuse, recycle, or recover end-of-life solar panels will be developed as the quantities of this waste stream increase. The Waste Electrical and Electronic Equipment (WEEE) Regulations (Ref. 14-101) place obligations on those who place solar panels on the market to finance the costs of collection, treatment, recovery, and environmentally sound disposal; and the landfill tax strongly incentivise reuse, recycling and recovery.

14.8.87 In assessment method W1 with the embedded mitigation measures in place, the overall quantities of operation and maintenance waste sent to landfill are anticipated to be below 1% of regional inert (418,000 m^3) and non-hazardous (249,000 m^3) landfill capacity and less than 0.1% of national hazardous (9,900 m^3) landfill capacity. Therefore, the magnitude of impact is **negligible** at a very high sensitivity, and the effect is **slight** adverse, which is considered to be **not significant**.

14.8.88 In assessment method W2 the overall recovery rate is therefore expected to be greater than 60% (and potentially greater than 90%). Therefore, the magnitude of impact is **minor** (60-90%) or **negligible** (more than 90%) at a medium sensitivity, and the effect is **neutral** or **slight** adverse which is considered to be **not significant**.

Table 14-22: Summary of Assessment of Effects – Material and Waste (Operation and Maintenance Phase)

Receptor	Potential Impacts	Duration	Mitigation	Significance of Effect
Materials	Changes in availability of construction materials	Temporary	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)
Waste	Changes in available non-hazardous (including inert) and hazardous void capacity	Permanent	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)

Decommissioning Effects

14.8.89 Construction materials required during the Scheme's decommissioning stage are unlikely to be required in large quantities (i.e. more than 1% of regional or national construction material availability). Therefore, no significant effects are anticipated.

14.8.90 As described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**, at the end of the Scheme's operation and maintenance, it would be decommissioned. As this is expected to be 40 years in the future, it is not possible to identify at this stage either the waste management routes or specific facilities that would be used, as these are liable to change over such a timescale.

14.8.91 Table 14-23 summarises the anticipated waste streams from decommissioning, this information is based upon other similar Solar NSIP schemes and the number of solar panels.

Table 14-23: Estimated Decommissioning waste

Waste Type	Estimated Quantity	Recyclable/Recoverable
General waste from site offices and welfare facilities	Minimal	Yes
Waste from the maintenance of vehicles used during decommissioning	Minimal	Yes
Hazardous waste	Minimal	Yes
Concrete and aggregates	40,958m^3 and 34,861m^3	Yes
Cabling	168m^3	Yes
Structure (aluminium and steel)	1,720 m^3 (based on a density of 8 tonnes/m^3)	Yes
Solar PV Panels	543,942 panels, 16,750 tonnes, 54,032 m^3 (based on a density of 0.31 tonnes/m^3).	Yes
PV inverter	87 tonnes	Yes (not converted to m^3 and not included in the total below as will not be sent to landfill)
Transformer	8,100 tonnes	Yes (not converted to m^3 and not included in the total below as will not be sent to landfill)
Switch gear	126 tonnes	Yes (not converted to m^3 and not included in the total below as will not be sent to landfill)
BESS batteries	2,375 tonnes	Yes (not converted to m^3 and not included in the total below as will not be sent to landfill)

Waste Type	Estimated Quantity	Recyclable/Recoverable
Total decommissioning waste	**131,739 m^3**	

14.8.92 In assessment method W1 with the embedded mitigation measures in place, the overall quantities of decommissioning waste sent to landfill are anticipated to be below 1% of regional inert (418,000 m^3) and non-hazardous (249,000 m^3) landfill capacity and less than 0.1% of national hazardous (9,900 m^3) landfill capacity. Therefore, the magnitude of impact is **negligible** at a very high sensitivity, and the effect is **slight** adverse, which is considered to be **not significant**.

14.8.93 In assessment method W2 aligning with the recycling rates described for the operation and maintenance components above and with the embedded mitigation measures in place, the overall recovery rate for decommissioning waste is expected to be greater than 60% (and potentially greater than 90%). Therefore, the magnitude of impact is **minor** (60-90%) or **negligible** (more than 90%) at a medium sensitivity, and the effect is **neutral** or **slight** adverse which is considered to be **not significant**.

Table 14-24: Summary of Assessment of Effects – Materials and Waste (Decommissioning Phase)

Receptor	Potential Impacts	Duration	Mitigation	Significance of Effect
Materials	Changes in availability of construction materials	Temporary	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)
Waste	Changes in available non-hazardous (including inert) and hazardous void capacity	Permanent	As set out in Section 14.8, Embedded Mitigation.	Slight adverse (not significant)

Additional Mitigation and Enhancement Measures

14.8.94 As no materials and waste significant effects have been identified, no further or additional mitigation or monitoring of significant effects are proposed.

Residual Effects

14.8.95 As no significant effects were identified in the assessment, and no further or additional mitigation is proposed, the residual effects remain as assessed in the assessment and are all **slight** and **not significant**.

Cumulative Effects

14.8.96 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 developments') within the surrounding area.

14.8.97 The cumulative developments to be considered in combination with the Scheme have been agreed in consultation with City of Doncaster Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1].**

Study Areas

14.8.98 Yorkshire and the Humber is used for the non-hazardous waste Study Area (rather than City of Doncaster alone) recognising the fact that waste may not always be managed in the Waste Planning Authority where it is generated and may instead be managed at the regional level.

14.8.99 England is used for the hazardous waste Study Area.

Methodology

14.8.100 Method W1 outlined in Paragraph 14.8.31 has been used to assess cumulative effects.

Recovery and Recycling Assumptions

14.8.101 Two assessment scenarios have been carried out, with different assumptions around waste recovery rates:

a. A 'realistic worst case' of a 70% recycling rate, based on current and likely future recovery rates.

b. An 'absolute worst case' based on the assumption that all C&D waste goes to landfill.

14.8.102 The 'absolute worst case' is considered to be extremely unlikely to occur, and the "realistic worst case" considered appropriately conservative for the following reasons:

a. The current C&D recovery rate for England is approximately 92.6% (Ref. 14-95) and has remained at a similar level since 2010. A 70% recycling rate is therefore considerably lower than this rate.

b. Waste generated by the Scheme comprises readily recyclable materials, with existing high recycling rates:

   i. Concrete and aggregate are widely recycled for use in construction.

   ii. Metals have a very high recycling rate with a very well developed market, historically driven by economics but increasingly also by the need for decarbonisation of the metal production sector.

   iii. Solar PV Panels are recyclable and there are numerous examples of companies recycling them. Capacity for solar PV panel recycling in the UK is relatively low at present, because there is currently little waste being generated (since most Solar PV Panels that have been installed are still operating). There are strong economic and regulatory drivers for recycling, and it is technically proven, and hence it is realistic to expect a high recycling rate.

   iv. Primary legislation (the Waste Electrical and Electronic Equipment Regulations 2013 (as amended)) places an obligation on producers (manufacturers and importers) of electrical and electronic equipment (which includes Solar PV Panels) to finance the collection and recycling of their products. Producers of Solar PV Panels are obligated to join a Producer Compliance Scheme (PCS), which then ensures their legal obligations are met, most significantly for the collection and recycling of old Solar PV Panels.

14.8.103 The assessment assumes that current policy, regulatory and fiscal incentives for recycling and otherwise diverting waste from landfill will be maintained. The Applicant considers this is a realistic worst case for assessment since:

a. Any move away from the current policy framework would be inconsistent with the underlying principles of waste management that have been progressively implemented over the past 20+ years, as well as being inconsistent with the policy objectives of Net Zero (since recycling and recovery have a significant role to play in achieving Net Zero); and

b. If at any point the policy framework were to move away from favouring recovery and recycling, then there would need to be a large expansion in landfill capacity to accommodate the waste that was no longer recovered or recycled; in which case landfill void capacity would no longer be considered a sensitive receptor. A move away from favouring recycling recovery without an associated increase in landfill void capacity would not be a tenable policy.

Cumulative Effects

14.8.104 The cumulative assessment considers the waste generated from the following other Solar PV schemes in City of Doncaster as outlined in

14.8.105 Waste estimates are not available for all of these projects, and hence estimates have been generated specifically for this cumulative assessment by:

a. Estimating PV module waste based on a nominal module capacity of 0.65 kW and weight of 35 kg;

b. Assuming that the ratio of other waste4 to PV module waste for schemes is the average of four schemes for which decommissioning waste estimates are available (Tillbridge Solar Project, Gate Burton Energy Park, Longfield Solar Farm and East Yorkshire Solar Farm) (i.e. 35% of total waste by mass comprises PV modules, and the remaining 65% is other waste).

14.8.106 This approach has been taken across all cumulative developments including Tillbridge Solar Project (rather than using the estimates provided for individual projects to enable a clear and consistent approach for the purpose this assessment.

14.8.107 The cumulative assessment focuses on decommissioning waste since:

a. The peak of waste generation would be during decommissioning and this is therefore the worst case in terms of waste generation – the decommissioning scenario would also cover any large-scale interim replacement of PV modules and other components; and

b. Operational waste generation is not expected to be concurrent for all projects, given that their PV modules and other components would have different operating periods and it is very unlikely that all facilities would replace their equipment at the same time.

14.8.108 For the purposes of this cumulative assessment, it is assumed that all schemes are decommissioned over a single five year period and that all waste is non-hazardous (although in practice a proportion may be hazardous – this is considered further below).

14.8.109 The cumulative impact assessment is presented in Table 14-25

Table 14-25: Cumulative Impact Assessment Summary

Scheme	Size (MW)	PV panel waste (tonnes)	Other waste (tonnes)	Total waste (tonnes)
City of Doncaster Ref. 21/02567/FULM	49.9	2,687	4,990	7,677
City of Doncaster Ref.23/01082/SCRE	49.9	2,687	4,990	7,677
City of Doncaster Ref. 22/02088/FULM	2.5	135	250	385
NSIP Helios Renewable Energy Project	190	10,231	19,000	29,231
NSIP Tween Bridge Solar Farm	600	32,308	60,000	92,308
Fenwick	354	19,040	54,400	73,440

[4] This includes items such as metal supports, aggregate from roads, cables etc. which are primarily non-hazardous

Scheme	Size (MW)	PV panel waste (tonnes)	Other waste (tonnes)	Total waste (tonnes)
TOTAL:	**1,246**	**67,087**	**124,590**	**191,677**
Cumulative Waste (assuming all schemes decommissioned within five year window)				
Total waste from cumulative developments (tonnes)		13,417	24,918	38,335
Total waste from cumulative developments (m^3) (assuming density of 0.31 t/m^3 for Solar PV Panels and 1.6 t/m^3 for other waste)		43,282	15,574	58,856
Waste to landfill, m^3 (realistic worst case estimate with 70% recovery)		12,985	4,672	17,657
Waste to landfill, m^3 (absolute worst case estimate - assuming zero recycling/recovery)		43,282	15,574	58,856
Baseline				
Regional landfill capacity (m^3)				66,751,836
Comparison Against Baseline				
% of regional landfill capacity required for Scheme (realistic worst case estimate)		0.02	0.007	0.03
% of regional landfill capacity required for Scheme (absolute worst case estimate)		0.06	0.02	0.09
Assessment				
Receptor Sensitivity				Very High
Realistic Worst Case				
Magnitude of Impact				Negligible
Effect				Slight adverse
Significance				Not significant
Absolute Worst Case				
Magnitude of Impact				Negligible
Effect				Slight adverse
Significance				Not significant

14.8.110 The assessment shows that, that under both assessment scenarios cumulative effects would be not significant.

14.8.111 The threshold of significance for an effect on hazardous landfill capacity is 0.1% of national capacity, equivalent to 9,912 m^3. If it is assumed that the hazardous fraction of waste solar panels is sent to hazardous waste

landfill, then a significant effect would occur if this hazardous fraction represents more than 3.75% of the mass of solar panels. However, the majority of solar panel components would not be considered to be hazardous waste, e.g. approximately 76%-89% glass, 4-10% plastic and 6-8% aluminium frame (Ref. 14-96).

Summary and Conclusions

14.8.112 No significant effects on materials and waste are anticipated.

14.8.113 As no materials and waste significant effects have been identified, no further or additional mitigation or monitoring of significant effects are proposed.

14.8.114 As no significant effects were identified in the assessment, the residual effects remain as outlined above and are not significant.

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