Tillbridge Solar

Tillbridge Solar Project

EN010142

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Environmental Statement
Chapter 17: Other Environmental Topics

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Table of Contents

Plates

Tables

17. Other Environmental Topics

17.1 Introduction

17.1.1 This chapter describes and assesses the likely effects of the Tillbridge Solar Project, also known as 'the Scheme', on:

a. Glint and Glare (Section 17.4);

b. Ground Conditions (Section 17.5);

c. Major Accidents and Disasters (Section 17.5.26);

d. Telecommunications, Television Reception and Utilities (Section 17.7);

e. Materials and Waste (Section 17.7.19); and

f. Electric and Electro-Magnetic Fields (Section 17.9).

17.1.2 The legislation, policy and guidance relevant to these topics are outlined in **Appendix 17-1: Other Environmental Topics Legislation and Policy** of this Environmental Statement (ES) **[EN010142/APP/6.2]**.

17.1.3 Where relevant, consultation undertaken, baseline conditions, assessment methodology and mitigation measures are outlined in the following sections for each topic.

17.1.4 Cumulative effects relevant to each of these topics are set out within **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**.

17.1.5 In addition, this chapter is supported by the following reports:

a. Glint and Glare Assessment (**Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**);

b. Ground Conditions Preliminary Risk Assessment (PRA) for Principal Site (**Appendix 17-3: Ground Conditions Principal Site PRA** of this ES **[EN010142/APP/6.2]**); and

c. Ground Conditions PRA for the Cable Route Corridor (**Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**).

17.2 Development Parameters Assessed

17.2.1 **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]** describes the development parameters for the Scheme, against which the effects covered in this chapter have been assessed. The assessment has been based on likely worst-case parameters, in accordance with the Rochdale Envelope approach. The actual impacts of the Scheme may therefore be less than anticipated, if the Scheme is built to a lesser scale.

17.3 Legislation and Policy

17.3.1 **Appendix 17-1** of this ES **[EN01042/APP/6.2]** identifies the legislation, policy, and guidance of relevance to the assessment of likely effects, proposed mitigation measures and residual effects of the Scheme on:

a. Glint and Glare;

b. Ground Conditions;

c. Major Accidents and Disasters;

d. Telecommunications, Television Reception and Utilities;

e. Materials and Waste; and

f. Electric and Electro-Magnetic Fields.

17.4 Glint and Glare

Introduction

17.4.1 This section summarises the likely effects of the Scheme on glint and glare for surrounding road users, railway operations, dwellings, Public Rights of Way (PRoW), and aviation activity.

17.4.2 The definition of glint and glare can vary; however, the definition used within this assessment is taken from the Federal Aviation Authority (FAA) and is widely accepted (Ref. 17-1). The definitions are as follows:

a. ‘Glint’ refers to a momentary flash of bright light typically received by moving receptors or from moving reflectors; and

b. ‘Glare’ refers to a continuous source of bright light typically received by static receptors or from large reflective surfaces.

17.4.3 The full Glint and Glare Assessment undertaken for the Scheme is available in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Consultation

17.4.4 A request for an EIA Scoping Opinion was sought from the Secretary of State as part of the EIA Scoping Process. The EIA Scoping Opinion and relevant consultation responses in relation to glint and glare are presented in **Appendix 1-2** of this ES **[EN010142/APP/6.2]** and the **Consultation Report Appendix** submitted with the Development Consent Order (DCO) Application **[EN010142/APP/5.1]**.

17.4.5 A summary of Scoping Opinion responses relating to glint and glare are presented in Table 17-1.

Table 17-1 Scoping Opinion Responses (Glint and Glare)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate	The Applicant proposes to scope out a standalone ES chapter on glint and glare. The Scoping Report notes (in paragraph 17.7) that glint and glare calculations will be provided in a separate technical appendix and results will be incorporated into the Proposed Development design. It is proposed that where solar reflection could occur and it is determined that it is likely to be a significant nuisance or hazard, mitigation will be proposed. Given the above, the Inspectorate is content that glint and glare do not need to be assessed as a standalone ES chapter and agrees that both matters should be addressed in the ES LVIA chapter and supported by detailed calculations provided in a technical appendix to the ES. Additionally, the technical appendix to the ES must clearly explain the assessment methodology (with reference to appropriate modelling and predictive techniques, charts/ diagrams and visual representations such as GIS based viewshed analyses) to indicate the likely extent and distance of potential glint and glare. Where professional judgement has been applied, this should be identified.	A standalone glint and glare ES chapter has subsequently been scoped out. Glint and glare assessment methodology and calculations are provided in a separate technical appendix, with a summary presented within this chapter. Glint and glare are also considered in **Chapter 12: Landscape and Visual Amenity** of this ES **[EN010142/APP/6.1]** and is supported by the detailed assessment provided in **Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.	**Section 17.4: Glint and Glare** of this chapter **[EN010142/APP/6.1]**. **Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.
Planning Inspectorate	Based on the nature of the activities, the distances to receptors and the use of a Framework CEMP and a Framework Decommissioning Environmental Management Plan (DEMP), the Applicant proposes to scope out an assessment of impacts from glint and	Assessment of glint and glare during construction and decommissioning has been scoped out of the ES, as the effects would	**Section 17.4: Glint and Glare** of this chapter **[EN010142/APP/6.1]**.

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	glare during construction and decommissioning out of the ES. The Inspectorate has considered the characteristics of the Proposed Development and is content that this matter can be scoped out.	be no worse than during the operational phase.	**Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.
Planning Inspectorate	At this stage it is not confirmed whether the solar arrays will use fixed or tracking panels. Given that the two different designs may lead to different glint and glare effects, the glint and glare assessment in the ES LVIA chapter and calculations in the technical appendix should assess the worst-case assessment for both options.	Through design development the Scheme has committed to tracker panels, which is assessed in the ES. Worst-case scenarios are assessed in the landscape and visual impact assessment (LVIA) and technical appendix.	**Section 17.4: Glint and Glare** of this chapter **[EN010142/APP/6.1]**. **Chapter 12: Landscape and Visual Amenity** of this ES **[EN010142/APP/6.1]**, **Appendix 12-6: LVIA Assessment of Visual Effects** of this ES **[EN010142/APP/6.2]** and **Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.

17.4.6 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information (PEI) Report. **Table 17-2** outlines the statutory consultation responses relating to glint and glare and how these have been addressed through the ES. Responses have been grouped thematically where relevant, but all relevant consultees are listed. No additional comments were received during the subsequent round of targeted consultation.

Table 17-2 Main matters raised through the Statutory Consultation (Glint and Glare)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Ministry of Defence (MOD)	The MOD has no safeguarding objections to this proposal. However, the MOD would request that we are consulted at all future stages for this development in order to conduct the necessary safeguarding assessments as further details become available.	The MOD have no concerns with regards to the Scheme but request to be further consulted, as the detailed design is developed. The Applicant will continue to consult the MOD over the course of the examination and detailed design phases.	N/A

Assessment Methodology

17.4.7 The glint and glare assessment methodology for the Scheme has been defined with reference to consultation from stakeholders and review of available guidance and studies including the US FAA Policy (Ref. 17-1) and the updated FAA Interim Policy (Ref. 17-2). This is detailed further in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**. The approach is to determine whether a reflection from the proposed solar development is geometrically possible and then to compare the results against the relevant guidance and studies to determine whether the reflection is significant.

17.4.8 In summary, the assessment methodology adopted for the Scheme includes the following:

a. 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.

b. Identifying receptors in the Study Area surrounding the Scheme. Receptors are identified with the following groups:

   i. Ground-based receptors, including residential, road and railway and users of PRoW within 1km of the Principal Site; and

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

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

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

g. Determining whether a significant adverse effect is expected in line with the significance criteria.

17.4.9 The Scheme and relevant receptor locations are defined within the assessment model. From this information, a chart is produced that states whether a reflection can occur, the duration, and the part of the Scheme that can produce the solar reflection towards the relevant receptor.

17.4.10 There is no specific guidance set out to identify the magnitude of impact from solar reflections, however, the following criteria have been set out for the purposes of this assessment:

a. **High** – Solar reflections impacts 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 and including 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.

17.4.11 The assessment of glint and glare has focussed on operational phase effects because it presents a worst-case scenario. By the nature of the other phases i.e. the addition of panels during construction and the removal of panels during decommissioning, there will be the same or fewer panels during these two phases when compared to the fully built out Scheme during the operational phase.

17.4.12 Further detail on assessment methodology, assumptions and assessment limitations is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Baseline Conditions

Ground Based Receptor Reflection Zones

17.4.13 Based on the relatively flat topography in the area, solar reflections between five degrees below the horizontal plane to five degrees above it are described as near horizontal. Reflections from the Scheme's solar PV panels within this arc have the potential to be seen by receptors at or near ground level.

17.4.14 Further analysis was conducted, and it was shown that reflections will only occur between the azimuth of 251.24 degrees and 290.92 degrees in the western direction (late day reflections) and 72.61 degrees and 111.57 degrees in the eastern direction (morning reflections) and therefore any ground-based receptor outside these arcs will not have any impact from solar reflections.

17.4.15 Further detail on Ground Based Receptor Reflection Zones is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Residential Receptors

17.4.16 Residential receptors located within 1km of the Principal Site have been considered in the assessment.

17.4.17 Glint is assumed to be possible if the receptor is located within the ground-based receptor zones. 87 residential receptors were identified within 1km of the Principal Site, which is a reasonable Study Area for solar farms based on experience of modelling other similar projects and confirmed by the findings of this study.

17.4.18 Out of the 87 identified residential receptors, there are two residential receptors that could not experience glint and glare effects as they are located within no reflection zones, as described above.

17.4.19 Further detail on Residential Receptors is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Road and Rail Receptors

17.4.20 Roads that are within 1km of the Principal Site and have potential views of the panels are considered in the assessment.

17.4.21 There are 11 roads within the 1km Study Area that required a detailed glint and glare assessment, these are: the A631, B1398, Common Lane, Coachroad Hill, Gainsborough Road, School Lane, Springthorpe Road, Hill Road, Cow Lane, Kexby Road and Northlands Road. In total, 162 receptor points along these roads were identified.

17.4.22 There are some minor roads that serve dwellings; however, these have been scoped out of the assessment as vehicle users of these roads will likely be travelling at low speeds, meaning there is a negligible risk of safety impacts resulting from glint and glare from the Scheme.

17.4.23 There are no railway lines within 1km of the Principal Site.

17.4.24 One hundred and sixty-one road receptors were identified for the assessment, out of which one receptor was excluded from further analysis, as it was located within the no-reflection zone.

17.4.25 Further detail on Road and Rail Receptors is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

PRoW Receptors

17.4.26 PRoWs that are within 1km of the Principal Site and have potential views of the panels are considered in the assessment.

17.4.27 There are three PRoWs within the 1km Study Area that required a detailed glint and glare assessment. Two of the PRoWs are within the no-reflection zones as they will never receive glint and glare impacts from the Scheme and hence have been excluded from the assessment.

17.4.28 Further detail on PRoW Receptors is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Aviation Receptors

17.4.29 Glint is only considered to be an issue with regards to aviation safety when the solar farm lies within close proximity to a runway, particularly when the aircraft is descending to land. This is outlined within the FAA guidance (Ref. 17-1) as being the key aviation receptor to assess and is considered best practice in the absence of UK guidance.

17.4.30 There are 14 aerodromes within the 30km Study Area from the Principal Site. However, only Sturgate Airfield, RAF Scampton and Wickenby Airfield require a detailed assessment as the Principal Site is located within their safeguarding buffer zone. RAF Scampton and Wickenby Airfield both have Air Traffic Control Towers (ATCTs).

17.4.31 The other 11 aerodromes do not require detailed assessments due to their location in relation to the Principal Site falling outside of their respective safeguarding buffer zones.

17.4.32 Further detail on Aviation Receptors is provided in **Appendix 17-2** of this ES **[EN010142/APP/6.2]**.

Embedded Mitigation Measures

17.4.33 The design of the Scheme includes embedded design mitigation for glint and glare, including landscaping to screen the Scheme from view of receptors to glint and glare, as well as landscape and visual impacts. This is described in detail in **Chapter 12: Landscape and Visual Amenity** of this ES **[EN010142/APP/6.1]**.

17.4.34 The embedded mitigation measures include:

a. Careful siting of the Scheme in the landscape with offsets from existing residential areas, vegetation patterns and road networks;

b. Conserving existing vegetation patterns;

c. Creating new Green Infrastructure (i.e. vegetation planting) within the Principal Site with extensive planting proposals; and

d. Anti-reflective coating (ARC), an industry standard for solar PV panels, to reduce the reflective properties of the panels.

Assessment of Likely Effects

17.4.35 As outlined within the British Research Establishment (BRE) document 'Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems' (Ref. 17-3), solar PV panels are designed to absorb, not reflect, irradiation. Relevant studies generally agree that there is potential for glint and glare from PV panels to cause a hazard or nuisance for surrounding receptors, but that the intensity of such reflections is similar to that emanating from still water. This is considerably lower than for other manmade materials such as glass, steel or white concrete (Ref. 17-4).

17.4.36 The US FAA Solar Guide (Ref. 17-1) includes a chapter on the impact and assessment of glint from solar panels and provides a quantitative threshold which is lacking in the English guidance. It concludes that:

"…evidence suggests that either significant glare is not occurring during times of operation or if glare is occurring, it is not a negative effect and is a minor part of the landscape to which pilots and tower personnel are exposed."

17.4.37 As such it is unlikely that adverse effects will be experienced from glint and glare due to the nature of the solar PV panels. This is discussed further in the following paragraphs for each receptor group.

17.4.38 A geometrical analysis comparing the azimuth and horizontal angle of the receptors from the Scheme and the solar reflection was conducted. The assessment did not take into account obstructions such as vegetation and

buildings, and therefore presents a worst-case scenario. Discussion on the potentially impacted receptors is provided, where necessary.

17.4.39 Glint and glare effects were only derived from the operational phase of the Scheme.

Residential Receptors

17.4.40 Solar reflections are possible at none of the 85 residential receptors located within potential reflection zones within the 1km Study Area, based on a theoretical modelled impact without consideration of local vegetation or other obstacles and assuming no cloud at any point in the year. Therefore, the magnitude of impact is **none** and there are considered to be **no impacts** on residential receptors.

Road Receptors

17.4.41 Solar reflections are possible at two of the 161 road receptor locations assessed within the 1km Study Area. However, upon reviewing the actual visibility of the receptors using Google Earth imagery, glint and glare impacts reduce to none for all road receptors as there are hedgerows that interrupt the line of sight to the solar PV panels. Therefore, the magnitude of impact is **none** and there are considered to be **no impacts** on the road receptors.

Aviation Receptors

17.4.42 Eight runway approach paths and two ATCTs were assessed in detail at Sturgate Airfield, RAF Scampton and Wickenby Airfield. Only Green Glare impacts, i.e. those predicted with a low potential for temporary after-image, were predicted for Runway 27 at Sturgate Airfield, which is an acceptable impact upon runways according to FAA guidance (Ref. 17-1). Overall aviation impacts are therefore assessed as **low (not significant)**.

Additional Mitigation Measures

17.4.43 No additional mitigation is required due to the no impacts found for the residential and road receptors. Also, no mitigation is required for aviation receptors as there is only a low impact.

Residual Effects

17.4.44 With the proposed embedded design mitigation, **no significant residual effects** are anticipated as a result of the Scheme.

17.5 Ground Conditions

Introduction

17.5.1 Preliminary Risk Assessments (PRAs) have been completed for both the Principal Site and Cable Route Corridor to assess the land condition within the Order limits to identify potential environmental land quality liabilities and

constraints prior to the Scheme development. The PRAs have been developed based on desk-top studies and site walkovers. The PRA for the Principal Site is included in within **Appendix 17-3** of this ES **[EN010142/APP/6.2]** and the PRA for the Cable Route Corridor is provided in **Appendix 17-4** of this ES **[EN010142/APP/6.2]**.

Consultation

17.5.2 Consultation responses in relation to ground conditions are presented in **Appendix 1-2** of this ES **[EN010142/APP/6.2]**, and the **Consultation Report Appendix** submitted with the DCO **[EN010142/APP/5.2]**.

17.5.3 A summary of scoping opinion responses relating to ground conditions are presented in **Table 17-3**.

Table 17-3 Scoping Opinion Responses (Ground Conditions)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate	On the basis of design, management and mitigation measures informed by a phase 1 Preliminary Risk Assessment (PRA), the Applicant proposes to scope out a specific chapter on ground conditions. Whilst the Inspectorate agrees that the ground conditions in the Principal Site are unlikely to give rise to significant effects, it is noted that the PRA does not take into account the Cable Route Corridor. This area comprises a large portion of the total project and will be subject to intrusive ground works. As such, there is insufficient evidence to rule out any significant effects arising from works in this area. The Inspectorate is therefore not in a position to scope out ground conditions in the Cable Route Corridor.	A standalone chapter for ground conditions has been scoped out of the ES. This is on the basis that a separate PRA for the Principal Site and Cable Route Corridor has been prepared to provide sufficient evidence to rule out any significant effects arising from works in this area.	**Section 17.5** of this chapter. **Appendix 17-3: Ground Conditions Principal Site PRA** of this ES **[EN010142/APP/6.2]** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**.

17.5.4 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report. **Table 17-4** outlines the statutory consultation responses relating to ground conditions and how these have been addressed through the ES. Responses have been grouped thematically where relevant, but all relevant consultees are listed. No additional comments were received during the subsequent round of targeted consultation.

Table 17-4 Main matters raised through the Statutory Consultation (Ground Conditions)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Bassetlaw District Council	The Environmental Impact Assessment should make reference to the land contamination. Both in terms of historic land use and prevention of land contamination arising from the proposed development.	Reference to land contamination, in terms of historic land use and prevention of land contamination arising from the Scheme, is included in the PRAs, which have been completed for both the Principal Site and Cable Route Corridor.	The PRA for the Principal Site is included within **Appendix 17-3** of this ES **[EN010142/APP/6.2]** and the PRA for the Cable Route Corridor is provided in **Appendix 17-4** of this ES **[EN010142/APP/6.2]**.
Bassetlaw District Council	Once the cable route is determined, it is important to take into consideration any historical land contamination that may exist	Historical land contamination has been considered in the PRAs, which have been completed for both the Principal Site and Cable Route Corridor.	The PRA for the Principal Site is included within **Appendix 17-3** of this ES **[EN010142/APP/6.2]** and the PRA for the Cable Route Corridor is provided in **Appendix 17-4** of this ES **[EN010142/APP/6.2]**.

Assessment Methodology

17.5.5 The assessment involved a desk-based review of the Order limits to identify historic land uses and the geological, hydrological, hydrogeological and ecological setting. A walkover was undertaken to inspect any stormwater, foul and off-site effluent discharges and to check the external building fabric of structures. The Study Area for the desk-based review and walkover was defined as the Order limits plus a 250m radius, which is the distance over which significant effects of human health and controlled water receptors can reasonably have a potential to occur.

17.5.6 A preliminary ground model was then prepared, followed by a Conceptual Site Model (CSM) with a view to identifying any potentially significant source-pathway-receptor linkages. This was followed by a qualitative risk assessment.

Baseline Conditions

Principal Site

17.5.7 The Principal Site comprises agricultural fields, with a tributary of the River Till flowing across the south-western part of the Principal Site, the River Eau at the north-eastern edge, and Fillingham Beck across the southern part of the Principal Site.

17.5.8 The permeability of superficial and bedrock geology is relevant to the assessment of ground conditions as it determines how far contamination may be able to spread from source. The anticipated geology includes quaternary deposits over sedimentary bedrock of mudstone, limestone and sandstone formations. The superficial deposits and the bedrock are classified as Secondary Aquifers, except for Lincolnshire Limestone Formation, bordering the Principal Site to the east, which is classified as a Principal Aquifer.

17.5.9 Flood Zones are relevant to the assessment of ground conditions as it determines how potential sources of contamination may interact with fluvial floodplains. The indicative floodplain map for the area, published by the Environment Agency, shows that the risk of surface water flooding at the Principal Site is generally very low (annual chance of flooding of less than 0.1%); with isolated patches of low (chance of flooding of between 0.1% and 1%), medium (chance of flooding of between 1% and 3%) and high risk (chance of flooding of greater than 3.3%) generally associated with the rivers located on the Principal Site.

17.5.10 Based on a review of historical maps, the Principal Site was undeveloped land/agricultural fields since the earliest available historical maps (late 1800s). Areas formerly associated with Sturgate Airfield (currently located 600m south-west of the Principal Site) extend across the south-western part of the Principal Site. Areas formerly associated with airfield also adjoin the Principal Site to the west, north of Common Lane.

17.5.11 Potential contaminative sources identified on-site include the historical use of the south-western part of the Principal Site as an airfield and an area characterised by a vegetated mound of unknown material, tyres and an abandoned vehicle (south-eastern part of the Principal Site). Small areas of potentially infilled land may be present on the Principal Site associated with pits and former ponds, which may have been filled with a variety of (potentially unlicensed) waste materials. A Pre-desk Study Assessment from Zetica indicates that a British bomber aircraft crashed on the Principal Site.

17.5.12 Off-site sources may include farmland, with farm buildings and yards where fuel and agricultural materials were/are stored, shown at various locations adjacent to the Principal Site; an active IGas Energy Plc. oil well, located adjacent south-east of the Principal Site; a former brick yard (adjacent north of the eastern part of the Principal Site); and a former metal recycling site/vehicle dismantler, adjacent west of the Principal Site, south-east of Sturgate and north of Common Lane. The former metal recycling site is located within areas formerly associated with the Sturgate Airfield.

Cable Route Corridor

17.5.13 The Cable Route Corridor comprises agricultural fields and sits across seven Water Framework Directive (WFD) surface water bodies, including Fillingham Beck, Skellingthorpe Main Drain, River Till, Tributary of Till, Marton Drain Catchment, Trent from Carlton-on-Trent to Laughton Drain and Seymour Drain Catchment.

17.5.14 The anticipated geology comprises superficial Quaternary deposits over sedimentary bedrock of mudstone and limestone formations. The superficial deposits are classified as Secondary A Aquifers and Secondary Undifferentiated Aquifers and the bedrock is classified as Secondary B and Secondary Undifferentiated Aquifers.

17.5.15 The Cable Route Corridor passes through several areas of fluvial Flood Zone 3 associated with tributaries of the River Till; and associated with the River Trent and Skellingthorpe Main Drain water body, between Marton and Cottam Power Station.

17.5.16 Based on a review of historical maps, the Cable Route Corridor was undeveloped land/agricultural fields since the earliest available historical maps (late 1800’s). Areas formerly associated with Sturgate Airfield extend across the northern edge of the Site at Cow Lane and borders the Cable Route Corridor to the west and north. Cottam Power Station extends across the south-western edge of the Site since the 1970s.

17.5.17 Potential contaminative sources identified on-site also include small areas of infilled land (associated with former pits/ground working) which may have been filled with a variety of (potentially unlicensed) waste materials; railway land (Great Northern and Great Eastern Joint Railway and Leverton Branch Railway); a former hospital and pumping station. Potential sources of land contamination adjacent to the Cable Route Corridor include (inter alia) current and historical landfill sites.

17.5.18 The regional unexploded bomb (UXB) mapping published by Zetica shows that the Cable Route Corridor lies within a zone that experiences a low risk of UXB. However, part of the Cable Route Corridor extends across/adjacent to areas formerly occupied by a currently operative airfield, which is considered a wartime site of interest.

Assessment of Likely Effects

17.5.19 A risk assessment of the identified plausible contaminated linkages has been undertaken for the Study Area in line with current legislation. The assessment takes into consideration the sources of possible contaminant risks and the presence of any plausible pathways or receptors as outlined in the Environmental Protection Act 1990 (Part 2A) (Ref. 17-5). The following contaminant linkages were assessed:

a. Hazards to human health: inhalation, ingestion or contact with made ground or groundwater contaminated by metal, inorganic and organic chemicals;

b. Hazards to controlled waters: leaching of contaminants from soils, lateral groundwater migration, or discharge to watercourses or made ground or groundwater contaminated by metal, inorganic and organic chemicals;

c. Hazards to ecological receptors: impacts from metal, inorganic and organise chemical contaminants within the made ground and groundwater through lateral groundwater migration, discharge to watercourses, sedimentation/dust deposition, physical damage to habitat, and increased human disturbance during construction;

d. Hazards to properties: impacts to crops or grazing animals from contaminated soils or contamination of ground gas to any on-site buildings; and

e. Impact on mining/mineral sites: loss of resource.

17.5.20 An assessment of the potential severity, likelihood of occurrence and potential risk associated with each contaminant linkage is included in Section 10 of **Appendix 17-3: Ground Conditions Principal Site PRA** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**. All contamination linkages were assessed to result in very low to low risk of impacting on human health or controlled waters receptors, with the introduction of the Scheme.

Mitigation Measures

17.5.21 Intrusive site investigation is proposed by the Applicant at the post-consent stage to provide geo-environmental data to evaluate soil and groundwater quality and verify the conceptual site model. It will also verify the proposed mitigation measures so that unacceptable pollutant linkages do not exist on completion of the Scheme. The geo-environmental investigation will be designed with due consideration of the requirements of BS 10175:2011: +A2 2017: Investigation of Potentially Contaminated Sites – Codes of Practice (BSI) (Ref. 17-6). The requirement for an intrusive investigation is expected to be secured through the **Framework Construction Environmental**

Management Plan (CEMP) [EN010142/APP/7.8] in accordance with a requirement of the DCO.

17.5.22 The construction works will be undertaken in compliance with Construction Design and Management (CDM) 2015 Regulations (Ref. 17-7).

17.5.23 Prior to work commencing, a health and safety risk assessment will be carried out in accordance with current health and safety regulations and based on ground investigation findings. This assessment will cover potential risks to both site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures will be implemented during the course of any works, including:

a. Use of appropriate Personal Protective Equipment (PPE) for construction workers - including gloves and, where appropriate, dust masks, use of ground gas monitoring equipment and hygiene facilities; and

b. Use of appropriate site control measures to minimise the migration of contaminated dusts and soils from the Site to adjacent areas.

17.5.24 A number of bespoke design mitigation measures will be implemented, including:

a. Plant: all plant (i.e. inverters, transformers and switchgear) will be installed on concrete bases with suitable bunding, where appropriate.

b. Surface water drainage: the detailed operational drainage design will be carried out pre-construction with the objective of ensuring that drainage of the land to the present level is maintained. It will follow either the design of a new drainage system taking into account the proposed new infrastructure (access tracks, cable trenches, structure foundations) to be constructed, or, if during the construction of any of the infrastructure, there is any interruption to existing schemes of land drainage, then new sections of drainage will be constructed. An **Outline Drainage Strategy** has been submitted with the DCO application, refer to **Appendix 10-4** of this ES **[EN010142/APP/6.2]**, which the detailed design will be in accordance with.

c. Operational Activities: during the operational phase, on-site activity will be minimal and would be restricted principally to vegetation management, equipment maintenance and servicing, replacement of any components that fail, and monitoring to ensure the continued effective operation of the Scheme.

17.5.25 A Framework CEMP [EN010142/APP/7.8], Framework Operational Environmental Management Plan (OEMP) [EN010142/APP/7.9] and Framework Decommissioning Environmental Management Plan (DEMP) [EN010142/APP/7.10] have been submitted alongside the DCO application. These set out measures to be implemented during construction, operation and decommissioning respectively to reduce nuisance impacts from dust generation, soil removal and waste generation. The implementation of the Framework CEMP, OEMP and DEMP are secured via a Requirement in the DCO.

Residual Effects

17.5.26 With the proposed mitigation in place, **no significant residual effects** are anticipated as a result of the Scheme.

17.6 Major Accidents and Disasters

Introduction

17.6.1 This section summarises the likely effects of the Scheme on the risks of major accidents or disasters occurring.

17.6.2 ‘Accidents’ are an occurrence resulting from uncontrolled developments in the course of construction, operation and decommissioning (e.g. major emission, fire or explosion).

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

Consultation

17.6.4 Consultation responses in relation to major accidents and disasters are presented in **Appendix 1-2** of this ES **[EN010142/APP/6.2]**, and **Consultation Report Appendix** submitted with the DCO Application **[EN010142/APP/5.2]**.

17.6.5 A summary of scoping opinion responses relating to major accidents and disasters are presented in **Table 17-5**.

Table 17-5 Scoping Opinion Responses (Major Accidents and Disasters)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate	Scoping Report Table 17-2 sets out a list of potential impacts from major accidents and disasters to/from the Proposed Development including: • Flooding; • Fire; • Road accidents; • Rail accidents; • Aircraft disasters; • Utilities failure; • Mining extractive industry; and • Plant disease. Paragraph 17.23 states that the relevant ES aspect chapters will identify the potential significant effect for receptors where further design mitigation is unable to remove the potential interaction between a major accident or disaster. The Inspectorate is content that any significant effects resulting from major accidents or disasters can be assessed within the project description and/or relevant aspect chapters of the ES. The ES should not be a 'paperchase' and should clearly signpost where these impacts are assessed in	Any significant effects resulting from major accidents or disasters have been assessed within the relevant aspect chapters of the ES. A summary is presented in this chapter in **Table 17-8** to signpost where mitigation measures for major accidents and disasters have been covered in other ES chapters.	**Table 17-8** of this chapter Mitigation Measures section in Section 17.5.26 of this chapter. Mitigation Measures section in the relevant technical chapters (**Chapters 6 – 16**) of this ES **[EN010142/APP/6.1]**.

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	other relevant chapters and where any relevant mitigation measures are secured.		
Planning Inspectorate	The Scoping Report refers to a lack of established guidance for this aspect topic. The assessment should refer to the IEMA guidance document 'Major Accidents and Disasters in EIA', where relevant.	The assessment methodology of Section 17.6 aligns with the 'Major Accidents and Disasters in EIA' guidance (Ref. 17-8). The guidance document is also referred to within **Appendix 17-1: Other Environmental Topics Legislation, Policy and Guidance** of this ES **[EN10142/APP/6.2]**.	**Appendix 17-1: Other Environmental Topics Legislation, Policy and Guidance** of this ES **[EN10142/APP/6.2]**.

17.6.6 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report. **Table 17-6** outlines the statutory consultation responses relating to major accidents and disasters and how these have been addressed through the ES. Responses have been grouped thematically where relevant, but all relevant consultees are listed. Additional comments were received during the subsequent round of targeted consultation as shown in **Table 17-7**.

Table 17-6 Main matters raised through the Statutory Consultation (Major Accidents and Disasters)

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
Health and Safety Executive (HSE)	According to HSE's records, the proposed DCO application boundary for this Nationally Significant Infrastructure Project falls into the consultation zones of a Major Accident Hazard Site [‘MAHS’] and a Major Accident Hazard Pipeline [‘MAHP’]. The major accident hazard site is HSE reference 4154 EDF Energy Ltd, Cottam Power Station, Nottinghamshire. The major accident hazard pipeline is HSE reference 11166, Uniper and E.ON UK, Blyborough to Cottam PS Pipeline. The Applicant should make contact with the above operators, to inform an assessment of whether or not the proposed development is vulnerable to a possible major accident.	The relevant statutory undertakers have been contacted. The design of the Cable Route Corridor and Principal Site has been refined to allow appropriate offsets for all hazards identified within the Order limits. As such, no significant risks have been identified.	This has been considered in the Assessment of Likely Effects of **Sections 17.5.26** and **17.7** of this chapter. Further information on consultation undertaken is provided within the **Consultation Report [EN010142/APP/5.1]**.
HSE	Based on the PEIR, it is not clear whether the applicant has considered the hazard classification of any chemicals that are proposed to be present at the development.	The Scheme does not require the use and storage of hazardous substances above the thresholds set out within the Control of Major Accident Hazards (COMAH) Regulations 2015 (Ref. 17-9).	This has been considered in the Assessment Methodology of **Section 17.5.26** of this chapter.
HSE	In the PEIR it was not clear if there was consideration of risk assessments arising from the development’s vulnerability to major accidents. We would advise this is considered further in line with Advice Note 11 Annex on the Planning Inspectorate’s website - Annex G – The Health and Safety Executive taking account of the	The Scheme’s vulnerability to existing major accident and disaster risks has been considered within the assessment.	This has been considered in the Assessment of Likely Effects of **Section 17.5.26** of this chapter

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
	following: “it may be beneficial for applicants to undertake a risk assessment as early as possible to satisfy themselves that their design and operation will meet the requirements of relevant health and safety legislation as design of the Proposed Development progresses.”.		
Lincolnshire County Council	With regard to Policy M12, and in line with the broader agent of change principle, we would expect sufficient information to be provided and assessments undertaken to demonstrate that the proposed development would not prejudice or detrimentally impact upon the operation of the safeguarded Glentworth K oil site that is surrounded on three sides by the proposed DCO boundary. Relevant issues to consider may include (but are not limited to) access, health and safety (including fire safety), screening/boundary treatments, site buffers, and the need to protect any associated utilities and infrastructure/pipelines etc. We would suggest contacting the site operator (IGas) and relevant experts such as the Environment Agency and local Environmental Health Officers to accurately determine the detailed maters that should be considered and any necessary mitigation.	Consultation with IGas has been undertaken and offsets from the safeguarded Glentworth K Oil site have been incorporated within the Scheme design.	**Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**. Assessment of Likely Effects of **Section 17.5.26** of this chapter. **Consultation Report** submitted alongside this DCO application **[EN010142/APP/5.1]**.
Lincolnshire County Council	On 17 April 2023 the County Council’s Planning and Regulation Committee resolved to grant planning permission (subject to a pending legal agreement) for a further oil site to the west of Glentworth K and to be connected by pipeline. This new site and the	Consultation with IGas has been undertaken and offsets from the safeguarded Glentworth K Oil site have been incorporated within the Scheme design.	**Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]** and **Consultation Report** submitted alongside this

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
	associated pipeline would be wholly within the proposed DCO boundary and so should be given due consideration in line with the above.		DCO application **[EN010142/APP/5.1]**. **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**.
Ministry of Defence	The application site occupies the statutory height and bird strike safeguarding zones surrounding RAF Scampton and is approximately 10km from the centre of the airfield.	The Scheme parameters do not impede on the safeguarding limits of RAF Scampton. In addition, it is understood that RAF Scampton has now been closed.	The design of the Scheme is outlined in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**.
Local residents	Concerns regarding the risk of fire introduced by the Scheme and the response time of the Fire and Rescue Service (FRS).?	A **Framework Battery Safety Management Plan (FBSM) [EN010142/APP/7.13]** has been prepared for submission with the DCO Application. Lincolnshire FRS has been consulted on the FBSMP and the Scheme layout, including emergency access points. Consultation will continue with the local FRS throughout the examination, post-consent and detailed design stage, to ensure all key stakeholders are satisfied that	This has been considered in the Mitigation Measures of **Section 17.5.26** of this chapter. Further information is also provided within **Framework Battery Safety Management Plan (FBSM) [EN010142/APP/7.13]**.

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
		mitigation and safety requirements are agreed prior to construction. In addition, firefighting water will be provided on-site in line with National Fire Chiefs Council (NFCC) guidelines (Ref. 17-10). At the detailed design stage, the BSMP and the design of the Scheme will be verified by an independent Fire Protection Engineer and agreed with the local FRS, as per NFCC 2023 guidelines (Ref. 17-11).	

Table 17-7 Main matters raised through the Targeted Consultation (Major Accidents and Disasters)

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
Lincolnshire Fire and Rescue (LFR)	The strategy should cover the construction, operational and decommissioning phases of the project. During the construction phase the number of daily vehicle movements in the local area will significantly increase. Lincolnshire Fire and Rescue will want to view the transport strategy to minimise this impact and prevent an increase in the number of potential road traffic incidents. Any development should not negatively impact on the Service's ability to respond to an incident in the local area.	**Chapter 16: Transport and Access** of the ES **[EN010142/APP/6.1]** presents an assessment of the Scheme's impacts on driver delay and road safety. The assessment concludes that neither of these impacts will be significant.	This has been considered in **Chapter 16: Transport and Access** of the ES **[EN010142/APP/6.1]**.
Lincolnshire Fire and Rescue	Since the use of batteries (including lithium-ion) as Energy Storage Systems (ESS) is a new and emerging practice in the global renewable energy sector, the Lincolnshire Fire and Rescue would like to work with the developers to better understand any risks that may be posed and develop strategies and procedures to mitigate these risks.	The Applicant recognises the benefits of early engagement and consultation with LFR. To date (March 2024), two meetings have taken place with LFR to discuss site indicative design and LFR emergency response requirements. All safety related project developments will be shared with LFR at the earliest opportunity.	N/A
Lincolnshire Fire and Rescue	Since large scale BESS is a fairly new technology, and as such risks may or may not be captured in current guidance in pursuance of the Building Regulations (as amended) and the Regulatory Reform (Fire Safety) Order 2005. This will highlight challenges the FRS have when responding to Building Regulations	The Applicant recognises that NFPA 855 (2023) currently provides the most comprehensive guidelines for BESS design and site installation specifications and will commit to following guidance, whilst also	This is further explained within the **Framework Battery Safety Management Plan** submitted alongside the

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
	consultations. For this reason, FRS strongly recommend applying the National Fire Protection Association (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems.	observing any separate UK legislation or National Fire Chiefs Council (NFCC) guidelines at the detailed design stage (if DCO consent is granted).	DCO application **[EN010142/APP/7.13]**.

Assessment Methodology

17.6.7 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.

17.6.8 An exercise was undertaken 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 Risk Register of Civil Emergencies (Ref. 17-12), Lincolnshire Community Risk Register (Ref. 17-13) and Nottinghamshire Community Risk Register (Ref. 17-14). Major accidents or disasters with little relevance to the Scheme were not included, such as volcanic eruptions and severe space weather, for example. **Appendix G** of the **EIA Scoping Report** (refer to **Appendix 1-1** of the ES **[EN10142/APP/6.2]**) reviewed the Scheme against a long list of major accident and disaster hazards, with those summarised in **Table 17-8** scoped in for further assessment within the ES.

Table 17-8 Major Accidents or Disasters Shortlisted for Further Consideration

Major accident or disaster	Potential receptor	Comments	Relevant Chapter or Appendix of the ES
Floods	Property and people in areas of increased flood risk.	Both the vulnerability of the Scheme to flooding, and its potential to exacerbate flooding to other areas, is addressed in the Flood Risk Assessment, and also reported in ES, both in terms of the risk to the Scheme and increased risk caused by the Scheme.	**Chapter 10: Water Environment of this ES [EN010142/APP/6.1]**. **Appendix 10-3: Flood Risk Assessment of this ES [EN010142/APP/6.2]**.
Fire	Local residents, habitats and species.	There is a risk of fire as a result of the battery storage element of the Scheme. However, the battery energy storage system will include cooling systems, which are designed to regulate temperatures to within safe conditions to minimise the risk of fire. A **FBSMP [EN010142/APP/7.13**] has been prepared setting out measures embedded within the design of the Scheme to minimise the risk of fire and emergency arrangements in case a fire does occur. In addition, **Appendix 17-5: Unplanned Emissions from BESS** of this ES **[EN010142/APP/6.2]** includes plume modelling in case of a fire. There is also a risk of fire from the neighbouring Glentworth K Oil site. Offsets from this site have been incorporated within the Scheme.	**Framework Battery Safety Management Plan [EN010142/APP/7.13]** and **Appendix 17-5: Unplanned Emissions from BESS** of this ES **[EN010142/APP/6.2]**. **Section 17.6** of this chapter. **Chapter 3: Scheme Description of the ES [EN010142/APP/6.1]**.
Road accidents	Aquatic environment Road users	The risk posed by spillage from hazardous loads as a result of a road traffic accident during construction or decommissioning is considered in **Chapter 10: Water Environment** of the ES **[EN010142/APP/6.1]**.	**Chapter 10: Water Environment of this ES [EN010142/APP/6.1]**.

Major accident or disaster	Potential receptor	Comments	Relevant Chapter or Appendix of the ES
		The risk of road traffic accidents increasing as a result of the Scheme's traffic is considered within **Chapter 16: Transport and Access** of this ES **[EN010142/APP/6.1]**. The potential for glint and glare to affect road users has been considered within **Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]** and summarised within Section 17.4 of this chapter.	**Chapter 16: Transport and Access of this ES [EN010142/APP/6.1]**. **Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.
Rail accidents	Rail users	The Cable Route Corridor crosses the railway line connecting Gainsborough to Saxilby and Lincoln. The crossing will be designed to meet the specific requirements of Network Rail and therefore the risk of a rail accident as a result of the crossing will be minimised.	Assessment of Likely Effects section of this chapter.
Aircraft disasters	Pilots and aircraft	The glint and glare assessment demonstrated there is Low potential for glint and glare to affect aircraft, meaning there is no need for mitigation.	**Appendix 17-2: Glint and Glare Assessment** of this ES **[EN010142/APP/6.2]**.
Flood Defence Failure	Employees	This is covered in the **Flood Risk Assessment [EN010142/APP/6.2]** and also reported in **Chapter 10: Water Environment** of the ES **[EN010142/APP/6.1]**, both in terms of the risk to the Scheme and increased risk caused by the Scheme.	**Chapter 10: Water Environment** of this ES **[EN010142/APP/6.1]**. **Appendix 10-3: Flood Risk Assessment** of this ES **[EN010142/APP/6.2]**.
Utilities failure (gas, electricity, water,	Employees and local residents	The Scheme has the potential to affect existing utility infrastructure below ground. To identify any existing infrastructure constraints, both	**Section 17-7** Telecommunications, Television Reception and Utilities of this chapter.

Major accident or disaster	Potential receptor	Comments	Relevant Chapter or Appendix of the ES
sewage, oil, communications)		consultation and a desk-based study have been undertaken.	
Mining / Extractive Industry	Employees	There is the potential for current or past quarrying activity in the vicinity to lead to unstable ground conditions. However, the risk will be considered as part of the detailed geotechnical design, following ground investigations, ensuring that the risk is designed out.	**Appendix 17-2: Ground Conditions Principal Site PRA** and **Appendix 17-3: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**
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. The planting design will take account of biosecurity risks through a wider mix of species including some non-natives.	**Chapter 9: Ecology and Nature Conservation** of this ES **[EN010142/APP/6.1]** and **Framework Landscape and Ecological Management Plan (LEMP)** submitted alongside this DCO application **[EN010142/APP/7.17]**.

17.6.9 Those major accidents and disasters listed in **Table 17-8** that are not being considered within another technical assessment have been reviewed and considered by the Applicant to ensure risks have been addressed through the design as necessary. These events are assessed in the Assessment of Likely Effects section below.

17.6.10 An effect is considered significant if there is an increased risk of damage from a major accident or a disaster occurring as a result of the Scheme. Details on appropriate prevention measures and mitigation for significant effects on the environment from such events are either provided in the sections below or within the referenced topic chapters.

Baseline Conditions

17.6.11 A number of receptors are present in the vicinity of the Scheme which could be vulnerable to major accidents or disasters, either because of their proximity to the Scheme or their importance to the surrounding area. These include:

a. Towns, villages, farms and residential homes;
b. Commercial sites and buildings;
c. Roads;
d. Railways;
e. Designated ecological sites, woodland, farmland, and waterbodies;
f. Underground infrastructure services including electricity, water, communications, and gas; and
g. Glentworth K Oil site.

17.6.12 Details of the specific receptors that fall into the above categories are provided in **Chapter 2: Scheme Location** of this ES **[EN010142/APP/6.1]**. These receptors have been considered in this assessment.

Assessment of Likely Effects

17.6.13 Risks of major accidents and disasters occurring during construction, operation and decommissioning are assessed in the relevant chapters outlined in **Table 17-8**. All works will be subject to risk assessments as required by the **Framework CEMP [EN010142/APP/7.8], Framework OEMP [EN010142/APP/7.9]** and **Framework DEMP [EN010142/APP/7.10].**

Construction and Decommissioning Phase

Fire

17.6.14 Health and safety on-site would be managed by the contractor during construction and decommissioning to mitigate the risk of fire in accordance with relevant legislation and guidance, as set out within the **Framework CEMP [EN010142/APP/7.8]** and **Framework DEMP [EN010142/APP/7.10]**. With the implementation of these measures, the risk of a fire occurring

during the construction and decommissioning of the Scheme is considered to be **not significant**.

Rail Accidents

17.6.15 The Cable Route Corridor crosses the East Midlands railway line, providing services between Doncaster and Lincoln. The cable route will be within a trenchless crossing in this location and the design for the trenchless crossing will be agreed with Network Rail as part of the detailed design development. As such, the Scheme is not expected to have an effect on the risk of a rail accident occurring.

17.6.16 Whilst there is a second railway crossing with the Scheme, this is associated with the railway line to the de-commissioned Cottam Power Station and this railway line is no longer in use. As such, it has not been considered further as part of this assessment.

Operational Phase

Fire

17.6.17 There is a potential fire risk associated with certain types of batteries such as lithium ion, which may be used for the BESS. The Scheme design includes cooling systems for the batteries, which are designed to regulate temperatures to within safe conditions to minimise the risk of fire. Further details are included in the **FBSMP** submitted with the DCO Application **[EN010142/APP/7.13]**.

17.6.18 The anticipated safety provisions provided in the **FBSMP [EN010142/APP/7.13]** include:

a. There shall be suitable access roads for emergency services vehicles with safe routes to BESS sites and appropriate fire service infrastructure.

b. A fire detection and fire alarm system using coincidence detection in accordance with BS 7273-1 and NFPA 855 guidelines (Ref. 17-16) and incorporating aspirating smoke detection and carbon monoxide (CO) detection within the BESS enclosure for early detection of gases produced during off-gassing and prior to thermal runaway.

c. At area level, in each BESS cluster area hydrants shall be located with adequate suppression pressure and flow for extinguishing operations. Hydrant supplies for boundary cooling purposes should be located close to BESS containers (but considering safe access in the event of a fire) and should be capable of delivering no less than 1,900 litres per minute for at least 2 hours.

d. All process water used in the system shall be prevented from contaminating potable water sources in accordance with local regulations through the use of check valves or other means as part of the system design.

e. An extra layer of protection will be provided for containment of firewater external of the BESS enclosure in case of rupture or overflow of contaminants.

f. Each BESS enclosure will be provided with a sump and drain valve to allow extraction of contaminated fire water and / or electrolyte spill without having to open the door of the enclosure and will prevent contamination of surrounding environment with the extracted liquid being taken off site for treatment.

17.6.19 An assessment on the potential for unplanned atmospheric emissions from BESS in the event of a fire has been undertaken and is provided in **Appendix 17-5: Unplanned Emissions from BESS** of this ES **[EN010142/APP/6.2]**. This study reviews the potential emissions to air from out-gassing and from fire and considers the potential magnitude of emissions and the likely consequences of emissions to air from BESS.

17.6.20 The battery technologies proposed for the Scheme are based on sealed cells with no excess electrolyte and secured through the **FBSMP** submitted with the DCO Application **[EN010142/APP/7.13]**. This removes the potential for venting or out-gassing of gaseous substances during normal operational use. If the battery cells become damaged by heat or are burnt within a fire affecting a single module, a rack of modules, or multiple racks, then the combustible materials consumed in the fire could give rise to a range of organic and inorganic air pollutants.

17.6.21 Dispersion modelling was undertaken to understand the minimum rates of dilution likely to occur to pollutant concentrations as they disperse from the source of the emission to receptor locations. Public Health England identifies acute exposure guideline level (AEGL) values, which start at AEGL-1 and increase in severity of health outcome to AEGL-3. The AEGL-1 criteria define the "*level of the chemical in air or above which the general population could experience notable discomfort*".

17.6.22 The assessment concluded that emissions of hydrogen fluoride could cause concentrations over time periods of 10 minutes, 1 hour, or up to 6 hours, which are below the AEGL-1 value at locations within 200m of the fire. In most instances the AEGL-1 value would be achieved within the Order limits and in all cases in a shorter distance than that to the nearest sensitive receptors.

17.6.23 The detailed design for the Scheme will ensure that the parameters assessed in this study are met (i.e. 1 kg to 3 kg of hydrogen fluoride from a 5-rack fire). The potential consequence at actual receptor locations surrounding the BESS (located within the relevant work areas as shown within the **Work Plans [EN0101042/APP/2.3]**) would be exposure to hydrogen fluoride at concentrations below the AEGL-1 value.

17.6.24 The design of the BESS includes a number of elements to both prevent, detect and control a fire should one occur. These include:

a. The use of batteries that are sealed by design so do not vent when in normal use and have no free electrolyte.

b. The battery modules will contain cells separated by a thermal barrier to prevent one cell affecting the temperature of the adjacent one, with the modules themselves also separated from one another by another thermal barrier or an air gap. The thermal barrier is intended to ensure

that should one cell/module heat up it will not impact on the adjacent cell/module so as to prevent a thermal cascade.

c. The batteries will be controlled by charging management systems that will detect if a cell or battery is not operating correctly and the whole BESS will be fitted with a fire monitoring system so if one cell or module were to catch fire, the fire suppression system will automatically be triggered to reduce the temperate and ensure that the burning cell/module does not affect the other cells/modules in the BESS.

17.6.25 These details for the battery design will be secured through the **FBSMP** submitted with the DCO Application **[EN010142/APP/7.13]**. included within this DCO Application.

17.6.26 Therefore, in the unlikely event that a fire was to break out in a single cell or module, it is considered very unlikely, given the control measures, that the fire would spread to the rest of the BESS. Even in the highly unlikely event that all the systems fail and a large-scale fire were to break out within one of the BESS containers, the resultant hydrogen fluoride concentration at the closest receptors would be below the level that Public Health England has identified as resulting in notable discomfort to members of the general population.

17.6.27 The expected hydrogen fluoride emissions will be checked against the assumptions in **Appendix 17-5: Unplanned Emissions from BESS** of this ES **[EN010142/APP/6.2]** at the detailed design stage (post-consent) once the make, model and layout of batteries to be used for the BESS is known. If necessary, consequence modelling will be undertaken to inform an updated BSMP to ensure that the impacts associated with an unplanned fire would not exceed the effects outlined in this report or cause any significance adverse health effects to the local community.

17.6.28 As the above measures limit the risk of fire spreading, they also provide mitigation for fire spreading to the Order limits from off-site sources.

17.6.29 With the above embedded mitigation, significant effects on the risk of fire would be unlikely as a result of the Scheme. The above measures will be secured through: **FBSMP [EN010142/APP/7.13]** and **Work Plans [EN0101042/APP/2.3]** with regards to the design of the BESS.

Rail Accidents

17.6.30 The Cable Route Corridor crosses the railway line connecting Gainsborough to Saxilby and Lincoln. The operation of the crossing will be managed to the specific requirements of Network Rail in line with the **Framework OEMP [EN010142/APP/7.9]** and therefore the risk of a rail accident as a result of the crossing will be minimised. Significant effects on rail accidents are not anticipated.

Mitigation Measures

17.6.31 Minimising the risk of major accidents during construction, operation and decommissioning will be addressed through appropriate risk assessments and measures as required in the **Framework CEMP [EN010142/APP/7.8]**,

Framework OEMP [EN010142/APP/7.9] and **Framework DEMP [EN010142/APP/7.10]**, submitted alongside the DCO application. Mitigation with regards to the design of the BESS is secured through the **FBSMP [EN010142/APP/7.13]**, and **Work Plans [EN010142/APP/2.3].**

Residual Effects

17.6.32 Given the nature of major 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. The focus is on prevention of major accidents and disasters, and mitigation if an event does occur. With the proposed mitigation in place, **no significant residual effects** are anticipated as a result of the Scheme.

17.7 Telecommunications, Television Reception and Utilities

Introduction

17.7.1 This section evaluates the effects of the Scheme on telecommunication infrastructure, television reception and existing utilities.

Consultation

17.7.2 The EIA Scoping Opinion and relevant consultation responses in relation to telecommunications, television reception and utilities are presented in **Appendix 1-2** of this ES **[EN010142/APP/6.2]**, and **Consultation Report Appendix** submitted with the DCO **[EN010142/APP/5.2]**.

17.7.3 A summary of scoping opinion responses relating to telecommunication infrastructure, television reception and existing utilities, are presented in **Table 17-9**.

Table 17-9 Scoping Opinion Responses (telecommunication infrastructure, television reception and existing utilities)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate	Scoping Report paragraph 17.25 states that the location and safeguarding areas relating to utilities, telecommunications and television assets will be identified and consultation will inform how the Proposed Development will embed mitigation to avoid any direct impacts on these assets. No indirect impacts are anticipated due to the nature of the Proposed Development. Subject to the inclusion of measures to avoid direct impacts on utilities, telecommunications and television assets in the ES, the Inspectorate is content to scope this matter out from further assessment.	As set out within this chapter, no significant effects with regards to telecommunications, television reception and utilities have been identified with embedded mitigation in place.	**Section 17.7** of this chapter.

17.7.4 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report. **Table 17-10** outlines the statutory consultation responses relating to telecommunications, television reception and utilities and how these have been addressed through the ES. Responses have been grouped thematically where relevant, but all relevant consultees are listed. No additional comments were received during the subsequent round of targeted consultation.

Table 17-10 Main matters raised through the Statutory Consultation (telecommunication infrastructure, television reception and existing utilities)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Cadent Gas	Cadent Gas has outlined their requirements to ensure utilities on site are protected throughout the duration of the works.	The design of the Cable Route Corridor and Principal Site has been refined to allow appropriate offsets for all Utilities identified within the Order limits. Furthermore, protective provisions have been provided for all relevant statutory undertakers in the **draft DCO [EN010142/APP/3.1].**	The design of the Scheme is outlined in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**. Protective provisions set out within the **draft DCO [EN010142/APP/3.1].**
Uniper UK Limited	The consultation documents appear to show that the Order limits will impact on the entrance to CDC. However, it is not clear as to what this impact will be. The CDC is manned 24 hours a day, 365 days a year and the access road forms part of a heavy / abnormal load route that we may require to use at any time to facilitate urgent repairs or replacements. It is therefore vital that any proposals for the Tillbridge Solar Project do not impact on the use of CDC.	The design of the Cable Route Corridor and Principal Site has been refined to allow appropriate offsets for all Utilities identified within the Order limits. Furthermore, protective provisions have been provided for all relevant statutory undertakers in the **draft DCO [EN010142/APP/3.1].**	The design of the Scheme is outlined in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**. Protective provisions set out within the **draft DCO [EN010142/APP/3.1].**
National Grid Electricity Transmission	If a landscaping scheme is proposed as part of the proposal, only slow and low growing species of trees and shrubs should be planted beneath and adjacent to the existing overhead line to reduce the risk of growth to a height which compromises statutory safety clearances.	Comment noted and agreed. Any planting will be in accordance with National Grid guidelines for planting under or in the vicinity of overhead powerlines, as set out	**Framework LEMP [EN010142/APP/7.17]**

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
		in the **Framework LEMP [EN010142/APP/7.17]**.	
National Grid Electricity Transmission	Drilling or excavation works should not be undertaken if they have the potential to disturb or adversely affect the foundations or “pillars of support” of any existing tower.	All construction and decommissioning works will be subject to risk assessments as required by the Framework CEMP and DEMP.	**Framework CEMP [EN010142/APP/7.8]** and **Framework DEMP [EN010142/APP/7.10]**.

Assessment Methodology

17.7.5 To identify any existing constraints relating to telecommunication infrastructure, television reception and existing utilities, both consultation and a desk-based study have been undertaken. Consultation with relevant telecommunication and utilities providers is a routine part of solar development and will continue post-DCO consent as part of detailed design development.

17.7.6 Consultees include water, gas and electricity utilities providers and telecommunications providers. Telecommunications and television providers are unlikely to be affected by Electromagnetic Interference (EMI) unless transmitters are near electrical infrastructure associated with the solar PV array.

17.7.7 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 undertaken by competent experts is used to assess the likelihood of significant effects on telecommunications, television reception and utilities.

17.7.8 Utilities within the Principal Site and the stand offs to the Scheme infrastructure are outlined below:

a. A Uniper gas pipe running northeast to southwest, with a 26m wide (total) stand-off;

b. ‘West Burton B’ gas pipe across Parcel 1 only, with 7m wide stand-off;

c. A Cadent gas pipe running east to west, with 65m wide stand-off; and

d. 33 kilovolt (kV) and 11kV overhead lines, with a 10m easement where feasible, minor realignment of the overhead lines may be required in consultation with the statutory undertaker.

17.7.9 In addition, any utilities within the Cable Route Corridor would be avoided by micro-siting during the detailed design stage where possible. Where this is not possible, suitable crossings would be agreed with the relevant statutory undertakers.

Assessment of Likely Effects

Construction and Decommissioning Phase

Telecommunications

17.7.10 The Scheme is unlikely to interfere with telecommunications infrastructure as typically structures need to be more than 5m in height to interfere with telecommunication signals. No such effects are anticipated in the construction and decommissioning phases.

Television Reception

17.7.11 The Scheme consists of fixed low-lying infrastructure and is therefore unlikely to interfere with digital television signals. No effects are anticipated in the construction and decommissioning phase.

Utilities

17.7.12 The potential exists for utilities to be affected during the construction and decommissioning of the Scheme through inadvertent damage caused as a result of excavation and engineering operations. Without any precautionary measures to avoid damage to utilities, this could lead to a short-term adverse effect.

17.7.13 The following embedded mitigation has been included within the Scheme to prevent such damage from occurring:

a. Locating the Scheme infrastructure outside of utilities protected zones;

b. The use of ground penetrating radar before excavation to identify any unknown utilities; and

c. Consultation and agreement with relevant utility operators regarding construction/demobilisation methods prior to works commencing.

17.7.14 These measures are set out within the **Framework CEMP [EN010142/APP/7.8]**, and **Framework DEMP [EN010142/APP/7.10]** submitted alongside this DCO Application and will reduce the likelihood of effects on utilities during construction and decommissioning. Furthermore, protective provisions have been provided for all relevant statutory undertakers in the **draft DCO [EN010142/APP/3.1].** Therefore, no adverse effects are expected during construction and decommissioning.

Operational Phase

Telecommunications

17.7.15 The vast majority of the Scheme consists of fixed low-lying infrastructure less than 5m from ground level and is therefore unlikely to interfere with telecommunications infrastructure. No effects are anticipated in the operational phase.

Television Reception

17.7.16 The Scheme consists of fixed low-lying infrastructure and is therefore unlikely to interfere with digital television signals. No effects are anticipated in the operational phase.

Utilities

17.7.17 No effects on utilities are predicted as a result of the operational phase of the Scheme because no below-ground works will be required during operation.

Mitigation Measures

17.7.18 The risk of damage to utilities during construction and decommissioning will be minimised through measures set out within the **Framework CEMP [EN010142/APP/7.8]**, and **Framework DEMP [EN010142/APP/7.10]**, which would involve those measures listed above and mapping infrastructure that crosses the Scheme and avoiding it through the design. Furthermore, protective provisions have been provided for all relevant statutory undertakers in the **draft DCO [EN010142/APP/3.1].** No further mitigation would be required.

Residual Effects

17.7.19 With the proposed mitigation, **no significant residual effects** are anticipated as a result of the Scheme.

17.8 Materials and Waste

Introduction

17.8.1 This section follows the methodology set out in the Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environment Assessment, Guidance for a Proportionate Approach (referred from herein as the 'IEMA Guidance' (Ref. 17-16)).

17.8.2 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. A qualitative high level preliminary assessment has been undertaken in accordance with the IEMA Guidance.

17.8.3 For the purposes of this assessment, materials and waste comprise:

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

b. The generation and management of waste.

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

17.8.5 Waste is defined as per the Waste Framework Directive (Ref. 17-18) as *"any substance or object which the holder discards or intends or is required to discard"*. 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. In practical terms, wastes include surplus spoil, scrap, recovered spills, unwanted surplus materials, packaging, office waste, and broken, worn-out, contaminated or otherwise spoiled plant, equipment, and materials.

Consultation

17.8.6 A Scoping Opinion was received from PINS on 4 November 2022 **(Appendix 1-2: EIA Scoping Opinion** of this ES **[EN010142/APP/6.2])**. The feedback received from stakeholders at scoping and Applicant responses in relation to materials and waste are summarised in **Table 17-11**.

Table 17-11 Scoping opinion responses (Materials and Waste)

Consultee	Summary of comment	How matter has been addressed	Location of response
Planning Inspectorate	The Inspectorate agrees that a standalone chapter on waste is not required within the ES. However, the ES should still contain a description of the potential waste streams of construction and decommissioning, including estimated volumes, and an assessment of the likely significant effects. In addition, the ES should describe any measures implemented to minimise waste and state whether the waste hierarchy will be utilised. If off-site disposal is required, an assessment of likely significant effects including intra-cumulative effects should be included within the ES.	A description of the potential waste streams of construction and decommissioning, including estimated volumes, are available in this ES chapter. An assessment of the likely significant effects, and measures implemented to minimise waste use, including use of the waste hierarchy, are outlined in this ES chapter. An assessment of likely significant cumulative effects is included in **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**.	**Table 17-15** and **Table 17-17.** Assessment of Likely Effects within **Section 17.8** of this chapter. Embedded Mitigation within **Section 17.8** of this chapter **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1].**
Planning Inspectorate	Solar developments are typically considered to be 30-to-40 year developments with panel degradation cited as a limiting factor on project lifespan. On this basis, the Inspectorate considers that some panels may need to be replaced during the operational life of the project. The ES should include an assessment of the likely impact of component replacement	An assessment of the likely impact of component replacement (e.g. batteries and panels) is outlined in this ES chapter. Measures that are in place to ensure that these components are able to be diverted	Assessment of Likely Effects within **Section 17.8** of this chapter.

Consultee	Summary of comment	How matter has been addressed	Location of response
	(e.g. batteries and panels) and outline what measures, if any, are in place to ensure that these components are able to be diverted from the waste chain. The ES should assess the likely significant effects from waste at decommissioning to the extent possible at this time. The Scoping Report states that a DEMP will be agreed with the Local Planning Authority. The Inspectorate would expect to see this secured through the inclusion of an Outline Decommissioning Plan, or similar, submitted with the Application. The ES should clearly set out how decommissioning is to be assessed and any components which may remain following decommissioning. The ES should also consider the requirement for cumulative impacts to be assessed at decommissioning due to a number of solar farms in the local area also likely to be decommissioned at a similar timescale.	from the waste chain are outlined in this ES chapter. Likely significant effects from waste at decommissioning to the extent possible at this time are outlined in this ES chapter. **A Framework DEMP [EN010142/APP/7.10]** accompanies the DCO Application. How decommissioning is to be assessed and any components which may remain following decommissioning is outlined in this ES chapter. Cumulative impacts are outlined in **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN10142/APP/6.1]**.	Embedded Mitigation within **Section 17.8** of this chapter Assessment of Likely Effects within **Section 17.8** of this chapter. **Framework DEMP** submitted with the DCO **[EN010142/APP/7.10]**. **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**.

17.8.7 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report. **Table 17-12** outlines the statutory consultation responses relating to materials and waste and how these have been addressed through the ES. One additional comment was received during the subsequent round of targeted consultation as shown in **Table 17-13**.

Table 17-12. Statutory consultation responses (Materials and Waste)

Consultee	Summary of comment	How matter has been addressed	Location of response
Nottinghamshire County Council	In terms of the Waste Core Strategy, there are no existing waste sites within the vicinity of the site whereby the proposed development could cause an issue in terms of safeguarding existing waste management facilities (as per Policy WCS10).	The Applicant thanks the Nottinghamshire County Council for its response and notes the representation made.	N/A
Bassetlaw District Council	In terms of the Waste Core Strategy, Nottinghamshire County Council has commented that there are no existing waste sites within the vicinity of the site whereby the proposed development could cause an issue in terms of safeguarding existing waste management facilities (as per Policy WCS10).	The Applicant thanks the Bassetlaw District Council for its response and notes the representation made.	N/A
Lincolnshire County Council	Planning Authority LCC is the planning authority for minerals and waste planning matters within Lincolnshire as well as for its own development which includes schools and highway developments. The Development Plan for the area affected by the project includes the Lincolnshire Minerals and Waste Local Plan (currently under review) and the Central Lincolnshire Local Plan adopted April 2023.	The Lincolnshire Minerals and Waste Local Plan and the Central Lincolnshire Local Plan have been considered within Section 6.15 of the **Planning Statement [EN010142/APP/7.2]** and within **Appendix 17-1** of this ES **[EN010142/APP/6.2]**.	**Planning Statement [EN010142/APP/7.2]** and within **Appendix 17-1** of this ES **[EN010142/APP/6.2]**.
Lincolnshire County Council	In respect of waste further detail and justification is required to substantiate the assertion that the amount of waste to be generated during the operation phase is minimal. The longevity of projects such as this are 40 years, yet this is proposed for an unlimited time and consequently it can reasonably be assumed that	The waste topic is assessed in this chapter with cumulative effects assessed in **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**. Moreover, as set out in the **Framework OEMP**	Embedded Mitigation and Assessment of Likely Effects within **Section 17.8** of this chapter.

Consultee	Summary of comment	How matter has been addressed	Location of response
	most of the infrastructure necessary for this project will need to be replaced at least once during the operational phase. Currently there are 11 other large solar projects in the County at various stage of the Development Consent Process creating a potential 5000MW of energy. All the infrastructure required for these projects, if approved, would be constructed during a similar timescale and is expected to be replaced at least once during the operational phase putting significant pressure on the County's waste facilities and consequently this topic should be covered in some detail in the ES. Whilst paragraph 16.7.29 sets out that at some point it will be necessary to replace the infrastructure it does not set out how this will be disposed of either from this project or in combination with discarded infrastructure from other solar projects that are expected to be constructed.	**[EN010142/APP/7.9]**, 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 Waste Electrical and Electronic Equipment (WEEE) Regulations. In addition, companies like SECONDSOL offer a marketplace service for the purchase and selling of second hand 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 with the industry best practice outlined in Solar Power Europe's Lifecycle Quality Best Practice Guidance.	**Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1].**

Table 17-13 Main matters raised through the Targeted Consultation (Materials and Waste)

Consultee	Summary of main matters raised	How has the matter been addressed?	Location of response in the chapter
Nottinghamshire County Council	As the Mineral Planning Authority, one of the key responsibilities of both the County Council but also the District and Borough Councils is to safeguard mineral resource (PPG, Paragraph 005, 2014). As minerals are a finite resource that can only be worked where they are found, the Minerals Local Plan contains a policy, SP7, which seeks to safeguard mineral resource from unnecessary sterilisation from non-mineral development and so establishes Mineral Safeguarding and Consultation Areas (MSA/MCA). As a two-tier authority, the Minerals Local Plan forms part of the overall Development Framework for Bassetlaw District Council. The entire of the western side of River Trent lies within a Sand and Gravel Mineral Safeguarding Area for Sand and Gravel, but given the relatively small land take for the proposed cabling route, we do not foresee any problems with regard to safeguarding the mineral reserve. In terms of the Waste Core Strategy, there are similar safeguarding policies. There no existing waste sites within the vicinity of the site whereby the proposed development could cause an issue in terms of safeguarding existing waste management facilities (as per Policy WCS10).	The Applicant thanks the Nottinghamshire County Council for its response and notes the representation made.	N/A

Assessment Methodology

Assumptions, Limitations and Uncertainties

17.8.8 The material and waste assessment has been undertaken on the basis of information available at the time of the assessment. Any assumptions made for the assessment and the limitations this presents are reported including:

a. The future baseline is assumed to be same as the current baseline as outlined in 17.8.17-17.8.18.

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%.

Matters Scoped in / Scoped out

17.8.9 As described in **Table 17-11** the Planning Inspectorate agreed that a standalone chapter on waste is not required within the ES, therefore the impacts are assessed presented within this section.

Study Area

17.8.10 The Study Areas for materials and waste are defined in line with the IEMA Guidance (Ref. 17-16). Two types of Study Areas are defined:

a. A Scheme Study Area – for construction, operational and decommissioning waste generation, use of construction, operational and decommissioning materials and consideration of impacts on allocated/safeguarded waste sites. The Study Area is deemed to include the footprint of the proposed works, together with any temporary land requirements during the construction.

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

   i. Non-hazardous and inert waste management – East Midlands and Yorkshire and the Humber;

   ii. Hazardous waste management – England;

   iii. Availability of key construction materials, crushed rock, sand and gravel, ready-mixed concrete and asphalt – East Midlands and Yorkshire and the Humber; and

   iv. Availability of key construction materials, steel – UK.

Methodology

17.8.11 The IEMA Guidance methodology for assessing the magnitude of impact from materials comprises a percentage-based approach that determines the

influence of construction materials consumption on the national and regional availability (consumption/sales). In a worst case, where material sensitivity is very high, a significant effect would occur at a magnitude of minor, which is where construction materials are more than 1% by volume of the baseline availability.

17.8.12 The IEMA Guidance offers two methods to assess waste effects and both methods are considered in the assessment:

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 the construction and/or operation. In a worst case, where landfill sensitivity is very high, a significant effect would occur at a magnitude of minor, which for Scheme non-hazardous and inert waste is more than 1% of landfill capacity and for hazardous waste is more than 0.1% of landfill capacity.

b. W2 – Landfill Diversion, a simpler approach where developments are compared to a good practice landfill diversion rate of 90%. A significant effect would occur at a magnitude of moderate which is a landfill diversion of less than 60%.

Baseline Conditions

17.8.13 This section describes the baseline conditions with the Study Areas with specific reference to materials and waste.

Data Sources

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

a. Make UK (Ref. 17-19);

b. Minerals Products Association (Ref. 17-20);

c. Environment Agency (Ref. 17-21);

d. Local Plans; and

e. Waste and Resources Action Programme (WRAP) (Ref. 17-22).

Existing Baseline

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

a. National and regional availability (consumption/sales) for key construction materials:

i. UK steel requirement 2022, 17 million tonnes (Ref. 17-19);

ii. Regional aggregates (39.8 million tonnes crushed rock and 8.2 million tonnes of sand and gravel) (Ref. 17-20);

iii. Regional asphalt (5.2 million tonnes) (4.9 million tonnes) (Ref. 17-20); and

iv. Regional concrete (2.4 million m^3, 5.8 million tonnes based on a density of 2.4 tonnes/m^3) (Ref. 17-20),

b. Non-hazardous and inert landfill void capacity in East Midlands and Yorkshire and the Humber (51.6 million m^3 and 32 million m^3) (Ref. 17-21);

c. Hazardous merchant landfill void capacity England (7.9 million m^3) (Ref. 17-21);

d. National non-hazardous construction and demolition 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. 17-23);

e. Standard, good and best practice recovery rates by material are provided by WRAP as outline in (Ref. 17-24); and

f. There are no safeguarded waste sites within the Order limits, mineral safeguarding is outlined in the **Planning Statement [EN/010142/APP/7.2]**.

17.8.16 Recovery rates for key construction materials and other construction wastes relevant to the Scheme are provided in **Table 17-14**.

Table 17-14 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

17.8.17 There is no publicly available information on any potential long-term changes to this national and regional availability (consumption/sales) for key construction materials by the time of construction of the Scheme.

Construction material demand such as ready mixed concrete is closely aligned to both the quantity of construction taking place and the general economy, therefore, it is deemed inappropriate to forecast future demand as the demand is unlikely to be linear. It is therefore not possible to set a future baseline for materials. Therefore, future availability is assumed to same as the current baseline.

17.8.18 There is no publicly available information on any potential changes to this landfill capacity by the time of the construction of the Scheme. Due the cyclic nature of inert landfill capacity, it is not realistic to forecast future landfill capacity since this may result in an increase in landfill capacity. Therefore, inert landfill capacity is assumed to remain the same as the current baseline. For non-inert landfill capacity (which includes 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: if there is still a need for landfill, then the waste planning authority will need to consent new landfill capacity to replace that which has been used up. Therefore, non-hazardous and hazardous landfill capacity is assumed to remain the same as the current baseline.

Embedded Mitigation

17.8.19 Where possible, mitigation measures have been incorporated into the Scheme design and/or construction methodology. Through iterative assessment, potential impacts have been assessed and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as possible. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation/mitigation by design approach has been taken into account when evaluating the significance of the potential impacts of the Scheme in terms of materials and waste.

Construction

17.8.20 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 17-1**.

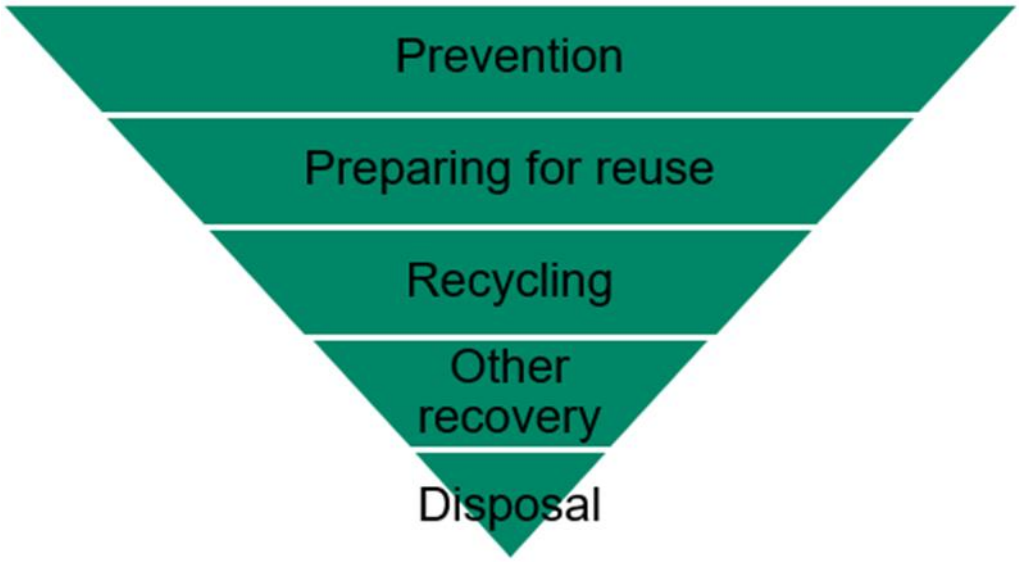

Plate 17-1 The Waste Hierarchy, from Defra's Guidance on Applying the Waste Hierarchy, recreated by AECOM

17.8.21 All management of waste will be in accordance with the relevant regulations (as outlined **Appendix 17-1: Other Environmental Topics Legislation, Policy and Guidance** of this ES **[EN10142/APP/6.2]**) 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.

17.8.22 The construction of the Scheme will be subject to measures and procedures defined within a 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. These measures are set out in the **Framework CEMP [EN010142/APP/7.8]**.

17.8.23 The construction contractor will use the **Framework CEMP [EN010142/APP/7.8]** to produce their CEMP and Site Waste Management Plan (SWMP) prior to works commencing on-site.

Operation

17.8.24 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 17-1**.

17.8.25 All management of waste will be in accordance with the relevant regulations (as outlined in **Appendix 17-1: Other Environmental Topics Legislation, Policy and Guidance** of this ES **[EN10142/APP/6.2]**) 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.

17.8.26 These measures are set out in the **Framework OEMP [EN010142/APP/7.9]**.

Decommissioning

17.8.27 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 17-1**.

17.8.28 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.

17.8.29 The decommissioning of the Scheme will be subject to measures and procedures defined within a DEMP as secured through the DCO. A **Framework DEMP** is submitted with the DCO application **[EN010142/APP/7.10]**.

Assessment of Likely Effects

17.8.30 The Scheme has the potential to affect materials and waste during construction, operation and during decommissioning, in the following ways:

a. Changes in demand for construction materials; and

b. Changes in available landfill void capacity.

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

Construction Effects

Materials

17.8.32 It is estimated that approximately 9,759 tonnes of concrete and 120,000 tonnes of aggregates would be required to construct the Scheme.

17.8.33 Internal roads are assumed to be 30,000m in length, 4m wide with 200mm of Type 1 aggregate on a base of 300mm 6F2 recycled aggregate. Quantities are converted from m^3 to tonnes based on a density of 2 t/m^3.

17.8.34 Total steel required for the Scheme has not been quantified however it is anticipated that steel reinforcement may be required for foundations (2% of total concrete volume for the Battery Energy Storage Systems (BESS) and control building) (651 tonnes). Total quantities of steel would not be large in the context of national steel availability.

17.8.35 Therefore, construction materials required to construct the Scheme are unlikely to be required in large quantities e.g., more than 1% of regional or national construction material availability (1% of national steel availability is 170,000 tonnes, 1% of regional availability of aggregates and concrete are 480,000 tonnes and 58,800 tonnes respectively). Therefore, no significant effects are anticipated.

Waste

17.8.36 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.

17.8.37 The solar panels, 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.

17.8.38 **Table 17-15** summarises the anticipated waste streams from construction, this information is based upon other similar Solar NSIPs and wastage from construction materials.

Table 17-15 Estimated Construction Waste

Waste Type	Estimated Waste Quantity	Recyclable/ Recoverable
General waste from site offices and welfare facilities	Minimal e.g. <100 tonnes	Yes
Waste from the maintenance of construction vehicles	Minimal	Yes
Hazardous waste (e.g. chemicals, batteries, solvents, oils, aerosols etc.)	Minimal	Yes
Wood (pallets)	42,000 pallets	Yes
Wood (cable drums)	30,000-40,000 cable drums	Yes
Plastic (protective foam layers)	Not quantified	Yes
Construction material wastage (assumed a 5% wastage rate for non-assembled components including concrete, aggregates, and steel)	6,520 tonnes	Yes

17.8.39 With the embedded mitigation measures in place, the overall quantities of construction waste are anticipated to be below 1% of regional inert (320,000 m^3) and non-hazardous (516,000 m^3) landfill capacity and less than 0.1% of national hazardous (7,900 m^3) landfill capacity. Therefore, the magnitude of impact is negligible, and the effect is slight, which is considered to be not significant.

17.8.40 As set out in **Table 17-14**, good and best practice waste recovery (landfill diversion) for the Scheme is likely to be above 90% for the majority of construction wastes. Therefore, the magnitude of impact is negligible, and the effect is slight, which is considered to be not significant.

17.8.41 Excavated material is not included in the construction waste estimates or when calculating the overall waste recovery rate since, where possible, the material would be reused on-site and hence will 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.

17.8.42 As the Principal Site 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 or import from/to the Principal Site. It is expected that all materials removed by cable trenching operations or in the creation of working or laydown/compound areas will 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, and would only be disposed of to landfill as a last resort, with reuse or deposit for recovery being preferred options.

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

Operational Effects

17.8.44 Materials required to operate the Scheme are unlikely to be required in large quantities e.g., more than 1% of regional or national construction material availability. Therefore, no significant effects are anticipated.

17.8.45 During operation there are expected to be small number of full time equivalent (FTE) staff with additional staffing/visitors such as maintenance workers and deliveries attending site on an ad hoc as needed.

17.8.46 Waste arisings from this day-to-day operation would include:

a. Welfare facility waste; and

b. General waste (paper, cardboard, wood etc).

17.8.47 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.

17.8.48 During operation, including maintenance activities, waste generation is expected to be negligible, since solar PV panels do not generate any waste as part of the energy production process.

17.8.49 Waste arisings associated with maintenance activities such as component replacement during the operational life of the Scheme will be managed in the same way as waste from the final decommissioning of the Scheme.

17.8.50 During the operational life of the Scheme, it is expected that there will be requirement for periodic replacement of some of the solar farm elements.

17.8.51 **Table 17-16** below summarises an indicative list of expected lifetimes of components. Replacement of key infrastructure and components is anticipated to first occur around the 10-year mark, with a gradual escalation in replacement activities. The timing of replacements can be concentrated within a brief timeframe or distributed throughout the year, depending upon stakeholder preferences and expectations.

Table 17-16. Indicative Design Life of Scheme Components

Scheme Component	Indicative Design Life	Recyclable
Solar Panels	25-40 years	Yes
Inverters	10-20 years	Yes
Racking and Mounting Systems	15-25 years	Yes
Above Ground Electrical Wiring and Cabling	25-30 years	Yes
Transformers	25-30 years	Yes
Monitoring and Control Systems	10-20 years	Yes
Batteries	5-15 years	Yes
DC/DC Converter	10-20 years	Yes
Meteorological Sensors	5-15 years	Yes
Substation Equipment	25-30 years	Yes
Communication Equipment	10-20 years	Yes

17.8.52 With the embedded mitigation measures in place, the overall quantities of operational waste are anticipated to be below 1% of regional inert (320,000 m^3) and non-hazardous (516,000 m^3) landfill capacity and less than 0.1% of national hazardous (7,900 m^3) landfill capacity. Therefore, the magnitude of impact is negligible, and the effect is slight, which is considered to be **not significant**.

17.8.53 As set out in **Table 17-14**, good and best practice waste recovery (landfill diversion) for the Scheme is likely to be above 90% for the majority of construction wastes. Therefore, the magnitude of impact is negligible, and the effect is slight, which is considered to be **not significant**.

Decommissioning Effects

17.8.54 **Table 17-17** summarises the anticipated waste streams from decommissioning. This information is based upon other similar Solar NSIP schemes and the number of solar panels.

Table 17-17 Estimated Decommissioning Waste

Waste Type	Estimated Quantity	Recyclable/Recoverable
General waste from site offices and welfare facilities	Minimal e.g. <100 tonnes	Yes
Waste from the maintenance of vehicles used during decommissioning	Minimal	Yes
Hazardous waste	Minimal	Yes
Concrete and aggregates	9,759 tonnes and 120,000 tonnes	Yes
Solar PV Panels	1,287,330 panels, 48,790 tonnes	Yes
Batteries	25,200 tonnes	Yes
Other e.g. combiner boxes, inverters, switchgear, transformers, DC/DC converters, cabling and fencing.	63,542 tonnes	Yes

17.8.55 Recycling routes are generally available for decommissioning 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.

17.8.56 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 PV panels.

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

17.8.58 As set out in the **Framework DEMP Plan [EN010142/APP/7.10]**, 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 Waste Electrical and Electronic Equipment (WEEE) Regulations (Ref. 16-1Ref. 17-33). In addition, companies like SECONDSOL offer a marketplace service for the purchase and selling of second hand 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 with the industry best practice outlined in Solar Power Europe's Lifecycle Quality Best Practice Guidance (Ref. 16-1Ref. 17-34).

17.8.59 The overall recovery rate is therefore expected to be greater than 60% (and potentially greater than 90%). Therefore, the magnitude of impact is minor or negligible, which is considered to be not significant.

17.8.60 The overall quantities of decommissioning waste sent to landfill are anticipated to be below 1% of regional inert (320,000 m^3) and non-hazardous (516,000 m^3) landfill capacity and less than 0.1% of national hazardous (7,900 m^3) landfill capacity. Therefore, the magnitude of impact is negligible, and the effect is slight, which is considered to be not significant.

Additional Mitigation Measures

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

Residual Effects

17.8.62 As no significant effects were identified in the assessment, the residual effects remain as outlined in the assessment. All effects are **not significant**.

17.9 Electric and Electro-Magnetic Fields

17.9.1 This section summarises the effects of the Scheme on electric and electro-magnetic fields. This includes any significant effects which are likely based on underground cabling. This section has been included in this ES chapter in response to comments from the Planning Inspectorate.

17.9.2 Electric fields are the result of voltages applied to electrical conductors and equipment. Fences, shrubs and buildings easily block electric fields. Electro-Magnetic Fields (EMFs) are produced by the flow of electric current; however, unlike electric fields, most materials do not readily block EMFs. The intensity of both electric fields and electro-magnetic fields diminishes with increasing distance from the source.

17.9.3 No overhead electricity cables will be used or constructed as part of the Scheme. With the exception of relatively short lengths of onsite electrical cabling connecting the solar panels and the inverters (which is typically above ground level and fixed to the mounting structure, or to other parts of nearby components), all cables will 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 **Chapter 3: Scheme Description** of this ES **[EN010142/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 electro-magnetic fields.

17.9.4 Furthermore, where the cable route is in a trenchless crossing under the River Trent and the River Till, a minimum depth of 5m from the bed of the watercourse will be maintained. This will avoid impact on fish as a result of electro-magnetic fields.

17.9.5 Onsite electrical cabling is required to connect the solar PV panels and BESS to inverters (typically via 1.5 kV cables), and the inverters to the nearby transformers (typically via 0.6/1 kV cables). The dimension of the trenches will vary depending on the number of ducts they contain but would typically be around 4m in width and around 1.2m in depth.

17.9.6 For string and DC cables, the trench will not be required to do deeper than 0.85m but can be as wide as 4m to 6m near the inverter DC inputs where several cables will be connected to the inverter (20 pairs of DC power cables).

17.9.7 The medium voltage (likely 33 kV) Interconnecting Cables are then required to transfer electricity between the transformers and the switchgear and from switchgear to the on-site substations. The dimension of the trenches will vary depending on the number of ducts/cables they contain but would up to 1m in width and up to 1.7m in depth. The routes of the Interconnecting Cables have been designed to avoid sensitive receptors as far as possible.

17.9.8 Low voltage cables between solar PV panels and the inverters will typically be fixed to the rear of the mounting structure and gathered together at the ends of rows. The grouped cables will then be inserted in underground ducting between racks and the Solar Stations. All other on-site cabling is anticipated to be underground.

17.9.9 Data / fibre optic cables will also be installed, typically alongside electrical cables to allow for monitoring during operation, communications, and the collection of data such as solar data from pyranometers.

17.9.10 The electricity is then exported from the two substations on the Principal Site, operating at 400kV/33kV to facilitate the export/import of electricity from/to the Principal Site to/from the National Grid.

Consultation

17.9.11 PINS requested the ES should demonstrate the design measures taken to avoid the potential for EMF effects from the cable and substation infrastructure on receptors within the EIA Scoping Opinion (**Appendix 1-2** of this ES **[EN010142/APP/6.2]**).

17.9.12 A summary of scoping opinion comments relating to EMFs are presented in **Table 17-18**.

Table 17-18 Scoping Opinion Responses (EMFs)

Consultee	Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate	The Scoping Report provides no consideration of EMF. In line with relevant guidance (DECC Power Lines: Demonstrating compliance with EMF public exposure guidelines, A Voluntary Code of Practice 2012), cables above 132 kilovolts (kV) have potential to cause EMF effects. The Proposed Development would require the installation of infrastructure exceeding 132kV, including 400kV cables and two 400kV substations (as stated in paragraph 3.46 of the Scoping Report). Furthermore, there is potential for exceedances of 132kV where infrastructure overlaps. The Inspectorate considers that the ES should demonstrate the design measures taken to avoid the potential for EMF effects from the cable and substation infrastructure on receptors and address the risks to human health arising from EMF to the extent that it is relevant to the nature of the development and where significant effects are likely to occur.	An assessment is presented within this chapter.	**Section 17.9** of this chapter.

17.9.13 Further consultation in response to formal pre-application engagement was undertaken through the PEI Report. No additional comments were raised with regards to EMFs during statutory consultation or subsequent targeted consultation.

Assessment Methodology

17.9.14 Underground cables eliminate the electric field altogether as it is screened out by the sheath around the cable, but they still produce EMFs. Therefore, effects of electric fields are not considered within the assessment, but effects of EMFs have been considered further.

17.9.15 The Control of Electromagnetic Fields at Work Regulations 2016 (Ref. 17-25) sets out the duties of employers in relation to controlling the risks of electro-magnetic fields to employees. This includes a requirement to assess employees' potential exposure to electro-magnetic fields with reference to action levels (ALs) and exposure limit values (ELVs). As the effects of EMFs on workers for the Scheme will be controlled and mitigated to acceptable levels through the legislative framework, impacts to workers are not considered within the assessment. The assessment therefore focusses on the potential impacts to the public.

17.9.16 The Applicant is aware that during the examination period of the Gate Burton Energy Park project a query was raised regarding the potential for electro-magnetic fields from cables running under watercourses to impact migratory fish. Due to the Cable Route Corridor crossing the River Trent there is a potential ecological connection for migratory fish between the Scheme and the Humber Estuary Special Area of Conservation (SAC) and Humber Estuary Ramsar site. Migratory fish are therefore considered in this assessment.

17.9.17 Similarly, as noted in the National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (Ref. 17-26), electric and magnetic fields have the potential to have adverse impacts on aviation**.** NPS EN-5 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. 17-31). The Scheme is not within the safeguarding zone of any safeguarded civil aerodrome as listed *on Annex 3 of the planning circular: Officially safeguarded civil aerodromes*. At the distances of separation between the underground cables and the Grid Connection Substations and potential aviation receptors, the levels of EMFs experienced by potential aviation receptors is considered to be negligible and therefore aviation receptors are not included in the assessment.

17.9.18 EN-5 (paragraph 2.9.8) (Ref. 17-26) recognises that there is little evidence that exposure of crops and farm animals to transmission line electro-magnetic fields has any agriculturally significant consequences. Therefore, consideration of the impacts to agriculture has not been included within the assessment.

17.9.19 The DECC guidance document (Ref. 17-27) states that underground cables at voltages up to and including 400 kV are considered not capable of exceeding the International Commission on Non-Ionizing Radiation Protection (ICNIRP) exposure guidelines for electro-magnetic fields (Ref. 17-30) and that compliance with exposure guidelines for such equipment can be assumed unless evidence is brought to the contrary in specific cases. However, there is potential for exceedances of 400 kV where infrastructure overlaps.

17.9.20 The onsite electrical cabling is not considered in the assessment as it would not significantly contribute to any increase in electro-magnetic fields should it overlap with other infrastructure.

17.9.21 Underground cables at voltages up to and including 400 kV are considered not to exceed the ICNIRP exposure guidelines. The National Grid guidance document (Ref. 17-28) provides data for underground 400 kV cables which has been utilised in this assessment.

17.9.22 The ICNIRP 'reference levels' for the public are 100 microteslas for electro-magnetic fields (Ref. 17-30). 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 9,000 volts per metre. They apply where the time of exposure is significant, for instance in a residence (Ref. 17-28 and Ref. 17-29). As a worst case the lower 'reference level' of 100 microteslas is used in the assessment as the threshold at which potentially significant effects could occur.

17.9.23 The National Grid guidance document (Ref. 17-28) states that for a 400 kV cable buried at 0.85m 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 10m 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 10m. 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. 17-30).

17.9.24 For context, the Energy Networks Association publication 'Electric and Magnetic Fields' (Ref. 17-29) 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 1m away, and for a TV, washing machine or microwave exposure is 50 microteslas next to these appliances and 0.2 microteslas at 1m distance.

17.9.25 Using National Grid's maximum known levels of electro-magnetic field generation for 400 kV cables, the assessment considers that as a worst case a residential receptor would need to be within 5 m of the centreline of a 33 kV Interconnecting Cable or 132 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.

Assessment of Likely Effects

17.9.26 There are no residential properties within the Order limits. The nearest properties are immediately adjacent to the Order limits, however it is unlikely that cables will be installed within 10m of any property due to the need for construction vehicles to manoeuvre both sides of the trench within the working width. Therefore, **no significant effects** to residential receptors are predicted to occur.

17.9.27 Some PRoW do cross over the proposed Principal Site and Cable Route Corridor. PRoW are shown on **Figure 12-7** of this ES **[EN010142/APP/6.3]**. The presence of the public either directly above or adjacent to underground cables associated with the Scheme would be transient, with the individuals using the PRoW exposed to electro-magnetic 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 effects** to users of PRoW are predicted to occur.

17.9.28 **Appendix 9-12: Habitat Regulations Assessment** of this ES **[EN010142/APP/6.2]** describes the migratory fish associated with the Humber Estuary SAC and the Humber Estuary Ramsar site, primarily River Lamprey and Sea Lamprey.

17.9.29 There is limited evidence regarding the impacts of electro-magnetic fields on fish and the major studies which have been undertaken are for subsea cabling rather than inland (fresh or brackish) waters. However, in its consideration of off-shore wind developments National Policy Statement EN-3: Renewable Energy Infrastructure (Ref. 17-32) 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*".

17.9.30 The combination of sealed cabling and a buried depth of at least 5 m below the bed of the River Trent is considered sufficient to reduce EMF to levels that are unlikely to be perceivable to fish species transiting along the River Trent and limited to a very small area. In addition, most species, including lamprey are known to use the entire depth range of the water column and so can also undertake avoidance behaviour via water depth selection.

Residual Effects

17.9.31 **No significant effects** were identified in the assessment.

17.10 References

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Ref. 17-5 HMSO (1990). Environmental Protection Act.

Ref. 17-6 The British Standards Institution (2011). BS 10175:2011: +A2 2017: Investigation of Potentially Contaminated Sites – Codes of Practice.

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