Tween Bridge Solar Farm

Environmental Statement
Chapter 16: Other Environmental Topics

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

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16. Other Environmental Topics

16.1. Introduction

16.1.1. The purpose of this chapter of the ES is to collate the assessment of other miscellaneous environmental topic areas that do not warrant individual chapters, either due to the brevity of the assessment or the limited impact associated with the Scheme.

16.1.2. This chapter describes and assesses the potential effects of the Scheme, in terms of:

- Major Accidents and Disasters (Section 16.2);
- Waste (Section 16.3);
- Electric and Electro-Magnetic Fields (Section 16.4);
- Climate Change Resilience and Adaptation (Section 16.5); and
- Glint and Glare (Section 16.6).

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

16.1.4. This Chapter is supported by the following technical appendices of this Environmental Statement:

- **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122];**
- **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-026];**
- **ES Appendix 16.3 – High Level Electromagnetic Fields Assessment (Human Health) [APP-124];** and
- **ES Appendix 16.4 – Climate Change Resilience and Adaptation Assessment [APP-125].**

16.2. Major Accidents and Disasters

16.2.1. This section summarises the potential effects of the Scheme on the risks of major accidents or disasters occurring. The consideration relates only to those accidents and disasters which are relevant to the Scheme.

16.2.2. A major accident is an event (for instance, train derailment or major road traffic accident) that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (i.e., contractors) to manage. Major accidents can be caused by disasters resulting from both man-made and natural hazards **[Ref 16-1].**

16.2.3. A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake, landslide, subsidence etc) with the potential to cause an event or situation that meets the definition of a major accident **[Ref 16-1].**

Policy and Guidance Context

16.2.4. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ("EIA Regulations") **[Ref 16-2]**, cite two specific directives as examples of types of risk assessments to be considered as part of an Environmental Impact Assessment (EIA). These are the Directive 2012/18/EU of the European Parliament and of the European Council **[Ref 16-3]** (which deals with major accident hazard registered sites) and the Council Directive 2009/71/Euratom **[Ref 16-4]** (which deals with nuclear sites). Neither of these Directives are relevant to the Scheme.

16.2.5. Additionally, the EIA Regulations (Regulation 5(4) and paragraph 8 of Schedule 4 to the EIA Regulations) require consideration to be given to the risks of major accidents and disasters, but the EIA Regulations do not include a definition of these terms.

16.2.6. Overarching National Policy Statement for Energy (NPS) EN-1 identifies how some energy infrastructure will be subject to the Control of Major Accidents Hazards (COMAH) Regulations (2015) **[Ref 16-31]**. These Regulations aim to prevent major accidents involving dangerous substances and limit the consequences to people and the environment of any that do occur. The Scheme does not fall within the requirements of the COMAH Regulations as there will be no storage, handling or processing of specified dangerous substances, as per the COMAH Regulations.

16.2.7. Paragraph 4.4.4 of NPS EN-1 requires the decision maker to consider potential effects of development proposals on human health, stating:

"where the proposed project has an effect on humans, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate."

16.2.8. The IEMA Guidance 'Major Accidents and Disasters in EIA: A Primer' **[Ref 16-1]** has been referred to in preparation of this chapter. No set matrix approach scale is provided in the guidance, instead, factors are set out to be considered in the determination of significance through the expert judgement of the team.

16.2.9. A further example is provided in the IEMA Guidance 'Major Accidents and Disasters in EIA: A Primer' that the:

"significance threshold could be set at anything that causes the loss of life or permanent injury, and/or permanent or long-lasting damage to an environmental receptor."

16.2.10. This significance assessment approach has been adopted.

Consultation

16.2.11. In undertaking the assessment of Major Accidents and Disasters, consideration has been given to the **ES Appendix 1.1 – Planning Inspectorate EIA Scoping Opinion [APP-057]** issued by the Planning Inspectorate on 14 March 2023 and statutory consultation responses received as detailed in **Table 16-1** and **Table 16-2** below.

16.2.12. The following major accidents and disaster comments were provided in the Planning Inspectorate Scoping Opinion dated 14 March 2023 (**Table 16-1**).

Table 16-1: EIA Scoping Consultation Responses for Major Accidents and Disasters

Id	Ref	Matter	Summary Of Planning Inspectorate Comments	Applicant's Response
3.1.1	Table 3.4	Major Accident and Disaster	The Scoping Report proposes that major accidents and disasters will be assessed within ES	The Applicant confirms that **ES Chapter 16 Other Environmental**

	and 3.5		Chapter 16 (Other Environmental Topics'), rather than in a standalone ES Chapter. The Inspectorate has considered the nature and characteristics of the Scheme and is content with this approach.	**Topics [Document Reference 6.2.16, Revision 2]** of the ES follows the approach set out in the Scoping Opinion, and no standalone ES Chapter is provided.
3.1.2	Table 3.4	Major Accident and Disaster - Methodology	Table 3.4 of the Scoping Report states that a proportionate assessment of risks from major accidents and disasters during construction, operation and decommissioning of the Scheme will be included in the ES, although a proposed assessment methodology has not been set out. The ES should describe the baseline, relevant receptors and methodology applied to the assessment of major accidents and disasters (including how significance of effect has been determined), with reference to relevant guidance.	The Major Accidents and Disasters section of this ES Chapter has been prepared in line with the guidance set out by the **Planning Inspectorate EIA Scoping Opinion [APP-057].** The Applicant confirms that **ES Chapter 16 Other Environmental Topics [Document Reference 6.2.16, Revision 2]** of the ES follows the approach set out in the Planning Inspectorate EIA Scoping Opinion.
3.1.3	n/a	Major Accident and Disaster - Potential accidents and disasters	The potential accidents and disasters which the Applicant considers to be relevant to the Scheme have not been defined at this stage.	The Major Accidents and Disasters section of this ES Chapter has been prepared in line with the guidance set out by the **Planning**

			The ES should explain the approach taken to identify relevant risks/ hazards.	**Inspectorate EIA Scoping Opinion [APP-057]**. The approach taken to identify the hazards is set out within the 'Assessment Methodology' section (paragraph 16.2.14-16.2.23) of the Major Accidents and Disasters section of this ES Chapter.
			The Inspectorate considers that the ES should assess the risk of fire/ explosion at the BESS, including any measures designed to minimise impacts on the environment in the event of such an occurrence. Any mitigation measures relevant to safety risks associated with the BESS, such as an Outline Battery Safety Management Plan, should be described in the ES and their delivery secured through the dDCO. Effort should be made to agree any necessary measures with relevant consultation bodies.	The Major Accidents and Disasters section of this ES Chapter assesses the risk of fire/ explosion due to the presence of the BESS. Embedded mitigation through the careful design of the Scheme and additional mitigation measures are secured by Requirements in the DCO in the unlikely event of an uncontrolled fire through the following documents - **Outline Construction Environmental Management Plan [Document Reference 7.1**

				Revision 3], Outline Environmental Decommissioning Plan [Document Reference 7.3 Revision 3], and Outline Battery Safety Management Plan [APP-179]. The Applicant has consulted with the Humberside Fire and Rescue Service and South Yorkshire Fire and Rescue Service in regard to the measures outlined in the **Outline Battery Safety Management Plan [APP-179]** and will continue liaison post submission of the DCO application and into the construction stage (if the DCO is granted).
			The ES should also assess risks to and from any Major Accident Hazard Pipelines and Major Accident Hazard sites that may be impacted listed in Northern Gas Networks and Health and Safety Executive (Appendix 2 of the	The Major Accidents and Disasters section of this ES Chapter considers risk of the Scheme to and from any relevant Major Accident Hazard Pipelines and Major Accident Hazard

			Planning Inspectorate Scoping Opinion)	sites that may be impacted.

16.2.13. The following major accidents and disaster comments were provided in statutory consultation responses (**Table 16-2**).

Table 16-2: Statutory Consultation Responses for Major Accidents and Disasters

Consultee	Summary Of Statutory Consultee Comments	Applicant's Response
Health and Safety Executive	According to HSE's records, the proposed DCO application boundary for the Scheme 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 Ref #3319 operated by H Burtwistle & Sons, Causeway Farm, Thorne, South Yorkshire, DN8 5RY. The major accident hazard pipeline is HSE Ref #7031, Transco Ref 1302, Operator National Gas, Pipeline 7 Feeder Eastoft / Susworth West. The Applicant should make contact with the above operators, to inform an assessment of whether or not the	The relevant statutory undertakers have been contacted. The design of the Scheme has been refined to allow appropriate offsets for all hazards identified within the Order Limits. Consultation with Mr H Burtwistle has confirmed that the HSE record relates to the ammonium nitrate storage facility used for farm fertiliser. They now use a different type of liquid fertiliser so ammonium nitrate is no longer stored at this site. As such, no significant risks have been identified. Further information on consultation undertaken is provided within the **Consultation Report [APP-022].**

	Scheme is vulnerable to a possible major accident.	

Assessment Methodology

16.2.14. In general, major accidents or disasters, as they relate to the Scheme, fall into three categories:

- Events that could not realistically occur, due to the nature of the Scheme or its location;
- Events that could realistically occur, but for which the Scheme, and associated receptors, are no more vulnerable than any other development; and
- Events that could occur, and to which the Scheme is particularly vulnerable, or which the Scheme has a particular capacity to exacerbate.

16.2.15. An exercise was undertaken to identify all possible major accidents or disasters that could be relevant to the Scheme within the Order Limits. The National Risk Register[1] **[Ref 16-32**] identifies risks that could affect the UK. A long list of potential major accidents or disasters was established utilising the National Risk Register. Major accidents or disasters with little relevance in the UK were not included, such as volcanic eruptions, for example. **Table 16-3** details the long-listed major accidents and disasters relevant to the Scheme and shortlists those considered for further assessment in this Chapter.

16.2.16. For the purpose of this assessment, major accidents or disasters have been defined as an event that threatens immediate or delayed loss of life or permanent injury/or serious long lasting or permanent damage to the environment and requires the use of resources beyond those of the Applicant to manage. These could be internal to the development or an external event, not in the applicant's control, which could affect the scheme. 'Accidents' are an occurrence resulting from uncontrolled developments in the course of construction, operation, and decommissioning (e.g., major emission, fire or

[1] The National Risk Register (NRR) is the external version of the National Security Risk Assessment (NSRA), which is the government's assessment of the most serious risks facing the UK

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

16.2.17. Major events therefore includes both man-made and naturally occurring events. The assessment of the reasonably foreseeable worst-case environmental consequence is the likelihood for significant effects.

16.2.18. The Scheme is not likely to cause a major accident or risk of disaster during either the construction, operation or decommissioning phases. In the context of this section, as set out in the IEMA's guide Major Accidents and Disasters in EIA: A Primer, typical methods employed within EIA to define significance are not applicable. By definition, a major accident or disaster would have a significant effect on the environment. Accordingly, any risks that could result in a major accident or disaster without suitable mitigation, management or regulatory controls in place will be assessed as significant.

16.2.19. The significance criteria for major accidents and disasters has therefore been based on professional judgement of the Applicant and their consultant team. This is an accepted approach as set out in the IEMA Guidance 'Major Accidents and Disasters in EIA: A Primer,' based on the guiding factors to determine significance of effect, including:

- The geographic extent of effects (effects beyond the development boundaries are more likely to be considered significant);
- Duration of effects (effects which are permanent (i.e., irreversible) or long-lasting are more likely to be considered significant);
- Severity of effects in terms of numbers;
- Degree of harm to those affected and the response effort required;
- Sensitivity of the identified receptors; and
- The effort required to restore the affected environment (effects requiring substantial clean-up or restoration efforts are more likely to be considered significant).

16.2.20. Any identified major accidents and disaster risks deemed requiring further assessment in this Chapter are assessed as significant if there is a high likelihood of loss of life or permanent injury, and/or permanent or long-lasting damage to an environmental receptor based upon professional judgement.

16.2.21. With regards to vulnerability, low consequence events do not meet the definition of major accidents or disasters. For example, minor spills which may occur during construction, but would be limited and temporary in nature would not meet the definition of a major accident. These low consequence / or low risk events would not threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment that require the use of resources beyond those of the client or its appointed representatives to manage. These have therefore been scoped out of the assessment and will be dealt with at the appropriate time.

16.2.22. The risks and potential effects that are knowingly caused by the development which can be quantified and assessed, such as noise and potential for traffic accidents are also taken into account within ES Environmental Aspect Chapters and as such haven't been replicated in the Major Accidents and Disasters assessment (see **Table 16-3** for details). Such events would also be dealt with under the Applicant's compliance with environmental working practices and legislative requirements, including: -

- Construction (Design and Management) Regulations 2015 **[Ref 16-6]** (CDM Regulations) - The CDM Regulations place legal duties on almost all parties involved in construction work. The regulations place specific duties on clients, designers, and contractors, so that health and safety is taken into account throughout the life of a construction project from its inception to its subsequent final demolition and removal. Under the CDM Regulations, designers have to avoid foreseeable risks so far as is reasonably practicable by eliminating hazards during the three phases of development namely, the construction phase, its proposed use / operational phase; and subsequent demolition / site restoration.

- Management of Health and Safety at Work Regulations 1999 **[Ref 16-7]** - The Management of Health and Safety at Work Regulations 1999 reinforce employer's duties to manage health and safety and apply to all work activities. The principle of risk-based assessment provides the cornerstone for management of health and safety and all employers are required to undertake risk assessments.

- Health and Safety at Work etc. Act 1974 **[Ref 16-8]** - The Health and Safety at Work etc. Act 1974 provides the framework for the regulation of workplace health and safety in the UK. It places general duties on employers, people in control of premises, manufacturers, and employees. The overriding principle is that foreseeable risks to people will be reduced so far as is reasonably practicable.

Table 16-3: Long list of potential Major Accidents and Disasters associated with Scheme

Risk	Potential Risk and Receptor	Applicant Response
Health and Safety at Work	Risk of accidents for workers during the construction and decommissioning of the Scheme	Shortlisted and considered further in the Major Accidents and Disasters section of this Chapter.
Flooding	Risk of flooding within the Order Limits and its potential to exacerbate flooding to nearby properties and infrastructure	This is assessed within **ES Chapter 10 Water Resources [Document Reference 6.2.10, Revision 2].**
Fire	Risk of fire from Scheme	Shortlisted and considered further in the Major Accidents and Disasters section of this Chapter.
Road accidents	Risk to road users in the area from increased traffic and slow-moving vehicles.	This is assessed within **ES Chapter 12 Transport and Access [APP-049]**
	Risk posed by spillage of hazardous loads from road traffic accidents during construction/decommissioning on the environment	This is assessed within **ES Chapter 10 Water Resources [Document Reference 6.2.10, Revision 2].**
	Risk from glint and glare to affect road users	This is assessed within **ES Appendix 16.1 & 16.2– Glint and Glare Assessment [Document Reference APP-122 & REP1-025]** and

		summarised in the Glint and Glare section of this Chapter.
Trenchless works affecting the integrity of the rail, canal, and highway	Risk of accident as a result of the cable route affecting the integrity of existing infrastructure of railway, canal, and motorway.	Shortlisted and considered further in the Major Accidents and Disasters section of this Chapter.
Aviation accidents	Risk from glint and glare to affect pilots and aircraft	This is assessed within **ES Appendix 16.1 & 6.2– Glint and Glare Assessment [Document Reference APP-122 & REP1-025]**) and summarised in the Glint and Glare section of this Chapter.
Utilities failure	Risk of utilities failure to affect employees and local residents	Shortlisted and considered further in this section of the Chapter.
Plant disease	Biosecurity risks from new planting to habitats and species	This is assessed within **ES Chapter 7 Ecology and Nature Conservation [Document Reference 6.2.7, Revision 3]**.
Criminal damage	Risk of sabotage/criminal activity and the effects of preplanned damage to the Scheme.	Shortlisted and considered further in the Major Accidents and Disasters section of this Chapter.
Unexploded Ordnance (UXO)	Risk of disrupting buried UXO	This is assessed within **ES Chapter 9 Ground Conditions [APP-046]**.

16.2.23. The following shortlisted major accidents and disasters to be considered further in this ES Chapter are:

- Health and safety at work;
- Trenchless works and existing infrastructure;
- Fire;
- Utilities failure (gas, electricity, water, sewage, oil, communications);
- Criminal damage; and
- Glint and Glare (detailed in Glint and Glare section of this chapter).

Baseline Conditions

16.2.24. 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: -

Table 16-4: Receptor for assessment for Major Accidents and Disasters

Receptor	Receptor within or adjoining Land Parcel[2]				
	A	B	C	D	E
Towns, villages, and isolated dwellings / farmhouses	x	x	x	x	x
Tween Bridge Wind Farm.	x				
Commercial sites and buildings	x	x	x	x	x
Strategic Road - M180				x	x
Strategic Road – A18			x	x	x

[2] Land Parcel Plan, ES Figure 1.2 [Document Reference 6.4.1.2]

Local Roads	x	x	x	x	x
Railway	x	x	x		
Canal	x	x	x		
Public Right of Way	x	x	x	x	x
Designated Ecological sites, woodland, farmland, and waterbodies	x	x	x	x	x
Underground infrastructure including electricity, water, communications, and gas	x	x	x	x	x

Assessment of Likely Effects

Construction and Decommissioning phase

Health and Safety at Work

16.2.26. There are various health and safety considerations particularly for workers during construction and decommissioning of the Scheme. As a result, workers are considered to be the most at-risk group. However, the risk both to construction/decommissioning workers and the general public across all Land Parcels (A, B, C, D & E) in the Order Limits is low and not significant during the construction and decommissioning phases.

16.2.27. Comprehensive health and safety assessments are an essential part of the construction/decommissioning process and would be carried out prior to construction/decommissioning by the contractor in accordance with legislation. A Construction, Design and Management (CDM) co-ordinator will be appointed responsible for the provision of a pre-construction information pack, as required under the CDM Regulations 2015 **[Ref 16-6]**. The appointed contractor will be required to provide a construction plan and will include measures such as the implementation of a risk management system on within the Order Limits.

16.2.28. The construction of the Scheme will be managed in accordance with the Health and Safety at Work Act 1974, and will comply with all other relevant Health and Safety Regulations, including:

- The Construction (Health, Safety and Welfare) Regulations, 1996 **[Ref 16-9]**;
- CDM Regulations 2015 **[Ref 16-6]**; and
- Electricity Safety, Quality and Continuity Regulations 2002 **[Ref 16-10].**

16.2.29. Construction/decommissioning work that is managed and complies with the above set of regulations will reduce the risk to workers due to the legal protection required by these. **No significant effects** are therefore anticipated.

Trenchless Works and Existing Infrastructure

16.2.30. Cabling would need to cross existing infrastructure, which include the railway line connecting Doncaster to Scunthorpe, the Keadby Canal (cable connecting land parcels A to C) and the M180 (underground cable connecting Land Parcels D to E). Trenchless techniques, such as horizontal directional drilling (HDD), will be used to construct the crossing of the cable route (as required); therefore, the works will be undertaken deep below the crossing and a distance either side, not interfering with the operations of the existing infrastructure. The locations of the HDD crossings are illustrated at **ES Figure 2.4 Indicative HDD Crossing Plan [APP-137]** and detailed in **ES Chapter 2 Scheme Description [APP-039].**

16.2.31. The construction and decommissioning of relevant underground cable crossings will be managed to the specific requirements for the relevant party and therefore the risk of a rail accident as a result of the crossing will be minimised. Therefore, **no significant effects** on rail accidents are anticipated.

16.2.32. The Applicant is in liaison with Network Rail, Canal Trust and National Highway to inform relevant easement requirements and the Applicant expects to put in place protective provisions in the DCO for the benefit of the relevant parties.

16.2.33. Additionally, underground cabling running from the main on-site 400kV RWE Substation in Land Parcel E to the edge of the Order Limits is assessed. It is anticipated that a cable plough or open trenching works would be used to install the 132 kV and 400kV cables, and HDD (or other trenchless methods) would be required in more constrained locations.

Fire

16.2.34. Health and Safety within the Order Limits would be managed by the contractor during construction and decommissioning to mitigate the risk of equipment failure that could lead to a fire risk in line with legislative safety requirements.

16.2.35. The risk of fire from Battery Energy Storage System (BESS) is low, and to a lesser extent for workers during the construction and decommissioning phase that onsite employees during the operational phase. The BESS will be containerised and will arrive within the Order Limits as modular units. They can also be carted out of the Order Limits as modular units at the time of decommissioning. This significantly reduces the risk of damage during installation.

16.2.36. It is intended that after the maximum 40-year operational life of the Scheme, the solar PV modules, BESS, and associated equipment will be removed from the Order Limits, removing the risk of fire.

16.2.37. The risk of fire is therefore anticipated to be small, and the Applicant will keep this under review until the detailed design stage. With the above mitigation, **no significant effects** are anticipated, and the risk of fire would be low.

Utilities failure

16.2.38. The potential exists for utilities to be affected during the construction/decommissioning of the Scheme through damage caused as a result of excavation and engineering operations.

16.2.39. For workers working in the immediate vicinity of a gas or high voltage electricity utility asset, the potential impacts are physical injury or death as a result of a utility strike. For communities dependent on the utility assets, the potential impact is the disruption to services provided by the assets.

16.2.40. Prior to the relevant construction and decommissioning phases, the Applicant and appointed Contractor will review the locations and alignments of the utilities using utilities plans and use them to inform the plans for the proposed works to ensure all known utilities are avoided, or otherwise managed in accordance with the protective provisions in the DCO and the CEMP.

16.2.41. Without any precautionary measures to avoid damage to utilities, this could lead to a short-term adverse effect. However, such risks will be minimised by:

- Locating the Scheme outside of utilities' protected zones, for example appropriate easement to the existing National Grid high voltage electricity overhead lines (400kV Drax to Keadby electricity transmission)

including a 15m tower stand-off in accordance with National Grid requirements;

- The use of ground penetrating radar before excavation to identify any unknown utilities;
- Consultation and agreement of construction/demobilisation methods with the relevant statutory undertakers (as required by the protective provisions in the DCO) prior to relevant works commencing;
- Good construction practices to manage the risk to any minor utilities which are not mapped by utilities companies;
- The Applicant will seek to enter into discussion with National Grid for the purpose of agreeing the relevant easement requirements and the protective provisions to protect National Grid's assets within the Order Limits.

16.2.42. These measures would reduce the likelihood of effects on utilities during construction and decommissioning.

16.2.43. Where high-voltage electricity cables are present, no Scheme infrastructure will be placed within a range of varying distances depending on the voltage of the cable and development component. Signage and height-restricted gates will be placed around high voltage power lines during construction/decommissioning to ensure that all construction vehicles adhere to the cable clearances.

16.2.44. The decommissioning phase would require below ground works to remove the infrastructure within the Order Limits; however, there is potential for buried cables to remain in situ. Works would be undertaken within the footprint excavated during construction. The embedded mitigation measures used during construction (see paragraph 16.2.41 above) would also apply during decommissioning and therefore no adverse effects are predicted during decommissioning.

16.2.45. Engagement is also ongoing with all statutory undertakers with apparatus with the potential to be affected by the Scheme to seek agreement regarding the protective provisions that are included in the DCO.

16.2.46. **No significant effects** are therefore anticipated.

Criminal Damage

16.2.47. It is anticipated that the Scheme would be managed by the contractor during construction and decommissioning to mitigate the risk of criminal activity, in line with the final CEMP and DEMP.

16.2.48. The design includes safety measures to protect the land within the Order Limits from criminal damage, such as CCTV cameras adjacent to the perimeter fencing for security, installed at the beginning of construction to provide surveillance during the construction period. It is anticipated that the CCTV system would have motion detection technology for recording and pointed directly within the Order Limits and away from any land outside of the Order Limits. Perimeter fencing will enclose solar PV module areas, BESS compounds, substation compounds and temporary fencing associated with construction compounds. The perimeter fencing will be stock wire deer fencing up to 2m in height, with wooden posts piled into the ground. The BESS compounds and substation compounds will be palisade security fencing up to 2.4m in height, fixed into the ground with concrete. See Indicative Layouts and Cross Sections Plans, **Figure 2.6 [APP-139].** In general, it is anticipated that the Scheme would not be lit, however, sensor triggered security lighting would be required around key electrical infrastructure.

16.2.49. Therefore, the Scheme is expected to have **no significant effect** on the environment as a result of criminal damage during construction and decommissioning.

Operational Phase

Health and Safety at Work

16.2.50. The Scheme would operate in accordance with the Health and Safety Executive 'Health and safety in the new energy economy: Meeting the challenge of major change' published in August 2010 **[Ref 16-11].**

16.2.51. Maintenance activities associated with the Scheme will be performed in accordance with relevant legislation. For example, any equipment required to be used (e.g., washing systems) will be appropriately handled, and employees will be trained. No significant effects are anticipated in this regard.

16.2.52. Traffic during the operational phase will consist of movements by staff that will supervise the operation and maintenance of the Scheme, and if sheep grazing occurs during the operational lifetime of the Scheme, those that attend the sheep as the pasture around the solar array will form part of any sheep farming enterprise. This is unlikely to involve HGVs and considered to be of negligible

magnitude, and hence any related effects will be not significant (see **ES Chapter 12 Transport and Access [APP-049]** for further details).

Trenchless Works and Existing Infrastructure

16.2.53. Trenchless techniques, such as HDD, will be used to construct the crossing of the cable route under the railway, canal and M180 during the construction phase of the scheme. The works will be undertaken deep below the crossing and a distance either side, not interfering with the operations of transport mode. The underground cable crossing will be designed to meet the specific requirements of the relevant parties and therefore the risk of accident to users of the transport node as a result of the works will be minimised. No ongoing management of the cable route is expected during the operational phase and therefore, **no significant effects** on existing infrastructure are anticipated.

Fire

16.2.54. When operational, the majority of the Scheme will comprise solar PV modules which are inert. Electrical infrastructure will be located across the Order Limits, in the form of inverters, transformers and cabling, all of which will be the subject of routine maintenance such that it is not considered to pose a significant risk to creating an accident or disaster.

16.2.55. The substation compounds, which will include transformers, and switchgear will be subject to routine maintenance such that it is not considered to pose a significant risk of creating an accident or disaster.

16.2.56. The Scheme has been designed to include BESS. The BESS compounds will include batteries, inverters, and system controllers. There are potential operational hazards associated with BESS infrastructure such as a thermal runaway fire event in a BESS container due to electrical/battery fault, arson or lightning strike (result of severe weather), and separately if the BESS containers are flooded due to severe weather it could lead to polluted runoff water (see **ES Chapter 10 Water Resources [Document Reference 6.2.10, Revision 2]** for further details).

16.2.57. Key receptors that could be affected are ecological receptors (flora and fauna), human receptors in the local area and emergency responders (including fire service staff).

16.2.58. Potential effects on these receptors in an uncontrolled fire would be temporary displacement of species caused by any smoke, with some potential

abandonment of bird nests resulting in chick mortalities if a fire occurred during nesting season. However, large-scale mortality or morbidity is unlikely.

16.2.59. Sufficient buffer zones surrounding and between the BESS containers mean that there is no pathway for a fire to propagate to hedgerows or nearby woods and so no direct impacts due to fire are likely and as such, this risk event is unlikely to constitute a significant effect in relation to major accidents and disasters upon ecological receptors.

16.2.60. For human residential receptors, whilst smoke from an uncontrolled fire event would disperse to some extent over the >300m distances from BESS containers to the receptors, there is the potential for minor health impacts on residents such as aggravation of pre-existing respiratory conditions in the unlikely event of a fire. However, given that serious injuries or fatalities are unlikely due to the large separation distances involved and low risk of a fire, this risk event (i.e., an uncontrolled fire in one BESS Enclosure) is unlikely to constitute a significant effect in relation to major accidents and disasters upon residential receptors.

16.2.61. For emergency response personnel, there is the possibility of loss of life and/or permanent injury from an uncontrolled fire in the unlikely event of an explosion whilst they are in close proximity to the BESS containers: however, as the BESS containers are designed to release such explosive pressure upwards via roof vent panels instead of horizontally, the possibility of loss of life and/or permanent injury to emergency responders is low. Again, due to the low risk of loss of life and/or permanent injury, an uncontrolled fire is unlikely to constitute a significant effect in relation to major accidents and disasters upon emergency responders.

16.2.62. Specific control measures within the BESS containers are dependent on the technology selected at the detailed design stage, post-consent. The following measures could be included and implemented; however, this will be confirmed in the final Battery Safety Management Plan, broadly in line with the **Outline Battery Safety Management Plan [APP-179].** A list of potential fire protection for battery technologies that could be implemented is outlined below

- BESS equipped with an FFSS (Fire Fighting Suppression System) inside each BESS container. An FFSS includes a smoke detector, control panel, alarm device, exhaust pipe and bump head. It uses clean fire suppression gas to minimize the second loss. Before gas blow-out, the system controller will send a signal to the HVAC main power switch to stop working as well as isolating the fans and thus achieve fire suppression process.

- The manufacturer undertakes extensive testing and analysis to assess fire risk;
- Do not install batteries where temperatures routinely approach or exceed 45C – this is not the case for the Scheme and site location;
- Do not install batteries near heating equipment or heat sources – this is not the case for the Scheme and Order Limits;
- The Scheme design will include separation distances between BESS containers to ensure that an isolated fire would not become widespread and lead to a major incident.
- Protect the installation area from flooding, which may cause electrical fires – the risk of flooding is assessed **in ES Chapter 10 Water Resources [Document Reference 6.2.10, Revision 2]** and the **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.4.10.1, Revision 3]** , and mitigation measures to protect it from flooding have been recommended which will be developed as part of the detailed design; and
- Ensure that installation areas comply with the appropriate local fire, electrical and building code requirements – this would be the case with the Scheme.

16.2.63. It is intended the Scheme would be self-sufficient during a potential battery-based fire and would not require fire service intervention to prevent fire spread or any other significant risks to people or property.

16.2.64. The Applicant will continue to monitor developments in technological and regulatory advancements for BESS to ensure that the final design of the BESS complies with any future amendments to the minimum fire and safety standards.

16.2.65. The guidance documents that will be relevant for the final design are:-

- Allianz Risk Consulting (ARC), Tech Talk Volume 26 (2019). Battery Energy Storage Systems (BESS) using Li-ion batteries **[Ref 16-12]**
- Institute of Engineering and Technology - Code of Practice for Electrical Energy Storage Systems (August 2017) **[Ref 16-13]**
- The Energy Institute: Battery Storage Guidance Note 1 - Battery Storage Planning (August 2019) **[Ref 16-14]**

- Safety requirements for grid-integrated EES systems — Electrochemical based systems. IEC 62933-5-2:2020 **[Ref 16-15]**
- National Fire Protection Association (NFPA) 855, Standard for the Installation of Stationary Energy Storage Systems, 2020 edition **[Ref 16-16]**
- UN 'Recommendations on the Transport of Dangerous Goods' – Section 38.3 covers Lithium-Ion Batteries. **[Ref 16-17]**

16.2.66. Therefore, the risk of fire is small and therefore not likely to lead to any major accidents or disasters as this has been mitigated by the design of the equipment and the design of the Scheme, and therefore **no significant effects** are anticipated.

Utilities failure

16.2.67. The potential exists for utilities to be affected during the operation of the Scheme through damage caused as a result of maintenance operations. However, effects are expected to be to a lesser degree than the construction and decommissioning stages of the Scheme because no below ground works/ additional engineering works are likely to be required during operation.

16.2.68. Existing utilities traversing the Order Limits include overhead pylons. The design of the Scheme will provide appropriate buffers, and the Applicant will seek to discuss and agree the relevant provisions during the detailed design stage as required. The operators will run their own maintenance programme which will include their own Health and Safety programme and procedures to implement.

16.2.69. Through careful design consideration of the Scheme, and operators following implemented site management and Health and Safety procedures, the risk of impact is considered unlikely and **not significant**.

Criminal damage

16.2.70. If the Scheme were to be damaged through pre-planned criminal activity, the risk of a major accident occurring within the Order Limits may increase. The design will ensure that the BESS and substation compounds and solar PV areas are secure to minimise the potential for damage to occur through criminal activity. Embedded mitigation will include fencing, CCTV cameras and sensor-triggered security lighting in critical areas.

16.2.71. There will also be a commissioning phase of testing undertaken prior to the operation phase to ensure that all equipment is operating correctly. The Scheme will be remotely managed, and this will include intruder security alert.

16.2.72. Furthermore, the Scheme does not process or include large scale chemicals and therefore criminal damage to the infrastructure is unlikely to lead to a large-scale leak, explosion, or other major event. Therefore, the Scheme is expected to have **no significant effect** on the environment due to the risk of a major accident occurring as a result of criminal activity during operation.

16.2.73. Applicant will also seek to use construction best practices in relation to storing materials in an adequate and protected place on site to prevent waste from criminal damage, as secured in the CEMP.

Mitigation and Enhancement

16.2.74. Minimising the risk of major accidents during construction and decommissioning will be addressed through appropriate risk assessments as required in the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3], Outline Operational and Environmental Management Plan [APP-177],** and the **Outline Decommissioning Environmental Management Plan [Document Reference 7.3 Revision 3]** of this Environmental Statement. The implementation of those plans is secured via requirements in the DCO.

16.2.75. The **Outline Battery Safety Management Plan [APP-179]** has been produced for the Scheme to reduce the risk of fire and propagation within the BESS compounds. A final Battery Safety Management Plan (secured via DCO requirement) will be implemented prior to the installation any BESS and implemented through the operational phase, once detailed design is confirmed.

16.2.76. Once the system is commissioned, regardless of the technology used, the whole installation will be monitored continuously at a central hub where engineers and technology experts will ensure that it is operating optimally and safely 24 hours a day, 7 days a week.

16.2.77. The preventative measures included in the design of the BESS compounds and associated systems are such that an uncontrolled battery fire event is highly unlikely, and as such a significant effect upon the identified receptor from such is unlikely in relation to major accidents and disasters.

16.2.78. In regard to accidents from trenchless works affecting the integrity of existing infrastructure of railway, canal and highway liaison with relevant statutory

undertakers is underway, and the Applicant expects to put in place protective provisions in the DCO.

Residual Effects

16.2.79. Given the nature of accidents and disasters, there is the potential for significant effects if an event does occur, however, the assessment has concluded that the risk of such events occurring is low for the Scheme, and no significant residual effects on the environment are therefore anticipated. On the rare occasion that a major accident or disaster does occur, the significance of the effect would correlate to the scale of the major accident or disaster event.

16.2.80. The focus is on prevention of major accidents and disasters, and mitigation if an event does occur. Considering the good industry practice and the proposed embedded design mitigation measured discussed above, the risk of accidents and disaster events at the Scheme is considered low and **not significant.**

16.3. Waste

16.3.1. This section sets out the approach to waste management. 'Waste' is defined as material assets that are unwanted, having been left over after the completion of a process which would otherwise be discarded. Waste also covers substances or objects, which fall outside of the commercial cycle or out of the chain of utility. In particular, most items that are sold or taken off site for recycling are wastes, as they require treatment before they can be resold or reused.

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

16.3.3. Waste minimisation is the process of reducing the quantity of such materials arising, requiring processing and/or disposal. The waste hierarchy ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last of all disposal.

16.3.4. The priority of the Scheme will not be producing waste in the first place. To do this, the implications of the proposals need to be considered at the earliest possible stage.

Policy and Guidance Context

16.3.5. The Overarching National Policy Statement for Energy (NPS EN-1) **[Ref 16-5]** considers Waste Management at section 5.15 and sets out the assessment requirements which applicants should consider with regards to waste arisings for the construction and operational phase of development. NPS EN-1 notes:

"…where possible applicants are encouraged to source materials from recycled or reused sources and use low carbon materials, sustainable sources and local suppliers." Furthermore, applicants are "…encouraged to use construction best practices in relation to storing materials to prevent waste… The use of Building Information Management tools to record the materials used on construction can help to reduce waste during the decommissioning phase."

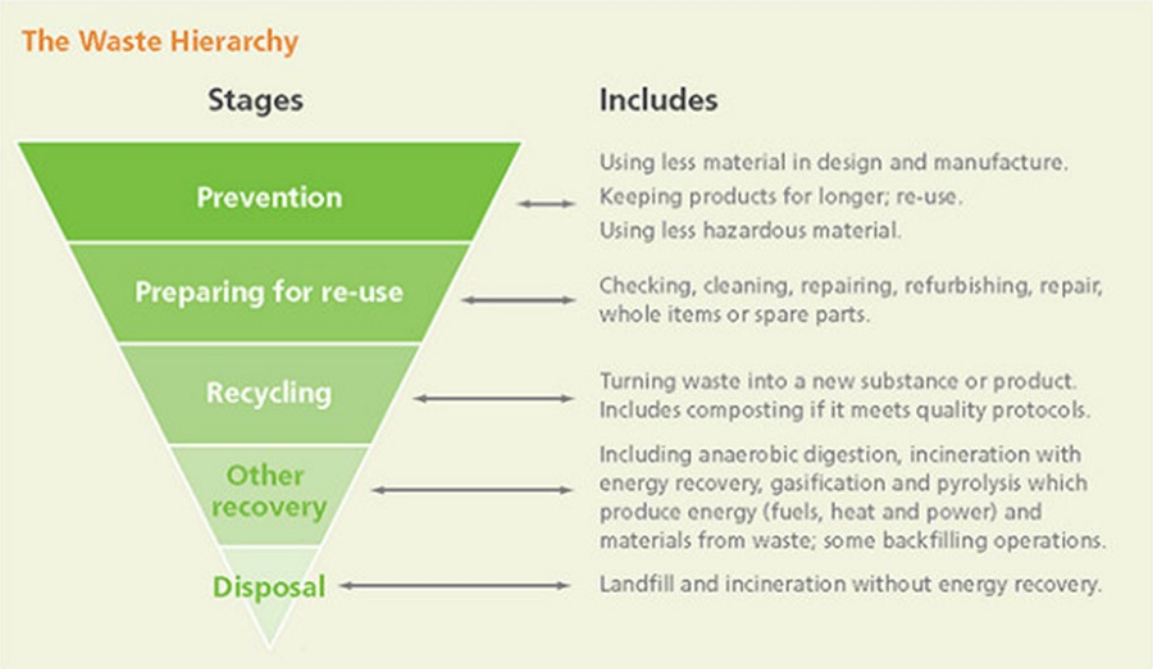
16.3.6. NPS EN-1, notes at 5.14.2, how sustainable waste management is to be implemented through the waste hierarchy setting out the priorities that must be applied when managing waste.

- prevention

- preparing for reuse
- recycling
- other recovery, including energy recovery
- disposal

16.3.7. Disposal of waste should only be considered where other waste management options are not available or where it is the best overall environmental outcome.

16.3.8. The waste hierarchy is noted at paragraph 5.15.2 of NPS EN-1 and shown below at **Figure 16-1**.



Source: DEFRA (2011) Guidance of applying the Waste Hierarchy

Figure 16-1: The Waste Hierarchy

16.3.9. The Waste Framework Directive (WFD) 2008 **[Ref 16-18]** is the legislative framework for the collection, transport, recovery and disposal of waste across the European community.

16.3.10. Schedule 1 of the Waste (England and Wales) Regulations 2011 **[Ref 16-19]** translates the provisions of the WFD into legislation and require waste prevention programmes and waste management plans that apply the 'Waste Hierarchy' to guide the principle to sustainable waste management.

16.3.11. The Waste Management Plan for England (WMPE) 2021 **[Ref 16-20]** is a high-level strategy that supersedes the former Waste Strategy 2013 and supports the implementation of the objectives and provisions set out within the revised WFD, specifically Article 28 which requires that Member States must establish one or more waste management plans covering their territory.

16.3.12. The Waste (England and Wales) Regulations 2011 **[Ref 16-19]** require that everyone involved in waste shall take all reasonable measures to apply the waste hierarchy except where, for specific waste streams, departing from the hierarchy is justified.

16.3.13. At a local level, The Barnsley, Doncaster and Rotherham Joint Waste Plan (adopted March 2012) **[Ref 16-22]** provide the policy context in respect of waste management. Policies generally relate to proposals for waste management and associated facilities – they are not considered explicitly relevant in the context of the Scheme.

16.3.14. However, Policy WCS1 (E) details *"All development proposals (including non-waste uses such as housing) must: 1) promote high quality design and layouts that minimise waste and reduce resources (e.g. recycled materials and secondary aggregates), especially during the construction process; and 2) ensure that they do not prevent or prejudice either the delivery or continued operation of waste facilities on safeguarded or allocated sites."*

16.3.15. Policy WCS7 in summary details all development proposals should submit a waste management plan with a planning application. Waste management measures are set out in the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3], Outline Operational Environmental Management Plan [APP-177], Outline Environmental Decommissioning Plan [Document Reference 7.3 Revision 3].** The **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3]** secures that a Site Waste Management Plan will be produced, prior to construction.

Consultation

16.3.16. In undertaking the assessment of Major Accidents and Disasters, consideration has been given to the **ES Appendix 1.1 – Planning Inspectorate EIA Scoping Opinion [APP-057]**issued by the Planning Inspectorate on 14 March 2023 and statutory consultation responses received as detailed in **Table 16-5** and **Table 16-6** below.

16.3.17. The following waste related comments were provided in the Planning Inspectorate Scoping Opinion dated 14 March 2023 (**Table 16-5**).

Table 16-5: EIA Scoping Consultation Responses for Waste

ID	REF	MATTER	PLANNING INSPECTORATE COMMENTS	APPLICANT'S RESPONSE
3.4.1	Table 3.4	Waste	The Scoping Report proposes that impacts associated with waste will be assessed within ES Chapter 16 (Other Environmental Topics'), rather than in a standalone ES Chapter. The Inspectorate has considered the nature and characteristics of the Scheme and is content with this approach.	The Applicant confirms that **ES Chapter 16 Other Environmental Topics [Document Reference 6.2.16, Revision 2]** of the ES follows the approach set out in the scoping opinion, and no standalone ES Chapter is provided.
3.4.2	Table 3.4	Impacts associated with waste during operational phase	Having regard to the nature and characteristics of the Scheme, the Inspectorate is content that impacts associated with waste produced during the operational phase are not likely to result in significant effects. This matter can be scoped out of the ES.	In light of comments received from Lincolnshire County Council at Statutory Consultation, operational waste is considered in the Waste assessment for completeness.

16.3.18. The following waste comments were provided in statutory consultation responses (**Table 16-6**).

Table 16-6: Statutory Consultation Responses for Waste

Statutory Consultee	Summary Of Statutory Response Comments	Applicant's Response

Lincolnshire County Council	Waste LCC is pleased to see various references to following the waste hierarchy in PEIR chapter 16. Table 16.3, item 3.4.1 is in line with PINS comments. It is also noted that waste is proposed to be included under a chapter entitled 'Other Matters' rather than in a separate chapter in the ES, which LCC agree providing the issues are fully considered. LCC is disappointed to that operational waste has been scoped out of the ES. In relation to 16.3.20, it is noted that 'The waste streams will be set out in the Environmental Statement. The Environmental Statement will also consider the potential waste streams for and expected programme of replacement of equipment.' LCC is concerned about the waste produced during the operational phase with regard to PV panels and requests that the developer provides an	The Applicant thanks Lincolnshire for its response and notes the representation made. The Waste Section of this ES Chapter details how the Scheme is designed, constructed and to be operated under the 'Waste Hierarchy' guidance and how it abides by the principles of sustainable waste management. In light of the comments received from Lincolnshire County Council, operational waste has been included in the Waste Assessment for completeness. An **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3], Outline Operational Environmental Management Plan [APP-177],** and **Outline Environmental Decommissioning Plan [Document Reference 7.3 Revision 3],** are submitted with the DCO application, and detailed versions will be submitted for the approval of the relevant local planning

	estimate of the annual failure rate of panels, what they intend to do with the failed panels (i.e. repair, recycle or disposal), and the annual quantity and fate of any associated waste arisings. In terms of construction waste LCC welcomes the reference to an outline Construction Environmental Management Plan (oCEMP) to be secured by virtue of a DCO Requirement, (paragraph 16.3.19) The commitment to provide data on the operational waste is also appreciated but in light of the above comment regarding PV panel failures, LCC require clarification around waste arisings and their fate, and recommend addressing PV failures in the operational phase in the oOEMP and Outline Waste Management Plan. LCC welcome the commitment to recycle PV panels but note that recycling facilities are currently limited. LCC requests the developer	authority post-consent. The preparation of the detailed plans will be secured via the requirements in the DCO. The Applicant will also engage with waste management providers in advance of construction to ensure waste can be accommodated. Cumulative effects of waste is assessed for the Scheme and relevant shortlisted schemes in the zone of influence and presented in **ES Chapter 17 Cumulative Impacts [Document Reference 6.17.1, Revision 2].**

	to please clarify what will happen to PV panel waste if recycling facilities do not become available in the meantime (paragraph 16.3.26). LCC appreciates the commitment to assess cumulative effects for waste arisings, particularly as there are a number of solar NSIP proposals in the north of the LCC area (paragraph 16.3.28).	

Assessment Methodologies

16.3.19. The following guidance informs the assessment: : IEMA Guide to Materials and Waste in Environmental Impact Assessment 2020 **[Ref 16-21].**

16.3.20. There are two approaches to assess the effects of waste, Void Capacity' and 'Landfill Diversion' within the IEMA Guide to Materials and Waste in Environmental Impact Assessment 2020. Void Capacity assesses the percentage of the remaining "space or void" within landfill capacity that will be used by waste produced during the construction and/operation phases of the development. Decommissioning waste is not assessed in the guidance. Appreciable quantities of waste are not expected to be generated unless major replacement works are required. It is likely that these would occur in the later stages of the operational life of the Scheme (i.e., over 20 years) and therefore the 'Void Capacity' approach was not applicable to adopt. There is no realistic way of anticipating what waste management capacity will be available in 20+ years' time, particularly for some specialist waste that may be generated by the Scheme.

16.3.21. An alternative approach under the IEMA Guide to Materials and Waste in Environmental Impact Assessment 2020 is to compare the expected landfill diversion rate against the following criteria.

Table 16-7: Landfill Diversion Criteria

Effect	Landfill Diversion Rate
No change	100% landfill diversion rate
Negligible	90-99% landfill diversion
Minor	60-89% landfill diversion
Moderate	30-59% landfill diversion
Major	<30% landfill diversion

16.3.22. An assessment of the effects of the waste generation associated with the Scheme has been undertaken in line with the 'Landfill Diversion' approach within the IEMA Guide to Materials and Waste in Environmental Impact Assessment 2020.

16.3.23. The study area has been defined in line with the IEMA Guide to Materials and Waste in Environmental Impact Assessment 2020 as primary study area is based on the Order Limits; constituting the area within which waste would be generated.

16.3.24. Waste streams and quantities have been estimated using waste management records for other solar development which are based on activities, material requirements and staff requirements during the construction phase. This is considered in relation to the waste hierarchy of minimising, reducing and re-use of waste as appropriate.

16.3.25. Overall, the fundamental purpose of a waste management assessment is to characterise waste types and arisings and to identify the existing and potential methods employed for their management. The significance of the effect (whether beneficial or adverse) is largely conditioned by the type, location and capacity of local and regional waste management facilities and their ability to manage waste in an environmentally responsible way.

Baseline Conditions

16.3.26. Almost all of the land is in arable farming use, by a mixture of tenures and management methods, and therefore waste in the Order Limits is currently associated with agricultural practice. Potential waste streams currently could include left over crop and straw bales, fertiliser sacks and chemical containers. Spreading of organic manure and slurries has taken place in the Order Limits.

Assessment of Likely Effects

Construction Phase

16.3.27. The Order Limits is primarily agricultural land; therefore, no demolition waste will be produced as part of the Scheme. It is also anticipated that minimal site preparation and excavation waste would be generated given the baseline. The underground cabling runs through both agricultural land and roads, which are likely to generate minimal arisings from activities, and would be reused within the Order Limits as cable route cover.

16.3.28. All the electrical infrastructure such as solar PV modules, inverters, transformers, BESS, and other supporting infrastructure will be manufactured offsite and delivered to the Order Limits ready for installation. The BESS would arrive as modular units. Therefore, construction and assembly waste is expected to be minimal, including packaging waste (wood and plastics), fencing (metal and wood), Waste Electrical and Electronic Equipment (WEEE) wastes and concrete.

16.3.29. Waste materials can be generated during the Scheme preparation stage of construction and during the installation of infrastructure and erection of built form.

16.3.30. Exact quantities and types of waste likely to be generated during the construction phase are unknown, however it is expected that waste streams could include:

- Welfare facility waste;
- Waste chemicals, fuels and oils;
- Waste metals (iron and steel);
- Waste water from dewatering of excavations;
- Waste water from cleaning activities (e.g., wheel wash);
- Packaging; and

- General construction waste (paper, cardboard, wood, etc.)

16.3.31. The destinations of the above potential waste streams would be (where applicable) through recycling plants. Landfill sites for construction and demolition wastes and landfill for hazardous waste would be used as a last resort. The generation of construction-related waste can be significantly reduced through the choice of materials and other opportunities pre-construction phase will be explored as far as possible.

16.3.32. The predicted quantities are set out below and are based on the construction waste management records of a 25MW solar scheme. This is presented at **Table 16-8**.

Table 16-8: Predicted waste streams and destinations during construction

Category	Type	Waste arising recorded from a 25MW solar project	Predicted estimates for the Scheme	Destination
General Waste Exchange	12 yard skip (3.9m by 2m and 2m tall)	12	384	Authorised recycling, worse case landfill
General Waste Exchange	Roll on Roll off (RoRo) 20 yard skip (6.2m long, 2.4m wide and 1.5m tall)	23	736	Authorised recycling, worse case landfill
Timber Exchange	RoRo 20 yard skip	33	1056	Authorised recycling, worse case landfill
Card / Paper exchange	RoRo 20 yard skip	12	384	Authorised recycling, worse case landfill

Category	Type	Waste arising recorded from a 25MW solar project	Predicted estimates for the Scheme	Destination
Metal waste exchange	RoRo – 20 yard	6	192	Authorised recycling, worse case landfill
Recyclable plastics	12 yard skip	2	64	Authorised recycling, worse case landfill
Total skips		**88**	**2816**	

16.3.33. Construction activities will also generate waste materials as a result of general handling, losses and surpluses and these wastes can be mitigated through good site practices, including proper storage and handling of materials to avoid damage, and accurate quantity estimates and efficient purchasing arrangements to avoid over ordering.

16.3.34. It is not intended to remove significant quantities of excavated arisings from the Order Limits during construction. There may, however, be a need to remove some soil from the Order Limits for treatment or disposal, if found to be contaminated, and it is not practical to treat this within the Order Limits. However, where reasonably practicable, soil arisings would be balanced through a cut and fill exercise to retain volumes within the Order Limits.

16.3.35. The main anticipated construction waste stream are all capable of being recycled, with recycling routes generally available for the materials. Therefore, the overall recovery rate and landfill diversion is expected to be at least 60-89% (minor), following a conservative approach, and therefore **not significant**.

Operational Phase

16.3.36. For the operational (including maintenance) phase, there would be relatively little waste produced and the requirement for material assets would be limited to maintenance and replacement parts, as required. No replacement of cabling

is anticipated during the proposed design life of the Scheme. Any waste arising is anticipated to be substantially less than that of the construction phase.

16.3.37. No permanent staff are expected to be on the Site during the operation of the Scheme; rather, there will be frequent visits made by off-site workers whose remit includes the Scheme, ensuring that it is maintained properly and remains operational. Waste arisings are expected to be minimal, and would include:

- Welfare facility waste;
- Any equipment that needs replacing;
- Waste materials; and
- General waste (e.g., paper, cardboard, and wood).

16.3.38. This waste will be managed by permitted waste carriers who will visit the Scheme frequently for general waste removal; and infrequently for larger items, such as equipment.

16.3.39. Should equipment fail and need replacing, it is anticipated that the associated part would be returned to the manufacturer if still under warranty for refurbishment if possible or recycled if facilities allow. Like all electrical equipment, producers have legal obligations under the Waste Electrical and Electronic Equipment Directive legislation. Solar panels contain aluminium which can be recycled, and the remaining glass and silicon mix can be ground up into other building materials and industrial applications. It is known that materials arising from solar panels can be reused for produced new solar panels . Solar PV modules are made of a frame (typically aluminium), glass, crystalline silicon solar cells and copper wiring, of which between 90 - 99% can be recycled. The electrical infrastructure, should it need replacing is also likely to be recycled.

16.3.40. Possibilities to re-use or recycle materials will be explored before resorting to landfill options in line with The Barnsley, Doncaster and Rotherham Joint Waste Plan (adopted March 2012) **[Ref 16-22]** which seeks to improve reuse and recycling rates, in alignment with the Waste Management Plan for England 2021 **[Ref 16-21**]. There is a new industry emerging for recycling solar PV modules. This would be explored, in addition to the resale of any operational panels.

16.3.41. As detailed in the decommissioning phase, the main elements of the Scheme (solar PV modules, PV module mounting structure, onsite cabling, BESS, inverters, transformers, switchgear and on-site substations) are all capable of being recycled, with recycling routes generally available for the materials. Therefore,

the overall recovery rate and landfill diversion is expected to be at least 60-89% (minor), following a conservative approach, and therefore **not significant**.

16.3.42. The operational phase effects associated with waste are anticipated to be not significant. Waste generated during operation will be appropriately managed in accordance with all relevant legislation.

Decommissioning Phase

16.3.43. During the decommissioning phase, it is expected that a number of waste streams will be created that will be managed using the principles of the waste hierarchy. They are likely to include the following:

- Solar panels and mounting structures;
- Waste materials from foundations;
- Electrical equipment;
- Energy Storage System i.e., batteries;
- Cables;
- Welfare facility waste;
- Waste chemicals, fuels and oils;
- Waste metals;
- Waste water from dewatering of excavations; and
- Wastewater from cleaning activities (e.g., wheel wash).

16.3.44. Reinstatement of the Order Limits to its original use is anticipated as far as possible and practicable. Any requirements to leave certain infrastructure, for example access tracks, would be discussed and agreed with landowners as part of the decommissioning process.

16.3.45. As the Scheme seeks to convert solar radiation into electricity, there will not be any hazardous waste created at the Order Limits (resulting in no requirement for an environmental remediation strategy).

16.3.46. Anticipated waste streams and destinations during decommissioning could be:

Table 16-9: Decommissioning Waste Streams and Destinations

Waste Stream	Destination
Solar Panels	Authorised recycling, worse case landfill
Concrete or foundation structures – could be covered by Metal also	Authorised recycling, worse case landfill
Hardcore or material used for tracks	Authorised recycling, worse case landfill
Electrical equipment	Authorised recycling
Metal	Authorised recycling
Welfare facility waste	Authorised recycling, worse case landfill

16.3.47. With reference to the waste hierarchy, the solar PV modules will be recycled or reused where possible. With regards to the supporting structures, the structures will be unscrewed/unbolted and then removed from the ground using a piling machine. Once the supporting structures have been removed, they will either be re-used or recycled, where possible. Only a small amount of backfilling will be required to fill the holes of the supporting structures.

16.3.48. Other associated infrastructure, such as the inverters will be removed from their concrete foundations and will be transported via HGVs off site. The equipment will either be re-used or recycled, where possible.

16.3.49. The inverter platforms and concrete foundations will be broken up and removed from the Order Limits. The crushed foundations will be provided to a licensed waste transfer station for appropriate disposal or solar as recycled aggregate. Any uneven ground will be reinstated to its former condition.

16.3.50. When removing the substation infrastructure, such as transformers, they will be loaded onto an abnormal indivisible load vehicle (AILs) and removed from the Order Limits in much the same way as it was delivered to the Order Limits. The area will be returned to its former condition, and the transformers are likely to be refurbished and re-used on another site or taken to a recycling facility.

16.3.51. Some tracks may be restored to the previous condition. In those cases, the aggregate used for the internal tracks will be recovered, loaded onto HGVs, and transported out of the Order Limits for re-use at another construction site or to a recycling facility.

16.3.52. Underground cables will typically be disconnected from the local electricity network to be capped off and left in situ. In the event any underground cables are dug up, they will be removed from the Order Limits and recycled where possible, following the waste hierarchy.

16.3.53. Recycling of all materials after end use will include panels (which are covered by the Waste Electrical and Electronic Equipment Directive), screws, mounting frames and wiring. Any non-recyclable waste will be stored in a skip for regular removal for disposal.

16.3.54. Restoring the Order Limits will involve some minor ground works. Any residual soil which cannot be accommodated within the Order Limits, will be removed and disposed of at an appropriate landfill or sold to a landowner needing additional soil. However, this is not expected to be required due to the size of the Order Limits.

16.3.55. All waste arisings transported out of the Order Limits would be delivered to the appropriately licenced receivers of such materials. Operators receiving any waste arisings would be subject to their own consenting procedures. It is not possible to forecast the capacity for final disposal for decommissioning at this stage due to potential change in waste regulations and legislation and generation and operators at that time.

16.3.56. The Applicant is dedicated to ensuring that, where possible, as much of the equipment proposed is either re-used or recycled. As such, the quantum of non-recyclable waste will be limited.

16.3.57. Therefore, the main anticipated decommissioning waste streams are all capable of being recycled, with recycling routes generally available for the materials. Therefore, the overall recovery rate and landfill diversion is expected to be at

least 60-89% (minor), following a conservative approach, and therefore **not significant**.

Mitigation and Enhancement

16.3.58. Waste arisings will be prevented and designed out where possible. Opportunities to re-use material resources will be sought where practicable. Where re-use and prevention are not possible, waste arisings will be managed in line with the Waste Hierarchy.

16.3.59. Design considerations will seek to minimise waste from the construction phase and are likely to follow these approaches:

- Maximise the use of reclaimed materials during construction;
- Maximise recycling opportunities in the decommissioning phase (further details below);
- Use prefabricated and standardised components in the standard product sizes (e.g., panels, mounting structures). As these are made in a factory-controlled environment, they tend to generate less waste and if standard product sizes are made use of, this minimises wastage within the Order Limits;
- Segregation of construction waste within the Order Limits to maximise potential for reuse/recycling;
- Use of suppliers who collect and reuse/recycle packaging materials wherever practicable;
- The off-site separation and recycling of materials where separation within the Order Limits is not possible; and
- Training of contractors in waste minimisation and materials reuse.

16.3.60. A Construction Environmental Management Plan is secured pursuant to the DCO as a requirement, and in will be prepared in accordance with the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3]**, submitted in support of the DCO application. **The Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3]** sets out how construction materials and waste would be managed within the Order Limits and how opportunities to recycle waste would be explored during the construction phase of the Scheme.

16.3.61. In addition a Site Waste Management Plan will be produced prior to the construction phase, secured within the Construction Environmental Management Plan . The Site Waste Management Plan will include measures to manage waste during the construction, operational (including maintenance) and decommissioning phases and will be substantially in accordance with the waste management measures set out in the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3], Outline Operational Environmental Management Plan [APP-177],** and **Outline Environmental Decommissioning Plan [Document Reference 7.3 Revision 3].**

16.3.62. A Decommissioning Environmental Management Plan would be secured pursuant to the DCO as a requirement, and in accordance with the **Outline Decommissioning Environmental Management Plan [Document Reference 7.3 Revision 3]** submitted in support of the DCO application. The Outline Decommissioning Environmental Management Plan will set out how the waste would be managed and detail opportunities for re-use and recycling during the decommissioning phase of the Scheme.

16.3.63. Re-useable waste includes soil excavated from trenches, roads, compound areas and foundations. Soils are an important resource, and to minimise effects to this resource, a Soil Management Plan is secured pursuant to the DCO as a requirement, and in accordance with an **Outline Soil Management Plan [Document Reference 7.8]** (submitted with this DCO application) and will be implemented across the Order Limits and will comprise the best practice for soil handling.

16.3.64. To avoid wastage, with reference to DEFRA's Soil Strategy (2009) **[Ref 16-33]** , stripped soils will be stored in separate resource bunds no more than 3m high, and kept grassed and free from construction traffic, to ensure that the soil can be re-used elsewhere at the Order Limits.

16.3.65. The primary measures to mitigate against the loss of soil resources will be to reuse as much of the surplus resources on-site and to dispose of any surplus soils thereafter in a sustainable manner (i.e., as close to the Scheme as possible and to an after-use appropriate to the soil's quality). However, surplus resources requiring removal outside of the Order Limits are not expected.

16.3.66. There may be a need to remove some soil from the Order Limits for treatment or disposal, if found to be contaminated and if it is not practical to treat this onsite. This would be overseen by a soil advisor specialist as outlined in the **Outline Soil Management Plan [Document Reference 7.8, Revision 3]**.

16.3.67. All waste transported out of the Order Limits will be delivered to the appropriately licensed receivers of such materials. Operators receiving any waste materials resulting from the Scheme will be subject to their own consenting procedures.

Residual Effects

16.3.68. During construction, operation (including maintenance), and decommissioning, the re-use or recycling of materials will be explored before resorting to landfill options. Waste during the construction, operation and decommissioning phase will be dealt with as part of the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3], Outline Operational Environmental Management Plan [APP-177],** and **Outline Environmental Decommissioning Plan [Document Reference 7.3 Revision 3]** which are prepared in line with relevant legislation and guidance. Therefore, it is anticipated that there would be **no significant residual effects** for waste from the Scheme.

16.4. Electric and Electromagnetic Fields

16.4.1. This section summarises the potential electric, magnetic and electromagnetic fields (EMFs) effects that could arise from the Scheme.

16.4.2. Electric and magnetic fields both occur naturally. The Earth's magnetic field, which is caused mainly by currents circulating in the outer layer of the Earth's core, is roughly 50 microteslas in the UK. This field may be distorted locally by ferrous minerals or by steelwork such as in buildings.

16.4.3. Power frequency EMFs arise from generation, transmission, distribution, and the use of electricity. They occur around power lines and electricity cables and around domestic, office or industrial equipment that uses electricity. Electric fields are the result of voltages applied to electrical conductors and equipment. Fences, scrubs, and buildings can block electric fields. Magnetic fields are produced by the flow of current, however, most materials do not readily block magnetic fields. The intensity of both electric fields and magnetic fields diminishes with increasing distance from the source.

16.4.4. EMFs are inevitable wherever electricity is produced, distributed, and used, including electrical substations, power lines and electric cables and around domestic, office or industrial equipment that uses electricity.

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

16.4.6. Electric fields depend on the operating voltage of the equipment. Magnetic fields depend on the electrical currents flowing and are not significantly limited by most common materials. Typically, ground level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line but can be higher at small distances from the cable.

16.4.7. Magnetic fields are produced by the flow of electric current; however, most materials do not readily block magnetic fields. The intensity of both electric fields and magnetic fields diminishes with increasing distance from the source. Magnetic fields depend on the electrical currents flowing and are not significantly limited by most common materials. Typically, ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line, but can be higher at small distances from the cable.

Policy and Guidance Context

16.4.8. There is no direct statutory provision in the planning system relating to protection from EMFs; however, the National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) **[Ref 16-23]** requires an applicant to consider the following aspects, with regards to Electric and Magnetic Fields:

- Compliance with Electricity Safety Quality and Continuity Regulations 2002 (ESQCR) **[Ref 16-24]**;
- Health Protection Agency (HPA) guidance **[Ref 16-25]** ; and
- The introduction of optimal phasing of high voltage overhead power lines wherever possible and practicable in accordance with the Code of Practice to minimise effects of EMFs. The Code of Practice is used to show compliance with guideline public exposure limits for NSIPs in England and Wales. To note, there are no overhead powerlines proposed as part of the Scheme, all cabling proposed will be underground.

16.4.9. Section 2.9 of NPS EN-5 acknowledges that all overhead lines produce both electric fields and magnetic fields. The fields will be highest directly under the conductors and will reduce dramatically as the distance from the line increases. The electric fields produced by overhead lines are also attenuated significantly by structures such as fences, walls, trees and hedges. As recognised by NPS EN-5, putting cables underground eliminates the electric field but underground cables can still produce magnetic fields. Again, the magnetic fields produced by underground cables drop rapidly as the distance from the cable increases.

16.4.10. The Electricity at Work Regulations 1989 **[Ref 16-26]** places duties on employers and employees with respect to health and safety when working on or with electrical equipment and particularly those involved in the design, construction, operation or maintenance of electrical systems and equipment.

16.4.11. The Electricity Safety, Quality and Continuity Regulations 2002 and subsequent amendments (SI 1521/2006 and SI 639/2009) **[Ref 16-10]** specify certain requirements for electrical infrastructure and equipment, including overhead lines and underground cables, intended for the safety and protection of workers and safeguarding of the general public from danger.

16.4.12. There are no statutory regulations in the UK that limit the exposure of the general public to power-frequency electric or magnetic fields, and responsibility for implementing appropriate measures for the protection of the public from EMF lies with the UK Government.

16.4.13. In 2004, the Government adopted guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in line with the terms of the 1999 EU Council recommendation on limiting public exposure to EMF (known as the 'ICNIRP guidelines') **[Ref. 16-34].** The ICNIRP guidelines were transposed into the HPA guidance. The criteria establish acceptable limits for exposure of the public to EMF that adopt a precautionary approach taking into account various scenarios and potentially more vulnerable groups (such as infants).

16.4.14. Guidance documents on EMF exposure and appropriate design of electrical infrastructure include:

- Power Lines: Demonstrating compliance with EMF public exposure guidelines – a Voluntary Code of Practice (Department of Energy and Climate Change (DECC), March 2012) **[Ref 16-27]**; and

- Power Lines: Control of micro shocks and other indirect effects of public exposure to electric fields - a Voluntary Code of Practice (DECC, July 2013) **[Ref 16-28]**.

16.4.15. The DECC (March 2012) guidance states that *"overhead power lines at voltages up to and including 132 kV, underground cables at voltages up to and including 132 kV and substations at and beyond the publicly accessible perimeter"* are not capable of exceeding the ICNIRP exposure guidelines and therefore no assessment is required for these and other types of infrastructure listed on the Energy Networks Association website.

16.4.16. Energy Network Association article **[Ref 16-29]** sets out that *"Underground cables, whether directly buried or in a tunnel, produce no external electric field."*

16.4.17. Additionally, The Control of Electromagnetic Fields at Work Regulations 2016 **[Ref 16-30]** 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.

16.4.18. NPS EN-5 (paragraph 2.9.58) also sets out that there is little evidence that exposure of crops and farm animals to transmission line electromagnetic fields has any agriculturally significant consequences. Therefore, consideration of the impacts to agriculture has not been included within the assessment.

Consultation

16.4.19. In undertaking the assessment of EMFs, consideration has been given to the **ES Appendix 1.1 – Planning Inspectorate EIA Scoping Opinion [APP-057]**issued by the Planning Inspectorate on 14 March 2023 and statutory consultation responses received as detailed in **Table 16-10** and **Table 16-11** below.

16.4.20. The following EMFs related comments were provided in the Planning Inspectorate Scoping Opinion dated 14 March 2023 (**Table 16-10**).

Table 16-10: EIA Scoping Consultation for EMFs

Id	Ref	Matter	Planning Inspectorate Comments	Applicant's Response
3.3.2	n/a	Impacts from Electric and Magnetic Fields (EMF)	The Scoping Report does not consider potential impacts on human health receptors from EMF. Should any cables exceeding 132kV be required as part of the Scheme, the ES should provide an assessment of any likely significant effects to human health receptors arising from EMF.	No standalone ES chapter is proposed to assess the impacts on EMF sources for the Scheme, but an Electric, and Electromagnetic Fields section within **ES Chapter 16 Other Environmental Topics [Document Reference 6.2.16]** is included assessing where relevant the

			The ES should describe any necessary mitigation measures relevant to EMF (for example a minimum depth for cable burial) and explain how such measures are secured through the dDCO or other legal mechanism.	cable systems above 132kV and that have potential to cause EMF effects. Additionally, a **High Level Electromagnetic Fields Assessment (Human Health) [APP-124]** is provided as a technical appendix, of this Environmental Statement, focusing on likely significant effects to human health receptors arising from EMF. Mitigation and enhancement is considered in the Electric and Electromagnetic Fields section within **ES Chapter 16 Other Environmental Topics [Document Reference 6.2.16, Revision 2].** However, no specific mitigation measures are considered necessary, given the maximum magnetic field produced by any proposed underground cables will not exceed public or occupational

				exposure reference levels for the ICNRIP guidelines.

16.4.21. The following EMF comments were provided in statutory consultation responses (**Table 16-11**).

Table 16-11: Statutory Consultation Responses for EMFs

STATUTORY CONSULTEE	SUMMARY OF STATUTORY RESPONSE COMMENTS	APPLICANT'S RESPONSE
UK Health Security Agency	It is noted that the current proposals do not appear to consider possible health impacts of Electric and Magnetic Fields (EMF). The applicant should assess the potential public health impact of EMFs arising from any electrical equipment associated with the Scheme. Alternatively, a statement should be provided explaining why EMFs can be scoped out.	Electric and Electromagnetic Fields are assessed in **ES Chapter 16 Other Environmental Topics [Document Reference 6.2.16, Revision 2]** , with a supporting technical appendix **High Level Electromagnetic Fields Assessment (Human Health) [APP-124]** considering the potential public health impact of EMFs arising from any electrical equipment associated with the development.

Assessment Methodologies

16.4.22. **ES Appendix 16.3 - High Level Electromagnetic Fields Assessment (Human Health) [APP-124]** assesses the underground cables (33kV to 400kV cables), 132kV substations and 400kV substation and 100MW BESS.

16.4.23. The exposure limits in the UK are from the ICNIRP guidelines. The ICNIRP 'reference levels' for the public are:

- 100 microteslas (μT) for magnetic fields; and
- 5 kilovolts (kV) per metre for electric fields.

16.4.24. The occupational limits are double for electric fields and five times higher for magnetic fields:

- 500 microteslas (μT) for magnetic fields; and
- 10 kilovolts (kV) per metre for electric fields.

16.4.25. If people are not exposed to field strengths above these levels, direct effects on the central nervous system would be avoided and indirect effects such as the risk of EMFs interfering with implantable medical devices will be minimised. 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.

16.4.26. The ICNIRP guidelines outlines an assessment methodology as a structured approach below:

- Stage 1 – comparison of external fields to ICNIRP reference levels;
- Stage 2 – if stage 1 identifies that an exceedance is above the reference levels, the results of the evaluation should be compared with the values of external fields required to produce the basic restrictions in the body; and
- Stage 3 - to demonstrate compliance with basic restrictions, a detailed assessment should be carried out taking into account factors that represent the actual exposure conditions.

16.4.27. Following each stage of evaluation, if the results of the assessments are at or below the reference values, then compliance with the basic restrictions can be assumed.

16.4.28. The scope of the assessment of EMFs is limited to consideration of any underground cables associated with the Scheme which exceed 132kV, as per paragraph 16.4.15.

16.4.29. **ES Appendix 16.3 - High Level Electromagnetic Fields Assessment (Human Health) [APP-124]** details that all underground cabling, transformer and solar PV inverters, BESS and substations as part of the Scheme's infrastructure with capabilities to produce electromagnetic fields, have smaller magnetic fields than the underground cabling in excess of 132kV, and are likely to be below the acceptable public exposure limits of the ICNIRP guidelines, and are therefore not discussed further in this chapter.

16.4.30. As only underground cabling in excess of 132kV is considered further in this chapter, only magnetic fields are assessed. Electric fields are not considered further in this assessment as per paragraph 16.4.16 of this chapter .Energy Network Association sets out that *"Underground cables, whether directly buried or in a tunnel, produce no external electric field."* No electric field is produced as the cable is within an insulated sheath and the electric field cannot pass through. Magnetic fields can pass through the sheath and ground.

16.4.31. Magnetic fields are not simply added together where they may be generated by separate sources and are typically dominated by the biggest source, therefore it is appropriate to consider the magnetic field generated by the 400 kV cable system in isolation in areas where a magnetic field may be present from multiple sources. This is the approach taken in this assessment.

Baseline Conditions

16.4.32. The Order Limits is located within a mixture of primarily rural and semi-rural areas, which accommodate existing electrical assets. There is approximately 2 km of 400 kV overhead line in the northern part of the Order Limits, bisecting through Land Parcels A and B. There are eight towers located within the solar panel areas associated with the overhead lines. This infrastructure would produce electric and magnetic fields.

16.4.33. 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 PV modules 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 **ES Chapter 2 Scheme Description [APP-039]** of this ES.

16.4.34. Medium voltage onsite (33 kV) cables are required to connect the solar pV modules and BESS Containers to inverters, and the inverters to transformers, and then transfer electricity between the Panel Areas and the 132kV substations and/or the RWE on-site 400kV Substation. The typical installation depth is expected to be between 1.2- 1.5 m (although potentially deeper at crossings), this is further described in **ES Chapter 2 Scheme Description [APP-039]**.

16.4.35. 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.

16.4.36. The electricity will then be exported from the RWE on-site 400kV Substation through a 400kV underground cabling to the edge of the Order Limits. A further 400kV export connection cable will be required to connect the Scheme to the transmission network ("the 400kV export connection cable"). The point of connection will be a new National Grid Electricity Transmission (NGET) 400kV substation ("NGET 400kV Substation"), which is to be consented and delivered separately by NGET. As the location of the new NGET 400kV Substation is not yet known, it is not possible at this stage for the Applicant to identify and assess the potential route options for the 400kV export connection cable outside the Order Limits. The typical installation depth is expected to be between 1.2 - 1. m for the 400 kV underground cabling (although potentially deeper at crossings).

16.4.37. The 400kv underground cabling will be located on private land within the Order Limits that is not publicly accessible; however, the public and occupational exposure reference levels have been used in this assessment to ensure that there are no adverse effects on the closest publicly accessible areas.

Assessment of Likely Effects

Construction and Decommissioning Phase

16.4.38. Effects during the construction and decommissioning phases of the Scheme are scoped out of the assessment as the cables will not produce any significant EMFs until the Scheme is generating electricity when it is operational.

Operational Phase

16.4.39. An underground high voltage 400kV cable system will be installed to connect the RWE on-site 400kV Substation to the edge of the Order Limits.

16.4.40. The highest EMFs produced by underground cables are located directly above the buried cables, and field strength decreases with distance from the source.

16.4.41. National Grid (2015) **[Ref 16-35]** gives examples of magnetic fields for underground cables calculated at 1m Above Ground Level (AGL), as seen in **Table 16-12** below.

Table 16-12: Magnetic Fields for direct buried underground cables at 1m above ground level

Voltage	Specifics	Location	Load	Magnetic Field in µT at Distance from Centreline			
				0m	5m	10m	20m
400kV	Direct Buried	0.5m spacing, 0.9m depth	Maximum	96.17	13.05	3.58	0.92
			Typical	24.06	3.26	0.90	0.23

16.4.42. The ICNIRP guidelines for occupational exposure are at 500 μT and for public exposure 100 μT. **Table 16-12** demonstrates that even directly above the cable under the maximum load, neither the occupational nor public limits will be breached. The maximum recorded levels of 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 guidelines.

16.4.43. For context, the Energy Networks Association publication 'Electric and Magnetic Fields' **[Ref 16-29]** 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 electromagnetic 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.

16.4.44. There are no residential properties within the Order Limits. The nearest properties are immediately adjacent to the Order Limits; however, cables will not 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.

16.4.45. Taking into account this guidance and the UK limits set for safety of members of the public, the maximum reported electromagnetic for HV cables buried at a minimum depth of 1.2m would comply with the ICNIRP limits even if the cabling were directly under a human receptor. Therefore, no significant impacts are

expected to arise from magnetic fields as a result of all underground cables that form part of the Scheme.

Mitigation and Enhancement

16.4.46. The requirement to consider EMF exposure guidance is fully understood by the Applicant and has been factored into the consideration of the route alignment within the Order Limits from an early stage.

16.4.47. No specific mitigation measures are considered necessary, given the maximum magnetic field produced by any proposed underground cables will not exceed public or occupational exposure reference levels for the ICNRIP guidelines.

16.4.48. The final route alignment and design of the electrical infrastructure will consider the measures required to ensure compliance with the Electricity Safety, Quality and Continuity Regulations 2002, and any new advice that may emerge from the Department of Health relating to Government policy for EMF exposure guidelines.

16.4.49. It has been shown that the relevant electrical infrastructure will comply with the current public exposure guidelines.

Residual Effects

16.4.50. No EMF effects are anticipated until the Scheme is operational and generating electricity. EMFs, specific to the 400kV underground cabling (as the only relevant infrastructure to be assessed), are demonstrated through the assessment work not to produce EMF exposure above public and occupational guidelines. Full details of all the infrastructure assessed as part of the Scheme is within **ES Appendix 16.3 – High Level Electromagnetic Fields Assessment (Human Health) [APP-124]**. Therefore, it is anticipated that there would be no significant residual effect on EMF from the Scheme.

16.5. Climate Change Resilience and Adaptation

16.5.1. This section summarises the effects of the Scheme's vulnerabilities and resilience by identifying relevant climate change projections, hazards, and impacts throughout its construction and operational lifetime. This section has been included in this ES chapter in response to comments from the Planning Inspectorate's Scoping Opinion.

16.5.2. The full study on climate change resilience and adaptation, undertaken for the Scheme is available in **ES Appendix 16.4 - Climate Change and Resilience Assessment [APP-125]**.

Consultation

16.5.3. The Planning Inspectorate requested the ES should describe effects resulting from the vulnerability of the Scheme to climate change and any impacts of the Scheme relevant to adaptation as per the **ES Appendix 1.1 – Planning Inspectorate EIA Scoping Opinion [APP-057]**issued by the Planning Inspectorate on 14 March 2023.

16.5.4. A summary of scoping opinion comments relating to Climate Change Resilience and Adaptation are presented in **Table 16-13.**

Table 16-13: EIA Scoping Consultation

Id	Ref	Matter	Planning Inspectorate Comments	Applicant's Response
3.2.2	n/a	Climate Change and Climatic Factors - Assessment	ES Chapter 16 should describe other potential impacts on/ from climate change and provide an assessment of any likely significant effects. This should include a description and assessment of any likely significant effects resulting from the vulnerability of the Scheme to climate change. The ES should describe	A Climate Change and Resilience Assessment is provided as a technical appendix, detailed at **ES Appendix 16.4 [APP-125]** of this Environmental Statement. A summary of the assessment is presented within the

			and assess any impacts of the Scheme relevant to adaptation.	Climate Change Resilience and Adaptation section of this Chapter, focusing on vulnerability of the Scheme to climate change and the impacts of the Scheme relevant to climate change adaptation. Carbon savings and impacts from greenhouse gas (GHG) emissions are assessed in **ES Chapter 14 Air Quality and Greenhouse Gas Emissions. [Document Reference 6.2.14, Revision 2]**. A standalone ES Chapter for Climate Change is not required, as confirmed in the **Planning Inspectorate EIA Scoping Opinion [APP-057].**

16.5.5. Further consultation in response to formal pre-application engagement was undertaken through the PEIR. No additional comments were raised with regards to Climate Change Resilience and Adaptation during statutory consultation.

16.5.6. In line with the agreed brevity of Climate Change Resilience and Adaptation assessment scope required in the EIA, a summary of the assessment is provided

below, reliant on **ES Appendix 16.4 - Climate Change and Resilience Assessment [APP-125]** where full details are provided (including methodology, baseline conditions, future climatic condition and detailed mitigation measures).

Summary Assessment of Likely Effects

16.5.7. The resilience and adaptation of the Scheme to climate change has been assessed. Four key climate hazards have been identified, these being:

- hotter summers with extreme temperatures (heatwaves);
- wetter winters including extreme rainfall (pluvial and groundwater flooding);
- Drier summers and drought; and
- increased wind and storms.

16.5.8. Key receptors are identified and assessed for the construction phase (construction site infrastructure/ equipment, and construction workers) and the operational phase (scheme infrastructure, on-site staff/personnel and habitats and biodiversity).

Hotter summers with extreme temperatures (heatwaves)

16.5.9. The hotter summers and extreme temperatures (heatwaves) for the construction and operational phases could cause overheating of equipment, workers overheating leading to heat stress/heat exhaustion and damage to vegetation and biodiversity.

16.5.10. To mitigate, equipment will be maintained, serviced, and inspected for the need to refurbish, reconstruct, or remove. Equipment will not be fitted or constructed during extreme temperatures and will be suitably protected. All equipment will be designed to meet relevant standards and specifications to withstand climate change effects. Contractors will monitor weather forecasts and plan works accordingly to avoid any extreme weather. Habitats are to be suitably protected and enhanced and include natural habitats for the area. This is secured through **the Outline Construction Environmental Management Plan (CEMP) [Document Reference 7.1 Revision 3]** and **Outline Operational Environmental Management Plan (OEMP) [APP-177]** for the relevant phases.

Residual Effects

16.5.11. For the construction and operational phases, **no significant effects** are identified with mitigation measures in place for receptors of hotter summers

with extreme temperatures (heatwaves) in regard to climate change resilience and adaptation.

Wetter winters including extreme rainfall (pluvial and groundwater flooding)

16.5.12. The wetter winters including extreme rainfall (pluvial and groundwater flooding) for the construction and operational phases could cause issues with access to the Order Limits, risk of injury and/or threat to life, deterioration of structures, damage to surfaces and/or exposed utilities, and damage to vegetation and biodiversity.

16.5.13. To mitigate, contractors will monitor weather forecasts and plan works accordingly to avoid any extreme weather. The layout has been designed to be flood resilient with certain infrastructure elements not located in higher flood risk areas or raising of equipment- full details are found in **ES Chapter 10 Water Resource [Document Reference 6.2.10].** Equipment will be maintained, serviced, and inspected for the need to refurbish, reconstruct, or remove. Habitats are to be suitably protected and enhanced and include natural habitats for the area. This is secured through the **Outline Construction Environmental Management Plan (CEMP) [Document Reference 7.1 Revision 3]** and **Outline Operational Environmental Management Plan(OEMP) [APP-177]** for the relevant phases.

Residual effects

16.5.14. For the construction and operational phases, **no significant effects** are identified with mitigation measures in place for receptors of wetter winters including extreme rainfall (pluvial and groundwater flooding) in regard to climate change resilience and adaptation.

Drier summers and drought

16.5.15. The drier summers and drought for the construction and operational phases could cause issues with water shortages for workers, deterioration of structures, and damage to vegetation and biodiversity.

16.5.16. To mitigate, contractors will monitor weather forecasts and plan works accordingly to avoid any extreme weather and protecting resources. All equipment will be designed to meet relevant standards and specifications to withstand climate change effects. Equipment will be maintained, serviced, and inspected for the need to refurbish, reconstruct or remove. Water management measures will be secured in the **Outline Construction Environmental Management Plan (CEMP) [Document Reference 7.1 Revision 3]** and **Outline**

Operational Environmental Management Plan (OEMP) [APP-177] for the relevant phases.

Residual Effects

16.5.17. For the construction and operational phases, **no significant effects** are identified with mitigation measures in place for receptors of drier summers and drought in regard to climate change resilience and adaptation.

Increased wind and storms

16.5.18. The increased wind and storms for the construction and operational phases could cause issues with damage to structures, increase in dust, increase in trips and falls, and damage to vegetation and biodiversity.

16.5.19. To mitigate, contractors will monitor weather forecasts and plan works accordingly to avoid any extreme weather and protecting resources. A Health and Safety Manager will be responsible for monitoring and controlling health and safety compliance onsite. Equipment will be maintained, serviced, and inspected for the need to refurbish, reconstruct or remove. Dust management is set out in the **ES Appendix 14.5 – Construction Mitigation [APP-118]** and secured through the **Outline Construction Environmental Management Plan (CEMP) [Document Reference 7.1 Revision 3]** and **Outline Operational Environmental Management Plan (OEMP) [APP-177]** for the relevant phases.

Residual Effects

16.5.20. For the construction and operational phases, **no significant effects** are identified with mitigation measures in place for receptors of increased wind and storms in regard to climate change resilience and adaptation.

16.5.21. In conclusion, **no significant effects** were identified in the assessment for relevant receptors of climate change resilience and adaptation.

16.6. Glint and Glare

16.6.1. This section summarises the effects of the Scheme on glint and glare for surrounding road users, railway operations, dwellings, and aviation activity. This section has been included in this ES chapter in response to comments from the Planning Inspectorate.

16.6.2. The definition of glint and glare can vary; however, the definition used within this assessment is as follows :

- 'Glint' refers to a momentary flash of bright light typically received by moving receptors or from moving reflectors.
- 'Glare' refers to a continuous source of bright light typically received by static receptors or from large reflective surfaces.

16.6.3. The full study on glint and glare, undertaken for the Scheme is available in **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122]** and **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-025]** of this Environmental Statement.

Consultation

16.6.4. The Planning Inspectorate requested the ES should contain a summary of the glint and glare assessments and identify any significant effects resulting from glint and glare, as per the **ES Appendix 1.1 – Planning Inspectorate EIA Scoping Opinion [APP-057]**issued by the Planning Inspectorate on 14 March 2023.

16.6.5. A summary of scoping opinion comments relating to glint and glare are presented in **Table 16-14**.

Table 16-14: EIA Scoping Consultation

Id	Ref	Matter	Planning Inspectorate Comments	Applicant's Response
3.15.1	Para 14.1 and 14.18	Glint and Glare ES aspect chapter	The Scoping Report proposes to scope out a Glint and Glare ES aspect chapter. A Glint and Glare Assessment would instead be presented as a standalone report	The Applicant notes the Planning Inspectorate's agreement that a standalone ES

			submitted as a technical appendix to ES Chapter 4 (Development Description). The Inspectorate is content that a standalone ES Chapter for Glint and Glare is not required. However, as the Scoping Report (paragraph 14.18) identifies 'moderate' adverse effects on receptors, the Inspectorate considers that significant effects as a result of glint and glare cannot be excluded. ES Chapter 16 (Other Environmental Topics') should therefore contain a summary of the assessment in the technical appendix and identify any significant effects resulting from glint and glare.	Chapter for Glint and Glare is not required. A full study on glint and glare is provided as two technical appendices, detailed at **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122]** and **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-025]** of this Environmental Statement. A summary of the assessment is presented within the Glint and Glare section of this Chapter.

16.6.6. Further consultation in response to formal pre-application engagement was undertaken through the PEIR. No additional comments were raised with regards to glint and glare during statutory consultation.

16.6.7. In line with the agreed brevity of the glint and glare assessment scope required in the EIA, a summary of the assessment is provided below, reliant on **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122]** and **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-025]** where full details are provided (including methodology, baseline conditions and detailed mitigation measures).

Summary Assessment of Likely Effects

16.6.8. Two glint and glare assessments support this chapter to assess the two layout options assessed within the Environmental Statement. Layout Option 1 is for hybrid, fixed and tracker solar panel design (see **ES Figure 2.2b Indicative Operational Layout Plan (Fixed and Tracker Solar Panel)[APP-135]**) and assessed within **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122]**. Layout Option 2 is for a fixed solar panel design (see **ES Figure 2.2a Indicative Operational Layout Plan (Fixed Solar Panel) [APP-134]**and assessed within **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-026**]. For full details on the layout options see **ES Chapter 2 – Scheme Description [APP-039]**.

16.6.9. The summary of assessment of likely effects below assesses both layout options. Some receptors have one assessment provided as there is no change or material difference in the assessment of both layout options, and where this is the case, this is made clear under the subheadings.

<u>Key Receptors – Layout Option 1 (Fixed and Tracker Solar Panel)</u>

16.6.10. The following key receptors have been assessed in **ES Appendix 16.1 - Glint and Glare Assessment (fixed and tracker design) [APP-122]**:

- Road receptors, of which 242 receptors have been identified distanced circa 100m apart across five road sections:
    - A 9.97km section of the M180 (road receptors A1 to A101);
    - A 1.64km section of the A18 (road receptors B1 to B18);
    - A 0.33km section of Tudworth Roundabout (road receptors C1 to C5);
    - A 9.95km section of the A18 (road receptors D1 to D101);
    - A 1.59km section of the A161 (road receptors E1 to E17).
- Dwelling receptors, of which 459 dwelling receptors were identified within a 1km assessment area and have potential views of the panels,
- Train driver receptors, of which 64 train driver receptor locations are identified, distanced circa 100m apart in two stretches of railway line (4.23km and 1.88km),

- Railway signals, of which 10 existing, trackside signal receptors are identified within the 500m assessment area,
- Aviation receptors, of which Sandtoft Airport (an unlicensed GA airfield located within 5km of the Order Limits understood to be operated by Yorkshire Aero Club), Finningley Village Airstrip and Haxey Airstrip (unlicensed GA airfields located outside of 5km but within 10km of the Order Limits) and Doncaster Sheffield Airport (an inactive (formerly licensed) airport located just outside of 10km of the Order Limits)

Key Receptors – Layout Option 2 (Fixed Solar Panel)

16.6.11. The following key receptors have been assessed in **ES Appendix 16.2 - Glint and Glare Assessment (fixed design) [REP1-026**]:

- Road receptors, of which 242 receptors have been identified distanced circa 100m apart across five road sections:
  - A 9.97km section of the M180 (road receptors A1 to A101);
  - A 1.64km section of the A18 (road receptors B1 to B18);
  - A 0.33km section of Tudworth Roundabout (road receptors C1 to C5);
  - A 9.95km section of the A18 (road receptors D1 to D101);
  - A 1.59km section of the A161 (road receptors E1 to E17).
- Dwelling receptors, of which 405 dwelling receptors were identified within a 1km assessment area and have potential views of the panels,
- Train driver receptors, of which 64 train driver receptor locations are identified, distanced circa 100m apart in two stretches of railway line (4.23km and 1.88km),
- Railway signals, of which 10 existing, trackside signal receptors are identified within the 500m assessment area,
- Aviation receptors, of which Sandtoft Airport (an unlicensed general aviation (GA) airfield located within 5km of the Order Limits understood to be operated by Yorkshire Aero Club), Finningley Village Airstrip and Haxey Airstrip (unlicensed GA airfields located outside of 5km but within 10km of the Order Limits) and Doncaster Sheffield Airport (an inactive

(formerly licensed) airport located just outside of 10km of the Order Limits)

Road Receptors

Layout Option 1 (Fixed and Tracker Solar Panel) and Layout Option 2 (Fixed Solar Panel)

16.6.12. A moderate effect is predicted on separate 0.2km and 1.6km sections of the M180, and a 0.1km section of the A18, under baseline conditions (no mitigation). This is due to solar reflections predicted to originate from inside of a road user's primary horizontal field of view in the absence of sufficient mitigating factors. Proposed vegetation planting is expected to screen panels once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice, and therefore no impact with mitigation in place.

Residual Effects

16.6.13. Overall, **no significant effects** are predicted on road users for either layout option.

Dwelling Receptors

Layout Option 1 (Fixed and Tracker Solar Panel)

16.6.14. The modelling has shown that solar reflections are geometrically possible towards 327 of the 459 assessed dwelling locations.

16.6.15. No impacts are predicted on 182 dwellings because there is significant existing screening such that views of reflecting panels are not expected to be possible in practice. Mitigation is not required.

16.6.16. A low effect is predicted on 139 dwellings under baseline conditions, either because the duration of effects received in practice on the ground floor is expected to be reduced to less than three months per year and less than 60 minutes per any one day, or there are mitigating factors such as a significant separation distance to the closest reflecting panels and effects occurring within a few hours of sunrise/sunset when the Sun is low in the sky. Proposed vegetation planting is expected to screen panels from the ground floor once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice, and therefore low or no impact with mitigation in place.

16.6.17. A moderate impact is predicted on six dwellings (receptors 24, 169, 199-201, 268) under baseline conditions due to the duration of effects (more than three months per year) in the absence of sufficient mitigating factors. Proposed vegetation planting is expected to screen panels from the ground floor once sufficiently matured (see **ES Figure 6.4 – Landscape and Visual Mitigation Strategy [Document Reference 6.4.6.4]**), such that views of reflecting panels are not expected to be possible in practice, and therefore no impact with mitigation in place.

Residual Effects

16.6.18. Overall, **no significant effects** are predicted on dwelling receptors if layout option 1 is pursued.

Layout Option 2 (Fixed Solar Panel)

16.6.19. The modelling has shown that solar reflections are geometrically possible towards 281 of the 405 assessed dwelling locations.

16.6.20. No impacts are predicted on 134 dwellings because there is significant existing screening such that views of reflecting panels are not expected to be possible in practice. Mitigation is not required.

16.6.21. A low effect is predicted on 140 dwellings under baseline conditions, either because the duration of effects received in practice on the ground floor is expected to be reduced to less than three months per year and less than 60 minutes per any one day, or there are mitigating factors such as a significant separation distance to the closest reflecting panels and effects occurring within a few hours of sunrise/sunset when the Sun is low in the sky. Proposed vegetation planting is expected to screen panels from the ground floor once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice, and therefore low or no impact with mitigation in place.

16.6.22. A moderate effect is predicted on seven dwellings (receptors 24-25, 169, 199-201, 268) under baseline conditions due to the duration of effects (more than three months per year) in the absence of sufficient mitigating factors. Proposed vegetation planting is expected to screen panels from the ground floor once sufficiently matured (see ES **Figure 6.4 – Landscape and Visual Mitigation Strategy [REP1-027]**), such that views of reflecting panels are not expected to be possible in practice, and therefore no impact with mitigation in place.

Residual Effects

16.6.23. Overall, **no significant effects** are predicted on dwelling receptors if layout option 2 is pursued.

Train Driver Receptors

Layout Option 1 (Fixed and Tracker Solar Panel) and Layout Option 2 (Fixed Solar Panel)

16.6.24. A low impact is predicted on the separate 2.3km, 0.3km and 0.6km sections of railway line. Where solar reflections are geometrically possible from inside a train driver's primary horizontal field of view, there are mitigating factors such as a significant separation distance to the closest reflecting panels and effects occurring within a few hours of sunrise/sunset when the sun is low in the sky.

16.6.25. No impacts are predicted on other sections of the railway line because solar reflections are not geometrically possible or are predicted to be screened.

16.6.26. Mitigation is not required.

Residual Effects

16.6.27. Overall, **no significant effects** are predicted on train driver receptors for either layout option.

Railway Signals

16.6.28. Solar reflections are geometrically possible towards nine of the ten assessed railway signals.

16.6.29. Without consideration of vegetation screening:

- For two signals, a low impact is predicted because solar reflections originate from outside 90 degrees either side of the direction of the signal;
- For the remaining seven signals, a low impact is predicted with consideration of factors such as all signals appearing to be LED, having hoods fitted, reflections don't originate directly in front of the signal, and/or there is a significant clearance distance to the reflecting area.

16.6.30. With consideration of existing and proposed vegetation screening (see ES **Figure 6.4 – Landscape and Visual Mitigation Strategy [Document Reference 6.4.6.4]**), no impacts are predicted on any signals. No furthermitigation is required.

Residual Effects

16.6.31. Overall, **no significant effects** are predicted on railway signal receptors for either layout option.

Aviation Receptors

Layout Option 1 (Fixed Solar Panel) and Layout Option 2 (Fixed and Tracker Solar Panel)

Sandtoft Airfield

16.6.32. Solar reflections with a maximum intensity of 'potential for temporary after-image' (yellow glare) are predicted towards final sections of visual circuits/joins at Sandtoft Airfield, originating from panel areas within a pilot's primary field-of-view (50 degrees horizontally either side of the direction of travel). The glare scenario presented in the main assessment considers this glare could be accommodated without significant changes to the operational activity of the airfield. Some mitigation measures that pilots may typically use to mitigate the effects of direct sunlight could be used to mitigate the effects of direct solar reflections from the solar panels given the operations at this unlicensed airfield. This includes measures such as wearing sunglasses, using darkened cockpit sun visors to reduce the intensity of the sun, and overflying the airfield and inspecting the runway prior to landing.

16.6.33. Considering a pilot's primary field-of-view, the maximum intensity of solar reflections predicted towards 1-mile splayed approach paths towards Runway 05 and 23 is 'low potential for temporary after-image' (green glare). This glare is acceptable, and mitigation is not required.

Doncaster Sheffield Airport

16.6.34. Significant impacts are not predicted on aviation activity at Doncaster Sheffield Airport based on the associated guidance and industry best practice. This is because:

- Solar reflections towards the Air Traffic Control (ATC) Tower are unlikely to be geometrically possible based on the location of the receptor relative to the Scheme (considering distance, height, and orientation). Any reflections that are geometrically possible are likely to be screened by intervening terrain, buildings, and/or vegetation.

- Any solar reflections geometrically possible towards aircraft on the final two-mile approach towards runway 20 would be outside of a pilot's primary horizontal field of view (50 degrees either side of the approach bearing). At worst, a low impact is predicted on pilots on this approach path based on the associated guidance and industry best practice for licensed airfields.

- Any solar reflections geometrically possible towards aircraft on the final two-mile approach towards runway 02 are predicted to have glare intensities no greater than 'low potential for temporary after-image' and therefore it can be reliably determined that this level of glare is acceptable for these receptors. Technical modelling is not recommended.

Finningley Village Airstrip

16.6.35. Significant impacts are not predicted on aviation activity at Finningley Village Airstrip based on the associated guidance and industry best practice. This is because:

- Any reflections towards aircraft on the final one-mile splayed approach towards runway 19 would be outside of a pilot's primary horizontal field of view. At worst, a low impact is predicted on pilots on this approach path based on the associated guidance and industry best practice for licensed airfields.

- Solar reflections originating from the Scheme towards the final one-mile splayed approach towards runway 01, and the final sections of the visual circuits and joins, are predicted to have glare intensities no greater than 'low potential for temporary after-image', and therefore it can be reliably determined that this level of glare is acceptable for these receptors. Technical modelling is not recommended.

Haxey Airstrip

16.6.36. Significant impacts are not predicted on aviation activity at Haxey Airstrip based on the associated guidance and industry best practice. This is because:

- Any reflections towards aircraft on the final one-mile splayed approach towards runway 36 would be outside of a pilot's primary horizontal field of view. At worst, a low impact is predicted on pilots on this approach path based on the associated guidance and industry best practice for licensed airfields

- Solar reflections originating from the Scheme towards the final one-mile splayed approach towards runway 18, and the final sections of the visual circuits and joins, are predicted to have glare intensities no greater than 'low potential for temporary after-image' , and therefore it can be reliably determined that this level of glare is acceptable for these receptors. Technical modelling is not recommended.

Residual Effects

16.6.37. Overall, **no significant effects** are predicted on aviation receptors for either layout option.

16.6.38. During Examination of the Scheme a request through the Examining Authority's First Written Questions (ExQ1) issued on 24th April 2026 sought a summary table of residual effects for Glint and Glare. Accordingly, **Table 16-15** below sets this detail out.

Table 16-15 – Glint and Glare Summary of Residual Effects

Receptor	Effects prior to Embedded Mitigation	Mitigation	Residual Effects
Layout Option 1 (Fixed and Tracker Solar Panel)			
Road Receptors	Moderate effects (significant) are predicted on separate 0.2km and 1.6km sections of the M180, and a 0.1km section of the A18	Proposed vegetation planting is expected to screen panels once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice. Proposed planting is shown in **ES Figure 6.4 Landscape and**	**Minor (not significant) effects**

		Visual Mitigation Strategy [REP1-027] secured by the **draft DCO [Document Reference 3.1 Revision 4].**	
Dwelling Receptors	Moderate effects (significant) are predicted on six dwellings due to the duration of effects Minor effects (not significant) are predicted on other dwellings either because the duration of effects received in practice on the ground floor is expected to be reduced to less than three months per year and less than 60 minutes per any one day, or there are mitigating factors such as a significant separation distance to the closest reflecting panels and effects occurring within a few hours of sunrise/sunset	Proposed vegetation planting is expected to screen panels from the ground floor of the six dwellings once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice. Proposed planting is shown in **ES Figure 6.4 Landscape and Visual Mitigation Strategy [REP1-027]** secured by the **draft DCO [Document Reference 3.1 Revision 4].**	**Minor (not significant) effects**

	when the Sun is low in the sky		
Train Driver Receptors	Minor (not significant) effects	None	**Minor (not significant) effects**
Railway Signals	Minor (not significant) effects	Proposed vegetation planting. Proposed planting is shown in **ES Figure 6.4 Landscape and Visual Mitigation Strategy [REP1-027]** secured by the **draft DCO [Document Reference 3.1 Revision 4].**	**Negligible (not significant) effects**
Sandtoft Airfield	Minor (not significant) effects	None	**Minor (not significant) effects**
Doncaster Sheffield Airport	Minor (not significant) effects	None	**Minor (not significant) effects**
Finningley Village Airstrip	Minor (not significant) effects	None	**Minor (not significant) effects**
Haxey Airstrip	Minor (not significant) effects	None	**Minor (not significant) effects**
Layout Option 2 (Fixed and Tracker Solar Panel)			

Road Receptors	Moderate (significant) effects are predicted on separate 0.2km and 1.6km sections of the M180, and a 0.1km section of the A18	Proposed vegetation planting is expected to screen panels once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice. Proposed planting is shown in **ES Figure 6.4 Landscape and Visual Mitigation Strategy [REP1-027]** secured by the **draft DCO [Document Reference 3.1 Revision 4].**	**Minor (not significant) effects**
Dwelling Receptors	Moderate (significant) effects are predicted on six dwellings due to the duration of effects Minor effects (not significant) are predicted on other dwellings either because the duration of effects received in practice on the ground floor is expected to be	Proposed vegetation planting is expected to screen panels from the ground floor of the six dwellings once sufficiently matured, such that views of reflecting panels are not expected to be possible in practice. Proposed planting	**Minor (not significant) effects**

	reduced to less than three months per year and less than 60 minutes per any one day, or there are mitigating factors such as a significant separation distance to the closest reflecting panels and effects occurring within a few hours of sunrise/sunset when the Sun is low in the sky	is shown in **ES Figure 6.4 Landscape and Visual Mitigation Strategy [REP1-027]** secured by the **draft DCO [Document Reference 3.1 Revision 4].**	
Train Driver Receptors	Minor (not significant effects)	None	**Minor (not significant) effects**
Railway Signals	Minor (not significant effects)	Proposed vegetation planting. Proposed planting is shown in **ES Figure 6.4 Landscape and Visual Mitigation Strategy [REP1-027]** secured by the **draft DCO [Document Reference 3.1 Revision 4].**	**Negligible (not significant) effects**

Sandtoft Airfield	Minor (not significant) effects	None	**Minor (not significant) effects**
Doncaster Sheffield Airport	Minor (not significant) effects	None	**Minor (not significant) effects**
Finningley Village Airstrip	Minor (not significant) effects	None	**Minor (not significant) effects**
Haxey Airstrip	Minor (not significant) effects	None	**Minor (not significant) effects**

16.7. References

- Ref. 16-1: IEMA Guidance (2020) Major Accidents and Disasters in EIA: A Primer
- Ref. 16-2: HMSO (2017) The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
- Ref. 16-3: OJEU (2012) Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.
- Ref 16-4: OJEU (2009) Council Directive 2009/71/EURATOM of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations.
- Ref 16-5: Department for Energy Security and Net Zero (2025) Overarching National Policy Statement for Energy (EN-1)
- Ref 16-6: Health and Safety Executive (2015) The Construction (Design and Management) Regulations 2015
- Ref 16-7: UK Statutory Instruments (1999) Management of Health and Safety at Work Regulations 1999
- Ref 16-8: Health and Safety at Work etc. Act 1974, c.37.
- Ref 16-9: UK Statutory Instruments (1996) The Construction (Health, Safety and Welfare) Regulations 1996
- Ref 16-10: UK Statutory Instruments (2002) The Electricity Safety, Quality and Continuity Regulations 2002
- Ref 16-11: Health and Safety Executive (2010) Health and safety in the new energy economy
- Ref 16-12: Allianz Risk Consulting (ARC), Tech Talk Volume 26 (2019). Battery Energy Storage Systems (BESS) using Li-ion batteries
- Ref 16-13: Institute of Engineering and Technology (2017) Code of Practice for Electrical Energy Storage Systems

- Ref 16-14: The Energy Institute: Battery Storage Guidance Note 1 (2019) Battery Storage Planning
- Ref 16-15: Safety requirements for grid-integrated EES systems (2020) Electrochemical based systems. IEC 62933-5-2:2020
- Ref 16-16: National Fire Protection Association (NFPA) (2020) 855, Standard for the Installation of Stationary Energy Storage Systems
- Ref 16-17: UN 'Recommendations on the Transport of Dangerous Goods' – Section 38.3 covers Lithium-Ion Batteries.
- Ref 16-18: Directive 2018/851/EC of the European Parliament and of the Council of 30 May 2018 amending Directive
- 2008/98/EC on waste (Waste Framework Directive).
- Ref 16-19: UK Statutory Instruments (2011) The Waste (England and Wales) Regulations 2011
- Ref 16-20: Department for Environment, Food and Rural Affairs (2021) Waste Management Plan for England
- Ref 16-21: IEMA (2020) Guidance: Guide to Materials and Waste in Environmental Impact Assessment
- Ref 16-22: Doncaster Council (2012) The Barnsley, Doncaster and Rotherham Joint Waste Plan (adopted March 2012)
- Ref 16-23: Department for Energy Security and Net Zero (2023) National Policy Statement for Electricity Networks Infrastructure
- Ref 16-24: UK Statutory Instruments (2002) The Electricity Safety, Quality and Continuity Regulations 2002
- Ref 16-25: HPA (2009) Application of ICNIRP Exposure Guidelines for 50 Hz Power Frequency Fields
- Ref 16-26: HSE (2015) The Electricity at Work Regulations 1989
- Ref 16-27: Department of Energy and Climate Change (2012) Power Lines: Demonstrating compliance with EMF public exposure guidelines

- Ref 16-28: Department of Energy and Climate Change (2013) Power Lines: Control of Microshocks and other indirect effects of public exposure to electric fields
- Ref 16-29: Energy Network Association (2012) Electric and magnetic fields, the facts.
- Ref 16-30: UK Statutory Instruments (2016) The Control of Electromagnetic Fields at Work Regulations 2016
- Ref 16-31: UK Statutory Instruments (2015) The Control of Major Accident Hazards Regulations 2015
- Ref 16-32: Cabinet Office (2025) Guidance - National Risk Register 2025
- Ref 16-33: Department for Environment, Food & Rural Affairs (2009) Policy paper - Safeguarding our soils: A strategy for England
- Ref 16-34: International Commission on Non-Ionizing Radiation Protection (1998) ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHZ)
- Ref 16-35: National Grid (2015) Undergrounding high voltage electricity transmission lines.

16.8. Glossary

Term/Acronym	Description
Accidents	An occurrence resulting from uncontrolled developments in the course of construction, operation, and decommissioning (e.g., major emission, fire, or explosion).
OBSMP	Outline Battery Safety Management Plan
OCEMP	Outline Construction Environmental Management Plan
CDM	Construction, Design Management
Disasters	Naturally occurring extreme weather events or ground related hazard events (e.g., subsidence, landslide, earthquake).
ODEMP	Outline Decommissioning Environmental Management Plan
Electro-magnetic field (EMF)	A combination of invisible electric and magnetic fields of force. They are generated by natural phenomena like the Earth's magnetic field but also by human activities, mainly through the use of electricity
EMF exposure	Refers to the degree of interaction with EMFs
EMI	Electromagnetic Interference
ESQCR	Electricity Safety Quality & Continuity Regulations 2002
Glare	refers to a continuous source of bright light typically received by static receptors or from large reflective surfaces.

Term/Acronym	Description
Glint	Refers to a momentary flash of bright light typically received by moving receptors or from moving reflectors.
HPA	Health Protection Agency
HSC	Hazardous Substances Consent
ICNIRP	International Commission on Non-Ionizing Radiation Protection
Ionizing	Mid to high-frequency radiation which can, under certain circumstances, lead to cellular and or DNA damage with prolonged exposure
Landfill Diversion	Process of diverting waste from landfills to alternative methods like recycling, composting, or reusing, reducing the amount of waste sent to landfills.
LIP	Lithium iron phosphate
Non-Ionizing	Low to mid-frequency radiation which is generally perceived as harmless due to its lack of potency
OOEMP	Outline Operational Environmental Management Plan
Utilities	A service that is used by the public, such as an electricity or gas supply.
Waste	Defined as materials that are unwanted, having been left over after the completion of a process which would otherwise be discarded. The legal definition of waste also covers substances or objects, which fall outside of the commercial cycle or out of the chain of utility.

Term/Acronym	Description
Waste Framework Directive (WFD)	Legislative framework for the collection, transport, recovery, and disposal of waste across the European community.
Waste Hierarchy	A framework that prioritizes waste management strategies based on their environmental impact, with waste prevention as the top priority. It outlines a preferred order: prevention, preparing for reuse, recycling, other recovery (including energy recovery), and finally disposal. This approach aims to minimize environmental harm and promote resource efficiency.
WEEE	Waste Electrical and Electronic Equipment
Void Capacity	Assesses the percentage of the remaining "space or void" within landfill capacity that will be used by waste produced during the construction and/operation phases of a proposed development.