One Earth Solar Farm

Volume 6.0: Environmental Statement [EN010159]

Volume 2: Aspect Chapters

Chapter 8: Land and Soils

February 2025

Document Reference: EN010159/APP/6.8

Revision 01

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Reg 5 (2) (a)

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Glossary

Term	Definition
Aquifer	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater (definition taken from gov.uk website).
Development High Risk Area	Relating to coal mining, a Development High Risk Area contains one or more recorded coal mining related features at surface or shallow depth, including mine entries; shallow coal workings; recorded coal mining related hazards; recorded mine gas sites; fissures and breaklines and previous surface mining sites.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil (legal definition as referenced on gov.uk website).
Source Protection Zones	Zones which show the level of risk to a source of water from contamination. An Inner zone (SPZ 1) is defined as a zone with a 50 day travel time of pollutant to source (50 metres default minimum radius). An Outer zone (SPZ 2) is defined as a zone with a 400 day travel time of pollutant to source (250m or 500m minimum radius around the source depending on the amount of water taken). A Total catchment (SPZ 3) is the area around a supply source within which all the groundwater ends up at the abstraction point.

List of Abbreviations and Acronyms

Term	Definition
ALC	Agricultural Land Classification
bgl	Below ground level
BGS	British Geological Survey
BMV	Best and most versatile
CSM	Conceptual site model
ES	Environmental Statement
IEMA	Institute of Environmental Management and Assessment
oCEMP	Outline Construction Environmental Management Plan
oCTMP	Outline Construction Traffic Management Plan
oDEMP	Outline Decommissioning Environmental Management Plan
oDTMP	Outline Decommissioning Traffic Management Plan
oLEMP	Outline Landscape and Ecology Management Plan
oOEMP	Outline Operation and Maintenance Environmental Management Plan
oOTMP	Outline Operation and Maintenance Traffic Management Plan
oSMP	Outline Soil Management Plan
PRA	Preliminary Risk Assessment
SPZ	Source Protection Zone

8. Land, Soil and Groundwater

8.1.1 This Chapter of the Environmental Statement (ES) was prepared by RSK Environment Limited and presents an assessment of the likely significant environmental effects of the Proposed Development upon Land, Soil and Groundwater.

8.1.2 A description of the methods used in the assessment is set out in this Chapter. This is followed by a description of the relevant baseline conditions, future baseline conditions and sensitive receptors, together with an assessment of the likely significant effects of the Proposed Development during construction, operation and maintenance, and decommissioning. Consideration of the potential significant environmental effects has been made throughout the design of the Proposed Development. Specific environmental measures relevant to Land, Soil and Groundwater have been identified and have been considered as part of the assessment. To conclude, a summary of the assessment is presented. Details of the cumulative effects assessment is presented separately within **ES Volume 1, Chapter 18: Cumulative Effects [EN010159/APP/6.18].**

8.1.3 As was defined by the Scoping Opinion (see **ES Volume 3: Scoping Opinion [EN010159/APP/6.23]**), the following are the likely significant effects considered within this chapter:

- Geological units (superficial and bedrock units) (construction and decommissioning);
- Mineral safeguarding sites (construction and decommissioning);
- Groundwater abstraction points (construction and decommissioning);
- Groundwater in bedrock and superficial geological units (construction and decommissioning);
- Soil resources of ALC grade 2, 3a and 3b (construction and decommissioning); and
- Availability of soil resources of ALC grade 2, 3a and 3b (operation);

8.1.4 This Chapter is supported by the following figures located within **ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]** and further detailed information contained within the following appendices located within **ES Volume 3: Technical Appendices Supporting ES Volumes 1 and 2 [EN010159/APP/6.21]**:

- ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]:
  - Figure 8.1: Study Area
  - **Figure 8.2:** Landfill sites, waste management sites and sites of potential contamination

- **Figure 8.3:** Bedrock geological units and geological hazards
- **Figure 8.4:** Superficial geological units and geological hazards
- **Figure 8.5:** Mineral extraction sites and mineral safeguarding areas
- **Figure 8.6:** ALC survey results
- **Figure 8.7:** Groundwater abstraction points

> ES Volume 3: Technical Appendices Supporting Volumes 1 and 2 [EN010159/APP/6.21]:

- **Appendix 8.1:** Summary of Legislation, Policy and Technical Guidance
- **Appendix 8.2:** Preliminary Risk Assessment
- **Appendix 8.3:** Agricultural Land Classification survey report
- **Appendix 8.4:** Preliminary Factual Site Investigation Results.

8.2 Relevant Legislation, Policy and Technical Guidance

8.2.1 A summary of the relevant legislation and policy documents for Land, Soil and Groundwater is provided in **ES Volume 3, Appendix 8.1: Summary of Legislation, Policy and Technical Guidance [EN010159/APP/6.21].**

> Legislation

- Part IIA of the Environmental Protection Act 1990;
- Control of Pollution Act 1974; and
- Environmental Permitting Regulations 2016 (as amended).

> Policy

- Overarching National Policy Statement for Energy (EN-1) (2023)1;
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (2023)2;

[1] Department for Energy Security & Net Zero (2023) Overarching National Policy Statement for Energy (EN-1). [Online], Available: https://assets.publishing.service.gov.uk/media/64252f3b60a35e00120cb158/NPS_EN-1.pdf [Accessed January 2025]

[2] Department for Energy Security & Net Zero (2023). *National Policy Statement for Renewable Energy Infrastructure (EN-3)*. [Online], Available: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf [Accessed January 2025]

- National Planning Policy Framework (2024)3;
- Environmental Improvement Plan (2023)4;
- Newark and Sherwood District Council (2023) Plan Review Second Publication Amended Allocations and Development Management DPD5;
- Newark and Sherwood District Council (2019), Amended Core Strategy Development Plan6;
- Central Lincolnshire Local Plan (2023) (particularly Policy S67 'Best and Most Versatile Agricultural Land')7;
- Bassetlaw Local Plan 2020-2038 (2024)[8];
- Lincolnshire Minerals and Waste Local Plan (Core Strategy and Development Management Policies adopted 2016 and Site Locations adopted 20172017)[9]; and
- Nottinghamshire Minerals Local Plan (Adopted March 2021)[10].

[3] Department for Levelling Up, Housing and Communities (DLUHC) (2024) National Planning Policy Framework, [Online], Available: https://assets.publishing.service.gov.uk/media/675abd214cbda57cacd3476e/NPPF-December-2024.pdf [Accessed January 2025]

[4] Defra (2023) Environmental Improvement Plan 2023, [Online], Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133967/environmental-improvement-plan-2023.pdf [Accessed January 2025]

[5] Newark and Sherwood District Council (2023) *Plan Review Second Publication Amended Allocations and Development Management DPD*. [Online], Available: https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-allocations-and-development-management-dpd/PLAN-REVIEW-PUB-STAGE-2.pdf [Accessed January 2025]

[6] Newark and Sherwood District Council (2019) *Amended Core Strategy*. [Online], Available: https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-core-strategy-dpd/amended-core-strategy-DPD.pdf [Accessed January 2025]

[7] Lincolnshire County Council (2023). *Central Lincolnshire Local Plan*. [Online], Available: https://www.n-kesteven.gov.uk/sites/default/files/2023-04/Local%20Plan%20for%20adoption%20Approved%20by%20Committee.pdf [Accessed January 2025]

[8] Bassetlaw District Council (2024). *Bassetlaw Local Plan 2020-2038*. [Online], Available: https://www.bassetlaw.gov.uk/media/gn1kjm1b/adopted-bassetlaw-local-plan-2020-2038.pdf [Accessed January 2025]

[9] Lincolnshire County Council (2017). *Lincolnshire Minerals and Waste Local Plan Site Locations*. [Online], Available: https://www.lincolnshire.gov.uk/downloads/file/2274/adopted-site-locations-pdfa [Accessed January 2025]

[10] Lincolnshire County Council (2017). *Lincolnshire Minerals and Waste Local Plan Site Locations*. [Online], Available: https://www.lincolnshire.gov.uk/downloads/file/2274/adopted-site-locations-pdfa [Accessed January 2025]

- Technical Guidance
  - Natural England (1988) 'Agricultural land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land (ALC011)11;
  - Natural England (2017) Likelihood of Best and Most versatile Agricultural Land12;
  - Department for Food, Environment and Rural Affairs (Defra) Local Lands, Soils and Groundwater Management Technical Guidance (TG22);
  - Land Contamination Risk Management (Environment Agency, 2023)13
  - Construction Industry Research and Information Association (CIRIA) document 'Contaminated land risk assessment, A guide to good practice (C552)14';
  - Institute of Environmental Management and Assessment (IEMA) Guide: A New perspective on Land and Soil in Environmental Impact Assessment (2022)15;
  - Technical Information Note TIN049: Agricultural Land Classification: protecting the best and most versatile agricultural land, 2nd edition (2012)16;
  - Solar and protecting our Food Security and best and Most Versatile (BMV) Land, Written Statement (reference UIN HCWS466) (May 2024);

[11] Natural England (1998). *Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land (ALC011)*. [Online], Available: https://publications.naturalengland.org.uk/publication/6257050620264448 [Accessed January 2025]

[12] Natural England (2017). *Likelihood of Best and Most versatile Agricultural Land*. [Online], Available: https://publications.naturalengland.org.uk/category/5208993007403008 [Accessed January 2025]

[13] Environment Agency (2023). *Land contamination risk management (LCRM)*. [Online], Available: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm [Accessed January 2025]

[14] Rudland, D J, Lancefield, R M and Mayell, P N (2001). *Contaminated land risk assessment. A guide to good practice (C552D)*. CIRIA: London

[15] IEMA (2022). *A New Perspective on Land and Soil in Environmental Impact Assessment*. IEMA: Lincoln

[16] Natural England (2012). *Technical Information Note TIN049: Agricultural Land Classification: protecting the best and most versatile agricultural land*. Natural England: Crewe

- A Green Future: Our 25 Year Plan to Improve the Environment (2023)17;
- The Environment Agency's approach to groundwater protection, (2018)18; and
- The Environment Agency, protect groundwater and prevent groundwater pollution (2024)[19].

8.3 Assessment Methodology and Significance Criteria

The Study Area

8.3.1 The Order Limits plus a 250m buffer (as set out in **ES Volume 3, Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**) was considered with regard to identifying land, soil and groundwater related receptors that could be impacted by the construction, operation and maintenance, and decommissioning of the Proposed Development. The size of the study area is considered appropriate to identify features that may be impacted by the Proposed Development and may impact the Proposed Development. Issues that could affect sensitive receptors assessed in this section occur by direct contact (for example contamination such as a fuel spillage coming into direct contact with soil, or physical contact from construction plant affecting soil quality) or by movement of contamination through soil, subsoil or groundwater. These types of pathways or contacts are physically restricted by factors such as the geology, topography, groundwater regime, and presence of surface water features. Professional judgement was used when considering whether sensitive receptors could be affected by different features or issues. The study area is shown in **ES Volume 3, Figure 8.1: Study Area [EN010159/APP/6.20]**.

8.3.2 The size of the study area was not defined within the EIA Scoping Report (see **ES Volume 3, Appendix 2.1: Scoping Report [EN010159/APP/6.21])** or discussed within **ES Volume 3: Scoping Opinion [EN010159/APP/6.23]**.

[17] DEFRA (2023). *A Green Future: Our 25 Year Plan to Improve the Environment*. [Online], Available: https://assets.publishing.service.gov.uk/media/5ab3a67840f0b65bb584297e/25-year-environment-plan.pdf [Accessed January 2025]

[18] Environment Agency (2018). *The Environment Agency's approach to groundwater protection*. [Online], Available: https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf [Accessed January 2025]

[19] Environment Agency (2024). Protect groundwater and prevent groundwater pollution [Online], Available: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution [Accessed January 2025]

Criteria for Geographical Extent of Impact

8.3.3 The geographical extent of impacts is considered by the assessment, on the following basis:

- Site: impacts that have an effect within the Order Limits, with none of the effect extending outside the Order Limits;
- Local: impacts that have an effect within the Order Limits, and potentially affect the local surrounding area up to the extent of the study area, which for One Earth is 250m outside the Order Limits;
- Unitary Authority: impacts that have an effect within the Order Limits and within the unitary authority area;
- Regional: impacts that have an effect within the Order Limits and have the potential to affect a wider area on a regional scale, namely within the counties of Lincolnshire and Nottinghamshire;
- England: impacts that have an effect within the Order Limits and within the country of England;
- United Kingdom: impacts that have an effect within the Order Limits and within the union of England, Scotland, Wales and Northern Ireland; and
- International: impacts of international importance will have an effect beyond the boundaries of the United Kingdom.

Establishing the Baseline

Existing Baseline

8.3.4 The existing baseline conditions of the study area were determined using the following sources:

- Geological maps (bedrock and superficial geology) (British Geological Survey (BGS) mapping accessed online[20])
- Hydrogeological and groundwater vulnerability maps (BGS database[20] and MAGIC maps [21])
- Soil survey maps [21,22]

[20] British Geological Survey (2020). *GeoIndex Onshore*. [Online], Available: https://mapapps2.bgs.ac.uk/geoindex/home.html

[21] Natural England (2025). *MAGIC Map*. [Online], Available: https://magic.defra.gov.uk/MagicMap.aspx

[22] Natural England (2016). *Regional Agricultural Land Classification*. [Online], Available: https://publications.naturalengland.org.uk/category/5954148537204736

- Site-specific data and historical mapping from an environmental database report[23] (providing details of features on or close to the Order Limits relating to water, waste, hazardous substances, geology and land use)
- Mineral resources information from Lincolnshire Minerals and Waste Local Plan[24] and Nottinghamshire Minerals Local Plan[25].

8.3.5 With respect to soil, a Project-specific soil sampling survey was undertaken. Reference has also been made to the Provisional Agricultural Land Classification (ALC) map of England[21].

Future Baseline

8.3.6 The future baseline considers the conditions that might occur if the Proposed Development is not constructed. The assessment of the future baseline was undertaken by considering the factors that have been scoped into the assessment and applying professional judgement to determine the expected future baseline in terms of Land, Soil and Groundwater. Further details as to how this assessment has been carried out are provided in **Section 8.4.41**.

Identifying Receptors and Receptor Sensitivity

8.3.7 Sensitivity criteria have been updated compared to those included in the methodology that was provided within the Scoping Report and the PEIR, to increase robustness of the assessment.

8.3.8 Sensitivity criteria for land and soil receptors, derived from the IEMA Guide A New Perspective on Land and Soil in Environmental Impact Assessment[15], are defined in **Table 8.1** below.

Table 8.1 Receptor sensitivity for land and soil

Sensitivity	Criteria guide
Very High	**Biomass production**: Agricultural Land Classification Grades 1 & 2. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected features within a European site (e.g., Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar); Peat soils; Soils supporting a National Park, or Ancient Woodland.

[23] Set of four Envirocheck reports, to be provided as a technical appendix to the ES (report references 339698695_1_1, 339699668_1_1, 339700353_1_1 and 339700725_1_1, dated 19-03-2024

[24] Lincolnshire County Council (2017). *Lincolnshire Minerals and Waste Local Plan Site Locations*. [Online], Available: https://www.lincolnshire.gov.uk/downloads/file/2274/adopted-site-locations-pdfa [Accessed January 2025]

[25] Nottinghamshire County Council (2021). *Nottinghamshire Minerals Local Plan*. [Online], Available: https://www.nottinghamshire.gov.uk/media/5079375/adoptedmineralslocalplancompressed.pdf [Accessed January 2025]

Sensitivity	Criteria guide
	Soil carbon: Peat soils. Soils with potential for ecological/landscape restoration. **Soil hydrology**: Very important catchment pathway* for water flows and flood risk management. **Archaeology, cultural heritage, community benefits and geodiversity**: Scheduled Monuments and adjacent areas; World Heritage and European designated sites; Soils with known archaeological interest; Soils supporting community/recreational/educational access to land covered by National Park designation. **Source of materials**: Important surface mineral reserves that would be sterilised (i.e., without future access).
High	**Biomass production**: Agricultural Land Classification Grade 3a. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected features within a UK designated site (e.g., UNESCO Geoparks, Site of Special Scientific Interest (SSSI) or Areas of Outstanding Natural Beauty (now Protected Landscapes), Special Landscape Area, and Geological Conservation Review sites); Native Forest and woodland soils; Unaltered soils supporting semi-natural vegetation (including UKBAP priority habitats). **Soil carbon**: Organo-mineral soils (e.g., peaty soils). **Soil hydrology**: Important catchment pathway* for water flows and flood risk management. **Archaeology, cultural heritage, community benefits and geodiversity**: Soils with probable but as yet unproven (prior to being revealed by construction) archaeological interest; Historic parks and gardens; Regionally Important Geological and Geomorphological Sites; Soils supporting community/recreational/educational access to Regionally Important Geological and Geomorphological Sites and Areas of Outstanding Natural Beauty (now Protected Landscapes). **Source of materials**: Surface mineral reserves that would be sterilised (i.e. without future access).
Medium	**Biomass production**: Agricultural Land Classification Grade 3b. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting protected or valued features within non-statutory designated sites (e.g., Local Nature Reserves (LNRs), Local Geological Sites (LGSs), Sites of Nature Conservation Importance (SNCIs), Special Landscape Areas; Non-Native Forest and woodland soils. **Soil carbon**: Mineral soils. **Soil hydrology**: Important minor catchment pathway* for water flows and flood risk management. **Archaeology, Cultural heritage, community benefits and geodiversity**: Soils with possible but as yet unproven (prior to being revealed by construction) archaeological interest; Soils supporting community/recreational/educational access to land. **Source of materials**: surface mineral reserves that would remain accessible for extraction.
Low	**Biomass production**: Agricultural Land Classification Grades 4 & 5. **Ecological habitat, soil biodiversity and platform for landscape**: Soils supporting valued features within non-designated notable or priority habitats/landscapes. Agricultural soils. **Soil carbon**: Mineral soils. **Soil hydrology**: Pathway* for local water flows and flood risk management.

Sensitivity	Criteria guide
	Archaeology, cultural heritage, community benefits and geodiversity: Soils supporting no notable cultural heritage, geodiversity nor community benefits; Soils supporting limited community/recreational/educational access to land. **Source of materials**: Surface mineral reserves that would remain accessible for extraction.
Negligible	As for low sensitivity, but with only indirect, tenuous, and unproven links between sources of impact and soil functions.
* As defined by the Site and catchment characteristics according to the professional judgement of a catchment hydrologist.	

8.3.9 The importance criteria for groundwater presented in Table 8.2 are derived from the Design Manual for Roads and Bridges LA 113: Road Drainage and the Water Environment[26].

Table 8.2 Receptor importance for groundwater

Importance	Typical criteria	Typical examples
Very High	Nationally significant attribute of high importance	Principal aquifer providing a regionally important resource, and/or supporting a site protected under EC and UK legislation; Groundwater that locally supports a Groundwater dependent terrestrial ecosystem; Source Protection Zone 1
High	Locally significant attribute of high importance	Principal aquifer providing locally important resource or supporting a river ecosystem; Groundwater that supports a Groundwater dependent terrestrial ecosystem; Source Protection Zone 2.
Medium	Of moderate quality and rarity	Aquifer providing water for agriculture or industrial use with limited connection to surface water; Source Protection Zone 3.
Low	Lower quality	Unproductive strata

[26] Design Manual for Roads and Bridges LA 113: Road drainage and the water environment, revision 1, March 2020. Available online: https://www.standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727

Assessment Methodology

8.3.10 A Minerals Safeguarding Assessment, demonstrating how impacts to Mineral Safeguarding Areas have been addressed, is presented in **Mineral Safeguarding Assessment [EN010159/APP/7.3]**.

8.3.11 A Preliminary Risk Assessment (PRA) has been completed for the Order Limits (presented as **ES Volume 3 Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**). This provides baseline data on the land, soil and groundwater factors relating to the Order Limits, alongside an assessment of potential risks relating to human receptors, controlled waters and other sensitive receptors. This work has been undertaken in line with the technical approach presented in Land Contamination Risk Management[27] and in general accordance with British Standard 10175[28]. The PRA report includes coverage of the Order Limits history, geology, hydrogeology, hydrology, and other issues. A Site walkover has been completed as part of the assessment. An assessment of contaminated land has been completed by means of development of a conceptual site model (CSM), which identified sources, pathways and receptors for contamination. A pollutant linkage is considered to exist when all three components of the CSM are identified. The significance of each pollutant linkage has then been assessed to identify potential risks.

8.3.12 The assessment methodology for land, soil and groundwater receptors that has been used in this Chapter is detailed below.

8.3.13 The assessment of potential effects with respect to land, soil and groundwater has been undertaken by considering the elements of the Proposed Development for each phase, alongside the identified receptors that have been listed in **Table 8.7**. Where a potential effect is considered to exist, this has been assessed alongside the environmental measures that forms part of the Proposed Development (as detailed further in **Section 8.5** and **Section 8.6**).

Construction

8.3.14 The following elements of the construction phase have been considered within this Chapter, as having the potential to affect land, soil and groundwater receptors (as detailed in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**):

- Site Establishment, including construction of site access points and setting out
- General Deliveries, including import and export of materials from Site

[27] Land Contamination Risk Management (LCRM) (Environment Agency, 2021)

[28] British Standard (BS) 10175: 2011 + A2 2017 (BSI, 2017).

- Establishment of Site compounds including installation of surfacing for material storage and parking
- Installation of welfare buildings and site offices
- Establishment of secondary compounds which will be used to store materials and welfare to limit movement of internal traffic
- Site Tracks: to comprise crushed aggregate
- Installation of geotextiles
- Preparation of substation platform
- Cabling Works
- Pouring of substation concrete
- Substation HV Deliveries
- Internal HV Works & Buildings
- Solar Array Works
- Piling of mounting structures
- Mounting of solar modules to be completed using lifting machinery but fixed using handheld power tools
- Installation of cabling & cabling sand
- Battery Platform
- Battery Foundations
- Battery Cabling
- Landscaping and habitat enhancement, including fencing
- Commissioning, including testing elements following the completion of key construction elements
- Final Connection

8.3.15 Plant to be used during construction works include:

- Excavator
- Mobile Cranes
- Compact track loaders
- Telehandlers (Telescopic Handlers)
- Bulldozers

- Aerial Work Platforms (AWPs) or Cherry Pickers
- Flatbed trucks
- Dump trucks
- Water trucks
- Generators
- Concrete Mixers and Pump Trucks
- Pile Driver
- Trencher
- Compactors.

8.3.16 Construction of the following elements have been considered within the assessment of effects on land, soil and groundwater receptors, as described in detail in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**):

- Construction of Solar PV modules, including foundations;
- Conversion of land beneath the PV Array Areas from arable land to shade tolerant grass or similar;
- Construction of PCS enclosures;
- Construction of BESS compounds;
- Construction of substation compounds;
- Ancillary works, including low voltage cabling, associated tracks or drainage requirements, access, fencing and CCTV, as well as other ancillary buildings; and
- Completion of the trenchless crossing of the River Trent.

Operation and Maintenance

8.3.17 The following elements of the operation and maintenance phase have been considered within this Chapter, as having the potential to affect land, soil and groundwater receptors (as detailed in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**):

- The DCO is seeking time limited consent and the Proposed Development will be operational for up to 60 years, after which time it will be decommissioned. As such the assessment within this chapter has assumed the operational phase of the Proposed Development is temporary and the project is not considered permanent.

- During the operational phase of the Proposed Development, onsite activities will be minimal and will principally relate to vegetation management, equipment maintenance and servicing, replacement and renewal of any components that fail, and monitoring and inspection. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment or replacement or improvement of faulty or broken equipment to ensure the continued effective operation of the Proposed Development.
- Replacement of the Solar Modules will be undertaken where necessary during the operational phase.
- Cleaning of Panels will be completed on an assumed two-year cleaning cycle. Panel cleaning will be achieved using a tractor mounted cleaning system with a rotating 'car-wash' type brush. It is anticipated that water will be brought to Site in 1 m^3 intermediate bulk containers (IBC). Individual IBCs will be mounted on the rear of the tractor to provide water supply during cleaning. No cleaning products will be used, only water.
- Management of vegetation - the management of green infrastructure alongside mitigation and enhancement areas during operation, will be undertaken in accordance with the oLEMP (see Outline Landscape and Ecology Management Plan [EN010159/APP/7.7]). The oLEMP sets out the management prescriptions (including cutting, planting and replanting of vegetation) for existing retained trees, hedgerow, woodland, individual trees and species-rich grassland.

Decommissioning

8.3.18 The following elements of the decommissioning phase have been considered within this Chapter, as having the potential to affect land, soil and groundwater receptors (as detailed in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**):

- Decommissioning will include the removal of all above ground infrastructure, including the BESS and Substations foundations. Permissive paths will also be removed. Underground cables may remain in situ. Trees and hedgerows planted as part of the Proposed Development are assumed to remain in situ when the land is returned to the landowners. It is also expected any clear span bridges used throughout the operational period will remain in place.
- It is considered all of the Solar Modules and batteries used as part of the Proposed Development will be recycled.

Significance Criteria

8.3.19 In order to allocate significance to effects, the assessment considers the receptor sensitivity and the magnitude of the impact and uses a significance matrix to identify the significance of each effect. The methodology for determining the magnitude of impacts relating to land, soil and groundwater is provided in this

section, with **Table 8.3** providing the magnitude of impact for land and soil receptors, and **Table 8.4** providing the magnitude of impact for groundwater receptors. Magnitude of impact criteria have been updated compared to those included in the methodology that was provided within the Scoping Report and the PEIR, to increase robustness of the assessment.

Magnitude of Impact

8.3.20 Where an impact relating to land and soil is considered to be present, the magnitude of impact is classified using the criteria presented the **Table 8.3** below, which are derived from the IEMA Guide A New Perspective on Land and Soil in Environmental Impact Assessment[15].

Table 8.3 Land and soil magnitude of impact

Magnitude of impact (change)	Description of impacts restricting proposed land use
Major#	Permanent, irreversible loss of one or more soil functions or soil volumes (including permanent sealing or land quality downgrading), over an area of more than 20ha or loss of soil-related features, as advised by other topic specialists in EIA team (including effects from 'temporary developments'*) or Potential for permanent improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of more than 20ha, or gain in soil-related features, as advised by other topic specialists in EIA team (including effects from 'temporary developments'*)
Moderate	Permanent, irreversible loss of one or more soil functions or soil volumes, over an area of between 5ha and 20ha or loss of soil-related features, as advised by other topic specialists in EIA team (including effects from 'Temporary Developments'*) or Potential for improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of between 5ha and 20ha, or gain in soil-related features, as advised by other topic specialists in EIA team
Minor	Permanent, irreversible loss over less than 5ha or a temporary, reversible loss of one or more soil functions or soil volumes, or temporary, reversible loss of soil-related features, as advised by other topic specialists in EIA team. or Potential for permanent improvement in one or more soil functions or soil volumes due to remediation or restoration over an area of less than 5ha or a temporary improvement in one or more soil functions due to remediation or restoration or off-site improvement, or temporary gain in soil-related features, as advised by other topic specialists in EIA team
Negligible	No discernible loss or reduction or improvement of soil functions or soil volumes that restrict current or proposed land use
No change	No change to the receptor.

Magnitude of impact (change)	Description of impacts restricting proposed land use

The IEMA Guide has what is assumed to be an error in this cell, but reference to Table 5 of the IEMA Guide confirms that the magnitude should be shown as Major, which is presented here, instead of reproducing the perceived IEMA error.

* Temporary developments can result in a permanent impact if resulting disturbance or land use change causes permanent damage to soils.

8.3.21 The magnitude of impact for groundwater has been classified using the criteria presented in **Table 8.4**, which are adapted from Design Manual for Roads and Bridges LA 113: Road Drainage and the Water Environment[29].

Table 8.4 Groundwater magnitude of impact

Magnitude of impact	Criteria	Typical examples
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute.	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff. Loss of, or extensive change to groundwater dependent terrestrial ecosystem or baseflow contribution to protected surface water bodies. Reduction in water body Water Framework Directive classification. Loss or significant damage to major structures through subsidence or similar effects.
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff. Partial loss of the integrity of groundwater dependent terrestrial ecosystem. Contribution to reduction in water body Water Framework Directive classification.

[29] Highways England (2020). *Design Manual for Roads and Bridges LA 113: Road drainage and the water environment*. [Online], Available: https://www.standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727

Magnitude of impact	Criteria	Typical examples
		Damage to major structures through subsidence or similar effects or loss of minor structures.
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Potential low risk of pollution to groundwater from routine runoff. Minor effects on an aquifer, groundwater dependent terrestrial ecosystems, abstractions and structures.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	No measurable impact upon an aquifer and/or groundwater receptors.
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
Moderate beneficial	Results in moderate improvement of attribute quality	Contribution to improvement in water body Water Framework Directive classification. Improvement in water body catchment abstraction management Strategy (or equivalent) classification. Support to significant improvements in damaged groundwater dependent terrestrial ecosystem.
Major beneficial	Results in major improvement of attribute quality	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body Water Framework Directive classification
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Defining the Effect

8.3.22 The following terminology has been used when assessing effects relating to land, soil and groundwater receptors:

- Not Significant: No significant effect to an environmental resource or receptor.
- Significant beneficial: Advantageous or positive effect to an environmental resource or receptor.

- Significant adverse: Detrimental or negative effect to an environmental resource or receptor.

Significance of effect

8.3.23 The significance of effect is based on the sensitivity of the receptor and the magnitude of impact, as outlined in **Table 8.5** below for land and soils (derived from IEMA guidance[15]) and **Table 8.6** below for groundwater (adapted from Design Manual for Roads and Bridges LA 104: Environmental Assessment and Monitoring [30]). The significance of effect can be adverse or beneficial. The significance matrices have been updated compared to those included in the methodology that was provided within the PEIR, to increase robustness of the assessment.

8.3.24 The significance of an effect is reported as either 'significant' or 'not significant'. Any effects that have been determined as 'Moderate' or above are considered to be significant. Any effects that have been determined as 'Slight' or below are considered not significant.

8.3.25 Where the significance matrix indicates a range for the effect significance (e.g. 'slight or moderate'), professional judgement can be applied to select one option (which would be justified by evidence, as appropriate), or an effect significance range can be applied. Where a range for the effect of significance means that the effect could be either significant or not significant, professional judgement will be applied to define the significance (for example with the range 'slight to moderate', where slight would be not significant, but moderate would be significant). Where both categories within the range fall within either 'significant' or 'not significant', the range will not be adjusted to a single descriptor (for example if the range is 'neutral or slight', as both effects are considered to be not significant; or if the range is 'large or very large', as both effects are considered to be significant).

8.3.26 In some situations, where professional judgement has determined that the mitigation measures that are proposed will be of sufficient robustness to minimise the significance of effect beyond the generic value that is generated by applying these criteria, the assessment has indicated a lower significance of effect. Where appropriate, this is detailed in Section 8.6.

[30] Highways England (2020). *Design Manual for Roads and Bridges LA 104: Environmental assessment and monitoring*. [Online], Available: https://www.standardsforhighways.co.uk/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a

Table 8.5 Land and soils significance of effect criteria

		Magnitude of impact (change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity	Negligible	Neutral	Neutral or Slight*	Neutral or Slight	Neutral or Slight	Slight
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large

** This cell is listed as 'Slight' in the IEMA Guide, but has been adjusted to 'Neutral or Slight' to be consistent with the ranking scheme (the significance of effect should be equal to or lower than the adjacent cell to the right, not higher)*

Table 8.6 Groundwater significance of effect criteria

		Magnitude of impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Importance	Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate

Consultation

8.3.27 As set out in **ES Volume 1, Chapter 2: EIA Methodology [EN010159/APP/6.2]**, a number of consultation activities have been undertaken. **ES Volume 3, Appendix 2.2: ES Response to PINs Scoping Opinion [EN010159/APP/6.21]** summarises the EIA Scoping Opinion for the Proposed Development and where elements have been agreed to be scoped out of the EIA.

8.3.28 Any consultation elements which have been raised and addressed post-scoping, are detailed within the **Consultation Report [EN010159/APP/5.1]**.

8.3.29 In addition to the above, Natural England have been consulted in relation to the methodology of the agricultural land classification survey, and in relation to the details as contained with the **Outline Soil Management Plan [EN010159/APP/7.10]** (oSMP). The oSMP as submitted with the DCO Application, has been approved by Natural England, who are satisfied with the details and approach to the protection of soils. The assessment of likely significance effects has been undertaken based on the oSMP being adopted (i.e. the effects following adopted of the oSMP).

8.3.30 No other specific feedback has been received in respect of land or soil following scoping. Anglian Water provided a response relating to groundwater abstraction locations. This indicated that Anglian Water's groundwater abstraction locations should be considered as receptors within the assessment. This issue is dealt with in Section 8.4.37.

Assumptions, Exclusions and Limitations

8.3.31 Historical OS maps have been reviewed from the following dates: 1884, 1885, 1899, 1900, 1919, 1920, 1921, 1955, 1973, 1994 and 2000. This has not caused difficulties in terms of completing the data review, as there are unlikely to have been changes across the Order Limits that occurred between map editions that would affect land, soil or groundwater factors. However, it is considered necessary to point out that this dataset is not continuous.

8.3.32 Construction activity is anticipated to commence in 2027 and will continue for a period of 2 years (24 months). The Proposed Development would be operational by 2030. At this stage phasing of works in unknown until a construction contractor has been appointed. The assessment assumes the maximum effect scenario of construction works happening across the whole Order Limits simultaneously for the full construction period, although this is unlikely.

8.3.33 For the purposes of assessment, the operational scenario has considered the impact throughout the 60-year lifespan of the Proposed Development.

8.4 Baseline Conditions

8.4.1 The following figures are provided in support of the baseline section of the land, soil and groundwater Chapter (see **ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**), with further details provided on the baseline conditions in the following sections (**Sections 8.4.2 to 8.4.42**):

- **Figure 8.2:** Landfill sites, waste management sites and sites of potential contamination
- **Figure 8.3:** Bedrock geological units and geological hazards
- **Figure 8.4:** Superficial geological units and geological hazards

- **Figure 8.5:** Mineral extraction sites and mineral safeguarding areas
- **Figure 8.6:** Agricultural land classification survey results
- **Figure 8.7:** Groundwater abstraction points.

Current Baseline Conditions

8.4.2 The following sections detail land, soil and groundwater conditions within the study area.

Site history

8.4.3 The earliest historical maps for the Order Limits (from 1884) show the land already in agricultural use, with field boundaries and drainage ditches present, along with tracks, roads, footpaths and some farm buildings. Small ponds are evident in some locations. The River Trent is present crossing through the Order Limits, with embankments evident in some places, suggesting flood defence systems had been constructed to protect the farmland. Some medieval features are noted on map editions (medieval villages of Whimpton and Woodcoates, both of which are outside the Order Limits). Springs are noted in some locations on within the Order Limits.

8.4.4 In the 1900 map edition, a railway is present crossing the Order Limits (roughly running from west to east), including a station and goods shed at Fledborough (on-site) and at Clifton-on-Trent (just outside the Order Limits). A nursery (botanical) is apparent in one location on-site, but there are no other notable developments. An area of allotments is shown on-site in 1921. Old sand and gravel pits are noted close to Clifton-on-Trent railway station, which are within the Order Limits.

8.4.5 Mapping from the 1970s includes overhead power lines crossing some areas of the Order Limits, associated with High Marnham Power Station (coal fired), which was located on-site. This is understood to have operated from 1959 until 2003, with demolition of the cooling towers in 2012. Pumping stations are shown in some locations within the Order Limits, associated with the drainage network.

8.4.6 The 1980 map edition shows the presence of a sewage treatment works adjacent to High Marnham Power Station (on-site, on the west bank of the River Trent). By this date, some poultry farming operations are apparent (located on land just outside the Order Limits).

8.4.7 The map from 2000 shows an oil well facility (on land that is outside the Order Limits, but within the study area), which was no longer operational by the time of the Site walkover (13 to 15 March 2024). The railway tracks are no longer present by this map edition (the line of the former railway now forms part of the Sustrans cycling route that is present within the Order Limits and crosses Fledborough Viaduct). Some historical sand and gravel pits within the Order Limits have been infilled.

Site walkover observations

8.4.8 An overview of the Order Limits was obtained during a Site walkover (undertaken 13 to 15 March 2024). The land is predominantly used for arable farming, with a smaller fraction used for grazing (approximately 90% arable to 10% grazing). No buildings were observed within the Order Limits. Occasional ponds were observed within fields, with most surface water being present in ditches along field boundaries. In terms of potential contamination sources, some minor areas of waste storage (associated with agricultural land-use) were noted. There was no visible evidence of infilled pits or quarries. An above ground oil pipeline was noted crossing the eastern area of the Order Limits. A former oil well facility was also noted at Newton on Trent, outside the Order Limits, but within the study area). Pumping stations operate to manage the surface water in some locations. Drainage ditches were deeper in western parts of the Order Limits. Visible discoloration of water was observed in ditches in some locations. In addition, some standing water was affected by algae. Overhead power lines are common across the area.

Animal burial sites

8.4.9 Historical animal burial sites are not officially recorded. However, landowners have been asked to provide information on any such sites, if present. All landowners within the Order Limits have provided a response. There are no reports of known animal burial sites within the Order Limits. However, one landowner did report that there was a practice of burying single sheep in the location that they died (if they were on arable land), prior to legislation being introduced covering this (The Animal By-Products (Enforcement) (England) Regulations 2013[31]). Due to the long-term agricultural site usage, it is a possibility that unrecorded animal burial pits could be present.

8.4.10 One landowner has also reported the known location of a site for the burial of poultry. This was indicated to have occurred during a fowl pest outbreak in the late 1960s. The location of the pit was the area of scrub land on the corner of Cottage Lane and Moor Lane. This position is outside the Order Limits, but within the study area (approximate grid reference 483689, 371742, located approximately 80m from the Order Limits).

Information from environmental database report

8.4.11 A full review of environmental data has been completed, as presented in the Preliminary Risk Assessment (PRA) report (provided as **ES Volume 3, Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**). The key observations from this review are summarised below:

[31] The Animal By-Products (Enforcement) (England) Regulations 2013. Available online: https://www.legislation.gov.uk/uksi/2013/2952/contents

- There are 12 discharge consents within the Order Limits, 11 of which relate to sewage and one relates to trade effluent.
- Outside the Order Limits, but within the study area, there are 25 discharge consents, relating to sewage, process water or trade effluent.
- There are no active landfills recorded within the study area.
- There is one historical landfill site located within the Order Limits. This is at High Marnham Power Station, where inert and industrial waste were imported from 1978 to 1979. There are no other historical landfills sites within the study area.
- There was also a waste management licence at High Marnham Power Station, issued for the physical treatment of waste from 2007 until 2013.
- A site located 65m from the Order Limits (but within the study area) holds a current waste management licence for a household waste transfer station, at Kettlethorpe Lagoons.
- There are two recorded historical mineral sites within the Order Limits (see **Sections 8.4.24 and 8.4.25** for more details)
- There are six recorded historical mineral sites within the study area, but outside the Order Limits (see **Sections 8.4.24 and 8.4.25**).
- The locations identified above as historical mineral extraction pits all have the potential to have been backfilled with unknown material.

Geology

8.4.12 The geological units present beneath the study area are shown on **Figure 8.3** and **Figure 8.4** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).

8.4.13 Superficial geological units are present across much of the Order Limits, although there are areas with no mapped deposits (suggesting that bedrock units are present directly beneath topsoil and subsoil), predominantly in the western part of the Order Limits, and more minor areas to the east of the River Trent.

8.4.14 The most dominant superficial deposit is the Holme Pierrepont Sand and Gravel member. This is present as an around 1km wide band running approximately north to south along the western side of the alluvium associated with the River Trent, and as a thinner band on the eastern side of the River Trent alluvium around North Clifton. There is also an extensive area of this unit in the eastern section of the Order Limits, on land between Newton on Trent and Wigsley.

8.4.15 Alluvium is present in an approximately 800m wide north to south trending swathe following the course of the River Trent, within the Order Limits and the study area. There are also several smaller occurrences of alluvium within the Order Limits, including:

- From Thorney Gates Farm in the north towards California Farm in the south, along the route of a minor watercourse.
- A large area between North Farm and Vicarage Farm, including sections meandering north to Ragnall and east to Fledborough along routes of watercourses.

8.4.16 An area of Devensian Till (mainly clay) is present in the north west of the Order Limits, between Ragnall and Darlton, extending from Far Hill Farm and Goosemoor Cottage in the west to Main Street, Ragnall, in the east.

8.4.17 To the east of the River Trent, there are some deposits of Blown Sand, extending from Hall Water Reservoir in the north, past North Clifton, to South Clifton in the south.

8.4.18 Bedrock geology within the Order Limits is dominated by mudstone from the Mercia Mudstone Group. This comprises mainly red mudstone with some layers of siltstones or halite-bearing units. Thin sandstone beds may be present. A small section of the Order Limits at the far eastern extent is underlain by mudstones from the Penarth Group. These are grey to black mudstones with occasional limestone or sandstone layers.

8.4.19 Geological units located within the study area, but outside the Order Limits, are consistent with the units present within the Order Limits, as shown on **Figure 8.3** and **Figure 8.4** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).

8.4.20 Intrusive site investigation work will be undertaken during the construction phase, prior to any works. At the time of submission of the DCO application, preliminary factual results were available for the intrusive work carried out at specific locations: the proposed location of the east and west substations, and the planned trenchless crossing of the River Trent. The work involved excavation of three trial pits and three boreholes on the east side of the river crossing; three trial pits and three boreholes on the west side of the river crossing; five trial pits and four boreholes at the western substation location; and three trial pits and three boreholes on the eastern substation location. Results generally demonstrated a layer of topsoil (slightly gravelly, slightly sandy clay) to up to 0.5m, over layers of clay or sand, over a weathered mudstone bedrock.

Geological hazards

8.4.21 Potential risks from geological hazards are categorised as listed below:

- Collapsible ground stability: very low risk or no hazard;
- Compressible ground stability: moderate risk or no hazard;
- Ground dissolution stability: no hazard;

- Landslide ground stability: low risk or very low risk;
- Running sand ground stability: no hazard, very low risk or low risk; and
- Shrinking or swelling clay ground stability: no hazard or very low risk.

8.4.22 Within the Order Limits, the stability of compressible ground is considered to be a moderate risk in a number of locations. These are predominantly located on land on the western side of the River Trent, with a smaller number on the eastern side. The distribution of these areas is shown on **Figure 8.3** and **Figure 8.4** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).

8.4.23 Comparing these locations to the geological mapping, the ground compressibility hazard is likely to be associated with alluvium, although in one location (the furthest east), the superficial geology is the Holme Pierrepont Sand and Gravel Member.

Mining and mineral extraction

8.4.24 None of the land covered by the study area is within a Coal Authority Development High Risk Area, and below ground or opencast coal mining does not affect the Proposed Development.

8.4.25 Historical mineral extraction sites are present across the Order Limits, mainly concentrated along the route of the River Trent. This includes extraction pits specifically to extract sand, gravel, gypsum and sandstone deposits, which are likely to have been infilled, as detailed below, and shown on **Figure 8.5** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).

- Recorded historical mineral sites within the Order Limits comprise:
  - Station Sand Pit located to the south east of North Clifton. Blown sand was excavated from this location, where excavation has now ceased (grid reference 482729, 371552), as shown on **Figure 8.5** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).
  - Windmill Pits, for extraction of sandstone from the Mercia Mudstone Group (grid reference 482857, 372220), as shown on **Figure 8.5** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**).
- In terms of recorded historical mineral sites within the study area, but outside the Order Limits, these sites are mainly sand and gravel pits, but there are also some gypsum and sandstone extraction sites, and clay and shale pits. These are no longer operational and based on evidence from aerial photographs and OS plans they have been backfilled:

- Station Gravel Pit (grid reference 482647, 371504), located in a rectangle of woodland which is outside of the Order Limits, but within the study area (approximately 15m from the Order Limits). This was operated to extract blown sand and is no longer in use.
- There is a second location which is also named Station Gravel Pit, but is located further east (grid reference 483497, 371447). This is within in a triangle of woodland which is outside of the Order Limits, but within the study area (approximately 15m from the Order Limits). This was operated to extract material from the Holme Pierrepont Sand and Gravel member and is no longer operational
- Newton Cliff Quarries located approximately 40m outside the Order Limits, for the extraction of gypsum from the Mercia Mudstone Group (two grid references listed, 482163, 372906 and 482163, 372878)
- North Clifton Pits located 160m outside the Order Limits, for extraction of sandstone from the Mercia Mudstone Group (grid reference 482788, 372205)
- Hall Farm Pit located 130m outside the Order Limits. This site was used to extract clay and shale from the Mercia Mudstone Group (grid reference 482701, 371978).

Mineral safeguarding

8.4.26 The Order Limits are located partly within the footprint of Lincolnshire County Council and partly in Nottinghamshire County Council, who are the relevant Mineral Planning Authorities.

8.4.27 The Nottinghamshire Minerals Local Plan[32] includes a mineral safeguarding and preservation area for sand and gravel running roughly along the route of the River Trent, extending eastwards over much of the central and southeastern areas, and extending westwards towards the north west, as shown on **Figure 8.5**. (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**). This figure also shows a large area of the Order Limits located in Lincolnshire is within a Petroleum Exploration and Development Licence (PEDL) area (as is a large area of Lincolnshire north of Lincoln) and one petroleum licence has been granted adjacent to the Order Limits (reference EXL141) at the Newton on Trent Oil Well, referenced above. This is addressed further in the **Planning Statement [EN10159/APP/5.3]**. These resources are located underground and therefore are not affected by the surface works associated with the Proposed Development.

8.4.28 Land within the Order Limits around Newton on Trent and North Clifton is within Lincolnshire County Council, and is covered by the Lincolnshire County Council

[32] Nottinghamshire Minerals Local Plan
https://www.nottinghamshire.gov.uk/media/5079375/adoptedmineralslocalplancompressed.pdf

Minerals and Waste Plan[33]. This document shows a Site Specific Mineral Safeguarding Area associated with the oil extraction well located off Southmoor Lane (outside the Order Limits, but within the study area). There is also a Sand and Gravel Mineral Safeguarding Area covering the majority of the Lincolnshire land area that is within the Order Limits, and a smaller Sand and Gravel Area of Search within the Order Limits to the east and north-east of Hall Water Reservoir.

8.4.29 A Mineral Safeguarding Assessment, which demonstrates how impacts to Mineral Safeguarding Areas have been addressed, is presented in **Mineral Safeguarding Assessment [EN010159/APP/7.3]**.

Potential contamination associated with existing features

8.4.30 The following issues have been identified that could have contamination consequences either during construction, operation or decommissioning:

- There are discharge consents within the Order Limits that relate mainly to sewage discharge, or process water/trade effluent.
- There is one historical landfill site and one historical waste management licence, at High Marnham Power Station.
- Approximately 65m from the Order Limits there is a household waste transfer station, at Kettlethorpe Lagoons.
- There is one recorded historical mineral site within the Order Limits, which may have been backfilled (Station Sand Pit, as detailed in Section 8.4.25).
- The Site walkover observed:
  - minor areas of waste storage are scattered across the Order Limits (associated with agricultural land-use),
  - a former oil well facility (located off Southmoor Lane, at grid reference 483759, 373455, on land that is outside the Order Limits, but within the study area),
  - the presence of a below ground oil pipeline (as identified by pipeline markers in the eastern section of the Order Limits, roughly north to south from the A57 to the east of Newton on Trent, to the intersection of Moor Lane and the A1133, to the east of South Clifton),
  - pumping stations (which could potentially be associated with contamination although such is unknown. The pumping station within Order Limits is on the western bank of the River Trent, at grid reference 481356, 371023); and

[33] Lincolnshire Minerals and Waste Local Plan https://www.lincolnshire.gov.uk/downloads/file/2274/adopted-site-locations-pdfa

- minor visible discoloration of water in ditches in some locations.

Soils

8.4.31 The National Soils Map, published at 1:250,000 scale, maps seven different soil associations within the Order Limits. Land to the east of the Order Limits mainly belongs to the Blackwood soil association. Fladbury 2 association is recorded in land adjacent to both sides of the River Trent. The south-western corner of the Order Limits is mapped as Whimple 3 association, with land to the north-west mapped as a mix of Compton, Brockhurst 2, Worcester, Blackwood and Dunnington Heath associations. Dunnington Heath association is also mapped between Fladbury 2 and Blackwood association soils to the east of the River Trent:

- Blackwood association is typically dominated by deep permeable sandy and coarse loamy soils in glaciofluvial drift, which can be variable in stone content and frequently overlies glaciolacustrine clay or till at depth.
- Dunnington Heath association soils are typically reddish coarse and fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.
- Fladbury 2 soils are generally stoneless clayey soils variably affected by groundwater with some sandy subsoils.
- Worcester association soils are typically slowly permeable reddish clayey soils over mudstone.
- Brockhurst 2 soils are slowly permeable seasonally waterlogged reddish fine loamy over clayey and clayey soils. Heavy texture and soil wetness impose considerable limitations upon the use of these soils and cropping is mainly limited to grass and cereal growing, even with adequate underdrainage.
- Compton soils are typically stoneless mostly reddish clayey soils affected by groundwater, often at risk of flooding.
- Whimple 3 association are reddish fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.
- Evesham 2 soils are typically slowly permeable calcareous clayey soils.
- Peat soils have not been identified on-site.

Agricultural Land Classifications

8.4.32 The Agricultural Land Classification system (ALC) is a method of classifying the quality of land used for agricultural purposes, based on the possible limitations on agricultural use due to physical or chemical properties. The three main factors affecting ALC are climate, site and soil. In addition to the ALC grades, the higher quality land is classified as ‘Best and Most Versatile Agricultural Land’, known as BMV land. Soils of ALC grades 1, 2 and 3a are considered to be BMV land, while soils of ALC grade 3b, 4 or 5 are considered to be non-BMV land.

8.4.33 An ALC survey of the Order Limits has been undertaken, with site work completed from June 2023 to April 2024, in line with industry best practice and Natural England guidance TIN049 [34]. The survey work involved using an auger to assess soil types (topsoil and subsoil) to depths up to 1.2m (approximately one sample per hectare), with some additional larger trial holes (also to 1.2m depth). The ALC survey covers the agricultural land within the Order Limits, with a total surveyed area of 1240 hectares (ha). The results of the ALC survey are summarised as follows, with reference to **Figure 8.5** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**). The full ALC survey reports is presented as **ES Volume 3, Appendix 8.3: Agricultural Land Classification Survey Report [EN010159/APP/6.21]**. It should be noted that figures have been provided to one decimal place of accuracy:

- Grade 1 (BMV land): none present
- Grade 2 (BMV land): 19.7% (244.8ha)
- Grade 3a (BMV land): 33.6% (416.1ha)
- Grade 3b (non-BMV land): 46.7% (579.5ha)
- Grade 4 (non-BMV land): none present
- Grade 5 (non-BMV land): none present
- Non-agricultural land: none present
- Urban land: none present.

8.4.34 Land that is classified as BMV land (ALC grade 2 and grade 3a) occupies a total area of 660.9ha, which equates to 53.3% of the surveyed land within the Order Limits, and 46.9% of the whole Order Limits.

8.4.35 Of the land which is defined as ecological enhancement areas and mitigation, such as habitat suitable for skylark nesting (see **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**) 42% of this is identified as BMV, with 58% non-BMV. For areas allocated for substations and BESS sites, 81% of this land is identified as BMV, with 19% non-BMV. In regard to solar areas, 57% of this land is identified as BMV, with 43% non-BMV.

Groundwater

8.4.36 The Mercia Mudstone Group bedrock units within the Order Limits are classified as a secondary B aquifer, with the Penarth Group classified as a secondary undifferentiated aquifer. Where superficial units are present within the Order Limits, these are categorised as secondary A aquifers. There is a small area of

[34] –Natural England Technical Information Note TIN049: Agricultural Land Classification: protecting the best and most versatile agricultural land, 2nd edition (2012).

secondary undifferentiated aquifer where till deposits are present between Ragnall and Darlton, within the Order Limits.

8.4.37 There are no groundwater SPZs within the study area. It should be noted that groundwater SPZs were identified within the PEIR (associated with Anglian Water groundwater abstractions). However, the Order Limits have since been altered and the groundwater SPZs detailed in the PEIR are no longer within the Order Limits. As a result, neither of the groundwater abstraction points identified by Anglian Water as being in the vicinity of the Proposed Development are now within the Order Limits, or the study area (as demonstrated on **Figure 8.7** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**)).

8.4.38 There is one groundwater abstraction point located within the Order Limits (which is indicated to be 'active' by the Environmental Database report (provided within the PRA provided as **ES Volume 3, Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**), with a further four being located within the study area, but outside the Order Limits. The abstraction location within the Order Limits is located at High Marnham Power Station, for industrial processing. As High Marnham Power Station is no longer present, it is possible that this abstraction point is no longer in use, but the licence remains active. The off-site abstraction points that are within the study area, but outside the Order Limits, are all for general farming (spray irrigation). One of these, located near Ragnall, is listed as being using as a domestic supply, in addition to the general farming use.

Sensitive Land Uses

8.4.39 No sensitive land uses [35] for the purposes of the land, soil and groundwater assessment have been identified within the Order Limits or within 250m of the Order Limits boundary.

Sensitive Receptors

8.4.40 Following a review of the baseline data collected, the sensitive receptors that should be subject to impact assessment have been identified. They are listed within **Table 8.7** below. The locations of receptors listed within **Table 8.7** are shown on **Figures 8.2** to **8.6** (**ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**) .

[35] Sensitive land uses covered by this search included: International designations – Ramsar wetland, Special Area of Conservation (SAC), Special Protection Area (SPA); National designations – Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), ancient woodland; Local designations – Local Nature Reserve, Site of Importance for Nature Conservation.

Table 8.7 Land, soil and groundwater receptors

Receptor	Location	Sensitivity/ Importance	Comments
Geological units (superficial and bedrock units),	Across entire study area	Low sensitivity- due to the geological units not supporting geodiversity (see Table 8.2 for details)	The Scoping Opinion required that potential impacts to existing geological units from contamination should be assessed within the ES for the construction phase and the decommissioning phase. However, it was indicated that the ES should describe measures to reduce the potential for contamination during operation, such as measures to prevent discharge, leakage or fire from the BESS and any chemicals required for the washing of PV panels, if proposed. The Applicant confirms that no chemicals will be used to wash the PV panels. The removal of dust and debris will be undertaken using water only, procedures for which are covered by measures detailed in the oOEMP. Measures for dealing with potential contamination in line with industry best practice (including preventing any contaminative releases from the BESS) and procedures for actions to be taken in the event of encountering unexpected contamination in soil or groundwater. are also detailed in the oOEMP. Measures for dealing with fire incidents, including minimising the effects of fire, dealing with potentially contaminated firewater and preventing release of potentially contaminative materials, are detailed in the Battery Safety Management Plan. This matter has been scoped out for the operation and maintenance phase. This relates to an existing receptor.
Mineral safeguarding sites	Sand and gravel safeguarding areas and areas of search across east, centre and towards north west of Order Limits. Site Specific Mineral Safeguarding Area around oil extraction licence point near Southmoor Lane.	Low sensitivity- as mineral reserves will remain accessible for extraction after the Proposed Development lifespan (see **Table 8.1** for details)	A Minerals Safeguarding Assessment is submitted in support of the DCO application (**Mineral Safeguarding Assessment [EN010159/APP/7.3]**). Consultation has been commenced with the Mineral Planning Authority.

Receptor	Location	Sensitivity/ Importance	Comments
Secondary aquifers (in both bedrock and superficial geological units)	The majority of the study area	Medium importance- as secondary aquifers that are outside groundwater source protection zones (SPZs) fall within this category (see Table 8.2 for details)	The existing aquifers are not connected to SPZs, hence the medium importance. This matter is scoped into the assessment for the construction and decommissioning phases of the Proposed Development.
Groundwater abstraction points	Present in several locations within the study area. One is located within the Order Limits at High Marnham Power Station, and four are located outside the Order Limits, but within the study area.	Medium importance- as they provide water for agricultural use (see Table 8.2 for details)	The existing groundwater abstraction points have been further assessed within the ES. Generally, the off-sit abstraction points within the study area but outside of the Order Limits are used for general farming (spray irrigation). In regard to the abstraction point within the Order Limits at High Marnham Power Station, as the power station is no longer present, the abstraction point may no longer be in use, but the licence remains active.
Soils of ALC grade 2	19.7% of Order Limits	Very high- as the criteria guide allocates soils of ALC grade 2 to this category (see Table 8.1 for details)	Assessment of potential effects on soil is provided within this Chapter of the ES. This excludes physical damage to the soil during the operation and maintenance phase, which has been scoped out, as long as further details are provided on the operation and maintenance phase, including the type and number of vehicles required for on-site maintenance (including potential replacement of panels). This was agreed with Natural England on 14th August 2024. Details of the type and number of vehicles required for these activities are documented within the outline Operational Transport Management Plan (oOTMP) and outline Soil Management Plan.
Soils of ALC grade 3a	33.5% of Order Limits	High- as the criteria guide allocates soils of ALC grade 3a to this category (see Table 8.1 for details)	Assessment of effects on soil is provided within this Chapter of the ES. This excludes physical damage to the soil during the operation and maintenance phase, which has been scoped out (see further details in the row above for grade 2 land).

Receptor	Location	Sensitivity/ Importance	Comments
Soils of ALC grade 3b	46.7% of Order Limits	Medium- as the criteria guide allocates soils of ALC grade 3b to this category (see Table 8.1 for details)	Assessment of effects on soil is provided within this Chapter of the ES. This excludes physical damage to the soil during the operation and maintenance phase, which has been scoped out (see further details in the row above for grade 2 land).
NB- no soils of ALC grade 1, grade 4 or grade 5 are present within the Order Limits			

Future Baseline Conditions

8.4.41 Within the Order Limits, the arable land would be expected to continue to be utilised for similar production. The types of crops grown may change over time depending on the landowner or tenant farmers' preference and market trends. Changing climatic conditions resulting from climate change may influence the choice of crops. However, the ALC grade across the Order Limits is not expected to change.

8.4.42 In the absence of the Proposed Development, it is considered that there is unlikely to be any future change to the baseline position with respect to the land, groundwater or ALC.

8.5 Environmental Measures

8.5.1 **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]** provides details of the environmental measures that will be taken during the construction, operation and maintenance and decommissioning phases. Details of design and management plans required to control the activities are also provided in **Chapter 5**.

Construction

8.5.2 A site investigation will be completed prior to the Proposed Development construction phase commencing, which will be secured by a requirement to the DCO. This will provide further information on potential pollutant linkages that were identified by the PRA report (**ES Volume 3, Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**). Factual data from a site investigation of specific areas of the Order Limits are presented as **ES Volume 3, Appendix 8.4: Preliminary Factual Site Investigation Results [EN010159/APP/6.21].**

8.5.3 Measures to minimise damage to land, soil and groundwater during the construction phase are detailed in the outline Construction Environmental Management Plan (oCEMP) (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**). These include procedures to mitigate against erosion, procedures to prevent disturbance of contamination, and emergency procedures to manage accidental spillages and leaks.

8.5.4 A piling risk assessment will be undertaken before the start of piling works, as detailed in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**). This will minimise impacts on groundwater as a result of piling activities.

8.5.5 Measures to manage any potential impacts to the soil and agricultural land during the construction phase are detailed in the oSMP (see **Outline Soil Management Plan [EN010159/APP/7.10]**), which has been agreed with Natural England. The oSMP identifies those areas within the Order Limits which may be more susceptible to damage, and it advises on when soils are suitable for being handled or trafficked. The oSMP also details measures for soil management and follows the principles of best practice to maintain the physical properties of the soil, with the aim of restoring the land to its pre-construction condition following the temporary construction use and at the end of the lifetime of the Proposed Development. The land will be returned to the landowner(s) after decommissioning.

8.5.6 At the start of the construction phase, the areas of agricultural land required for the temporary construction compounds and access tracks will be stripped of topsoil, a suitable membrane will be spread and stone or matting will be laid down. The topsoil will be removed and matting laid across the temporary Construction Compound locations, onto which stone will be spread. This prevents intermixing of soil with the temporary stone surface.

8.5.7 The topsoil removed during the construction process will be placed temporarily in a low-level bund or bunds on land outside of the area of the temporary construction compounds. These bunds are short-term storage areas for the topsoil, which will be used to restore these areas once construction is complete. Topsoil mounds will be shaped to repel water and if they will be in place for more than 6 months they will be sown with a low maintenance grass seed mix, in accordance with the measures detailed in the oSMP.

8.5.8 Where vehicle movements are required over soils, these will be managed by measures detailed in the oSMP to prevent damage to soil structure. This will control the timing of works (to avoid periods when soil is more susceptible to damage), and will take into account variables such as soil saturation (with the oSMP defining acceptable saturation levels for trafficking). Although construction of the Proposed Development will not adversely affect soils if the measures detailed in the oSMP are followed, it is worth noting that when a reduction in soil quality occurs due to agricultural works being undertaken in non-optimal soil conditions, it is possible to return soils to their former condition after they have dried out, preventing medium or long-term effects.

8.5.9 Access routes for the importation of construction materials, plant and equipment will be determined in advance of construction works, to avoid inappropriate trafficking of soil and measures detailed in the outline Construction Traffic Management Plan (oCTMP, see **Outline Construction Traffic Management**

Plan [EN010159/APP/7.9]), thereby ensuring construction vehicle movements are monitored.

8.5.10 The activities undertaken during the construction phase will be audited against the requirements detailed in the oSMP. The requirement for auditing will also be secured via the oSMP. This work will be completed by an appropriately qualified person to ensure adherence.

8.5.11 The measures detailed above are in line with industry best practice, along with relevant legislative and policy requirements.

Operation and Maintenance

8.5.12 Measures to avoid, minimise or mitigate effects on the environment during operation and maintenance are detailed in the **Outline Operational Environmental Management Plan [EN010159/APP/7.5]** . These include procedures to mitigate against erosion, procedures to prevent disturbance of contaminated land, and emergency procedures to manage accidental spillages and leaks in order to minimise any risk to land, soil and groundwater.

8.5.13 The procedures for managing firewater associated with any incidents at the location of the BESS, and mitigating any associated impacts to the environment, are detailed in the oOEMP. Requirements for the control and safety of the BESS are detailed in the outline Battery Safety Management Plan (see **Outline Battery Safety Management Plan [EN010159/APP/7.11])**. These include measures for preventing the release of polluted water, where water is used as the suppressant; incorporating an appropriate drainage design to collect firewater used in cooling adjacent units; and provision of sufficient capacity to ensure that there is no runoff of firewater.

8.5.14 Measures to manage any potential impacts to soil and agricultural land during the operation and maintenance phase are detailed in the oSMP. As detailed above for the construction phase, the oSMP identifies areas that may be more susceptible to damage and advises on when soils are suitable for being handled or trafficked. The oSMP also provides details for managing soil and maintaining the physical properties of the soil.

8.5.15 There will be limited ground disturbance or trafficking over the soil during the operation and maintenance phase in comparison to the construction phase. Maintenance will be subject to periodic visits, including replacement of damaged parts or cleaning and maintenance of the Solar PV panels. Established tracks (installed during the construction phase) will be used during these activities and therefore any additional impacts will be minimised. The cleaning of Solar PV panels will be undertaken with water only (no chemicals will be used), as secured by the oOEMP (**Outline Operational Environmental Management Plan [EN010159/APP/7.5]**).

8.5.16 Where practicable, the timing of works will be managed carefully to consider weather conditions, particularly heavy and persistent rain to minimise vehicles travelling across the Order Limits when soil conditions are wet. Movement of maintenance vehicles during operation and maintenance will be limited and will follow access tracks that have been established during the construction phase. These measures will be detailed in the oSMP.

8.5.17 The operation and maintenance phase of works will be audited by an appropriately qualified person against the requirements detailed in the oSMP.

8.5.18 During the operational phase soil from some areas will continue to be managed in segregated stockpiles (for example soil from the substation, BESS and access tracks, which will remain in situ until decommissioning of the solar farm). The stockpiles will be managed in accordance with the measures detailed in the oSMP during the operation and maintenance phase.

8.5.19 The measures detailed above are in line with industry best practice and meet relevant legislative requirements.

Decommissioning

8.5.20 Measures to avoid, minimise or mitigate effects on the environment during decommissioning works are detailed in the outline Decommissioning Environmental Management Plan (oDEMP), see **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**. These include procedures to mitigate against erosion, procedures to prevent disturbance of contaminated land, and emergency procedures to manage accidental spillages and leaks in order to minimise any risk to the soil and groundwater during the decommissioning phase.

8.5.21 Measures to manage the potential impact of firewater associated with the BESS will remain in place during the decommissioning phase, until no longer necessary. The procedures for managing the firewater and avoiding any impact to the environment are detailed in the oDEMP and requirements for the control and safety of the BESS are detailed in the outline Battery Safety Management Plan (see **Section 8.5.13** of this Chapter).

8.5.22 Measures to manage any potential impacts to the soil and agricultural land during the decommissioning phase are detailed in the oSMP. The oSMP identifies those areas within the Order Limits which may be more susceptible to damage, and it advises when soils are suitable for being handled or trafficked. The oSMP also details measures for soil management and details the practices that will be adhered to in order to maintain the physical properties of the soil, with the aim of restoring the land to its pre-construction condition at the end of the lifetime of the Proposed Development. The land will be returned to the landowners after decommissioning. Established tracks will be used during the decommissioning phase and therefore impacts on soil due to vehicle movements will be minimised.

8.5.23 Where practicable, the timing of works during decommissioning will be managed carefully to consider weather conditions, particularly heavy and persistent rain, to minimise vehicles trafficking when soil conditions are wet.

8.5.24 The decommissioning phase of works will be audited by an appropriately qualified person against the measures detailed in the oSMP.

8.5.25 During the decommissioning phase, all above ground infrastructure, including the BESS and Substations foundations will be removed. Permissive paths will also be removed. Underground cables may remain in situ (as indicated in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**).. This will limit the disturbance and impact to soil quality.

8.5.26 The location of power conversion stations, access tracks, BESS, principal construction compounds, satellite construction compounds and substations will be restored using soil that has been retained on-site in managed bunds; or with new topsoil that will be brought to the Order Limits. All areas will be restored to their original ALC grade by the replacement of the original soils from their stockpiles, or new topsoil of equivalent quality.

8.5.27 The measures detailed above are in line with industry best practice and meet relevant legislative requirements.

8.6 Assessment of Likely Significant Effects

Construction: Land

8.6.1 The following sensitive receptors related to land require assessment with respect to likely significant effects associated with the construction phase:

- Geological units (superficial and bedrock units);
- Mineral safeguarding sites.

8.6.2 Contamination of land could occur as a result of construction activities (including spills of fuel or chemicals, or refuelling activities and trenchless crossing works). There is also the potential for contaminated material to be encountered that is associated with past developments. The sensitivity of the geological units (in terms of risks from contamination) is categorised as low, because the units do not support any noticeable geodiversity. With the implementation of environmental measures detailed in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**) to ensure that significant contamination events do not, the magnitude of impact is considered to be negligible, as there would be no discernible loss or reduction in value of the geological units. A PRA is provided (see **ES Volume 3, Appendix 8.2: Preliminary Risk Assessment [EN010159/APP/6.21]**) to this Chapter, and this includes an assessment of the potential for contamination to be present associated with historical site usage. Based on the findings of the PRA, possible

contaminant linkages were identified associated with risks to site users from contamination at the site of the former High Marnham Power Station (including the historical landfill site at that location) and potential risks associated with ground gases from the landfill at High Marnham Power Station. The assessment recommended that intrusive site investigation work should be undertaken to conclude whether these pollutant linkages were present or not. The appropriate site investigation works will be secured via a requirement to the DCO and will be undertaken prior to commencement of construction works. The host authorities will then ensure that any necessary mitigation or remedial actions are completed. After the conclusion of intrusive work, associated risk assessment and any connected remediation, any pollutant linkages will have been removed, so there will be no residual risk from the potential contamination sources identified within the PRA. The significance of effect is therefore considered to be neutral or slight adverse. Therefore, the effect on geological units (superficial and bedrock) during construction is considered to be not significant with respect to potential contamination issues.

8.6.3 Impacts to geological units could occur as a result of the trenchless crossing activities and trenching and earthworks activities for other facilities during construction.

8.6.4 The sensitivity of the geological units (in terms of effects due to excavation or piling) is categorised as low, because the units do not support any noticeable geodiversity. The magnitude of impact is considered to be minor, as there would be a permanent, irreversible change to less than 5 ha. The significance of effect is therefore considered to be neutral or slight adverse. Therefore, the effect on geological units (superficial and bedrock) during construction is considered to be not significant with respect to issues relating to excavations, piling and the trenchless crossing work.

8.6.5 Mineral safeguarding areas could be affected by sterilisation of resources due to the construction phase. However, due to the short-term construction phase for the Proposed Development (less than 3 years), this matter has been considered as an effect during the operation and maintenance phase (which is 60 years). **Section 8.6.34** therefore presents the detailed assessment of effects relating to mineral safeguarding areas. A **Mineral Safeguarding Assessment [EN010159/APP/7.3]** is submitted in support of the DCO application and provides further information on this issue.

Construction: Groundwater

8.6.6 The following sensitive receptors related to groundwater require assessment with respect to likely significant effects associated with the construction phase:

- Groundwater abstraction points;
- Groundwater in bedrock and superficial geological units.

8.6.7 Contamination of groundwater could occur as a result of accidental release of hydrocarbons or petrochemicals from construction plant and the mobilisation of silts and contaminants during soil stripping and earthworks operations (including activities associated with trenchless crossing works). There is also the potential for contaminated material associated with past developments to be encountered during construction works, and to adversely impact groundwater receptors. In areas within the Order Limits where the groundwater is classified as a secondary aquifer, and in areas where there are groundwater abstraction points, the receptor importance is medium, as the receptor has moderate capacity to absorb change without significantly altering its character. Methods for ensuring the safe storage and use of fuels or chemicals, and detailed response plans for addressing leaks and spills, are documented in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**). The oCEMP also includes temporary measures to reduce the risk of polluted surface water from discharging to ground (such as through the use of environmental capture techniques and silt traps).

8.6.8 With the implementation of these environmental measures, the potential for leaks and spills will be minimised, and in the event of spillage events, the impacts would be localised and limited in duration. Procedures detailed in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**) to manage the presence of unexpected contamination will also minimise any effects on groundwater. This includes the development of an emergency response plan to manage the response to environmental incidents and emergencies. This results in the magnitude of impact being categorised as minor adverse, which is defined as resulting in some measurable change in the quality or vulnerability of attributes. The significance of effect would therefore be slight adverse and not significant.

8.6.9 In relation to the potential for impact on groundwater from trenchless crossing works, piling activities and earthworks, the groundwater is deemed to have a medium importance where there are secondary aquifers and where groundwater abstraction points are present. After consideration of the environmental measures (including the piling risk assessment, which is detailed in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**)), the magnitude of any impact from piling or earthworks during construction is considered to be minor adverse, with some potential for a measurable change in the quality or vulnerability of attributes. The significance of the effect is slight adverse on medium importance groundwater from piling and not significant. Extensive groundworks will be carried out during the construction stage, including the construction of foundations with up to 2m deep concrete pads to serve the substation, welfare, storage, BESS and Power Conversion Station buildings, and piles up to 3m in depth to serve the solar modules. These works have the potential to impact on groundwater flows.

8.6.10 The oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**) includes temporary measures to ensure that during construction any observed groundwater flows are monitored and managed. The

detailed CEMP will be supported by a Water Management Plan (WMP) that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction. The WMP will include details of pre, during and post-construction water quality monitoring. This will be based on a combination of visual observations and reviews of the Environment Agency's automatic water quality monitoring network. The WMP will include details for pollution prevention and response in the event of an incident. It is expected that variable depths to groundwater may be present across the Order Limits, hence construction works will be phased to limit the impacts to groundwater flows.

8.6.11 Any requirement for temporary dewatering during construction of the foundations will be discussed with the EA and LLFA in advance to agree on discharge requirements and location (as referred to in **ES Volume 1, Chapter 7: Hydrology and Hydrogeology [EN010159/APP/6.7**). This is secured via the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**).

8.6.12 The receptor importance is considered to be medium. Based on the temporary nature of the construction stage and the minor likely changes during construction, the magnitude of the impact to the groundwater flow regime would be minor adverse and the effects would be slight adverse and therefore not significant.

Construction: Soil and Agricultural Land

8.6.13 The following sensitive receptors related to soil and agricultural land require assessment with respect to likely significant effects associated with the construction phase:

- Soil resources of ALC grade 2, 3a and 3b, with respect to the physical properties of the soil and the access to the soil and agricultural land.

8.6.14 **Table 8.1** provides a guide to the criteria for determining the sensitivity of soil and agricultural land receptors. Based on the results of the ALC survey undertaken for the land within the Order Limits, the following receptor sensitivities apply with respect to soil and agricultural land (see **Figure 8.6** in **ES Volume 3: Figures Supporting Volumes 1 and 2 [EN010159/APP/6.20]**):

- There are no areas where the soil is classified as grade 1
- 19.7% of soils are classified as grade 2 and have 'very high' sensitivity
- 33.6% of soils are classified as grade 3a and have 'high' sensitivity
- 46.7% of soils are classified as grade 3b and have 'medium' sensitivity; and
- There are no areas where the soils are classified as being of 'low' sensitivity (grade 4 or 5, or urban soils).

8.6.15 With respect to soil, adverse effects to the physical structure of soil could potentially occur during construction, as a result of activities such as topsoil stripping, earthworks, piling, stockpiling of material and vehicle movements.

8.6.16 In terms of adverse impacts to the ALC grade of the soil, it should be noted that construction works would not have sufficiently great impacts on the soil resource to result in a downgrade to the ALC grade. Machinery that is used in the construction process will be of similar size, or smaller/lighter, than plant used in standard agricultural processes. Therefore, the construction works will not result in additional loads on the soil compared to the current agricultural use. Correct soil management techniques will ensure that soil compaction is minimised, and any impacts could be reversed by techniques that are common in normal agricultural land management. Given that the environmental measures for the Proposed Development include an oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**) and oSMP, (see **Outline Soil Management Plan [EN010159/APP/7.10]**) which will protect soil resources in terms of physical and chemical characteristics, it is considered that a change to existing ALC grades as a result of the Proposed Development is highly unlikely to occur. The oSMP has been prepared and informed by engagement with Natural England to ensure that measures are appropriate to protect soil.

8.6.17 Given the information detailed in this section and subject to adherence to the measures detailed in the oSMP and oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**), damage to soils during construction will be limited, and there is the potential to restore soils if accidental damage did occur.

8.6.18 Soil and agricultural land within the Order Limits are classified as very high sensitivity (grade 2 land), high sensitivity (grade 3a) and medium sensitivity (grade 3b land). It is considered that any impact as a consequence of construction activities will at worst lead to a temporary reduction in availability of agricultural land, with no discernible change in soil quality or ALC grade. The potential for damage to field drains (with possible subsequent effects on drainage of agricultural land) will be managed by the measures detailed in the oCEMP (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**). The area within the Order Limits that is classified as BMV land is 660.9 Ha (53.3% of the surveyed land and 46.9% of the whole Order Limits). Therefore, given the nature of the works being undertaken, it anticipated that some areas of habitat and biodiversity mitigation and enhancement will remain in-situ, and a temporary (short term) and reversible reduction in availability of agricultural land, the magnitude of impact on both the physical structure of the soil and the availability of agricultural land is categorised as minor. The significance of effect is therefore determined to be moderate or large adverse for very high sensitivity soils; slight or moderate adverse for high sensitivity soils; and slight adverse for medium sensitivity soils.

8.6.19 The generic criteria applied by following the methodology presented in Section 8.3 have been considered using professional judgement with respect to the potential for significant effects that concern soil and availability of agricultural land in terms of the Proposed Development. It is considered that due to the adherence to stringent soil management procedures, as presented above (key factors being that the ALC grade will not be altered by the works, soil compaction will be minimised by the oSMP (see **Outline Soil Management Plan [EN010159/APP/7.10]**) and any impacts that do occur can be reversed by using common agricultural land management techniques), the actual effect on soil will not be significant. Therefore, given that the quality of the soil, and the ALC grade, will not be changed by the Proposed Development (with works all being completed in accordance with the measures detailed in the oSMP and oCEMP) (see **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**), it is considered appropriate to adjust the significance of effect to slight adverse for very high and high sensitivity soil.

8.6.20 The effect on very high, high and medium sensitivity soil and agricultural land from the works associated with the construction of the Proposed Development is therefore assessed as being not significant.

Summary of Likely Significant Effects During Construction phase

8.6.21 The likely effect of possible contamination on geological units during construction is considered to be a **direct** effect of **short-term** duration, affecting the **Order Limits or local** environment and of **neutral or slight adverse significance**. This effect is not significant.

8.6.22 The likely effect of possible contamination, or trenchless crossing works, piling or earthworks, on **medium importance** groundwater resources during construction is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits or local** environment and of **slight adverse significance**. This effect is not significant.

8.6.23 The likely effect of trenchless crossing works, piling or earthworks, on the groundwater flow in relation to **medium importance** groundwater resources during construction is considered to be a **direct** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.24 The likely effect of construction works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains for **very high sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.25 The likely effect of construction works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains , for **high sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration,

affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.26 The likely effect of construction works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains, for **medium sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

Operation and Maintenance: Agricultural land use

8.6.27 The following sensitive receptors related to agricultural land use require assessment with respect to likely significant effects associated with the operation and maintenance phase:

- Availability of soil resources of ALC grade 2, 3a and 3b.

8.6.28 The Proposed Development will lead to temporary impacts on availability of soil and agricultural land for the duration of the operation and maintenance phase (which has been assessed as being 60 years), with it anticipated that some areas of habitat and biodiversity mitigation and enhancement will remain in-situ (see **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]** and **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**). In particular, this will affect the areas in which the BESS and substations will be located. The areas of land underneath the Solar PV panels and within the field margins will be used for ecological mitigation and enhancements, to include planting of high biodiversity value grassland. This planting will be expected to reduce soil degradation and erosion during the operation and maintenance phase which will lead to potential benefits to the soil quality. A reduction in the application of herbicides, pesticides or fertilisers as a result of changes in land management from agricultural producer to solar farm will result in a reduction of surface water runoff polluted with herbicides, pesticides or fertilisers.

8.6.29 As detailed in **Section 8.6.14**, and based on the results of the ALC survey undertaken for the land within the Order Limits, the following receptor sensitivities apply with respect to agricultural land:

- 19.7% of soils are classified as grade 2 and have ‘very high’ sensitivity
- 33.6% of soils are classified as grade 3a and have ‘high’ sensitivity
- 46.7% of soils and classified as grade 3b and would ‘medium’ sensitivity; and
- There are no areas where the soils would be classified as being of ‘low’ sensitivity (grade 4 or 5, or urban soils).

8.6.30 Soils and agricultural land within the Order Limits are classified as very high sensitivity (grade 2 land), high sensitivity (grade 3a) and medium sensitivity (grade 3b land). Within this section, the assessment separates the potential effects on soil quality from the potential effects on availability of agricultural land, as although these are connected, and the sensitivities are defined in the same way, the magnitudes of impact differ, which can result in different significances of effect.

8.6.31 With respect to soil quality:

- It is considered that impacts as a result of the operation and maintenance phase of the Proposed Development will not adversely affect the quality of the soil, and it is likely that there will be a slight beneficial effect, due to the lack of application of agricultural practices (including the reduction in physical working of the soils, changes to the composition of the soil due to an increase in the soil organic matter, and a reduction in the use of herbicides, pesticides or fertilisers). Therefore, the lack of agricultural activity of the Proposed Development is considered to have a minor beneficial impact during the operation and maintenance phase.
- For very high sensitivity soils, the significance of effect on soil quality is categorised as moderate or large beneficial. Based on professional judgement, this significance range is adjusted to a significance of effect of moderate beneficial.
- For high sensitivity soils, the significance of effect on soil quality is categorised as slight or moderate beneficial. Based on professional judgement, this significance range is adjusted to a significance of effect of slight beneficial.
- For medium sensitivity soils, the significance of effect on soil quality is categorised as slight beneficial.
- The effect on very high sensitivity soil (with relation to soil quality) from the works associated with the operation and maintenance phase of the Proposed Development is therefore assessed as being significant (beneficial).
- The effect on high and medium sensitivity soil (with relation to soil quality) from the works associated with the operation and maintenance phase of the Proposed Development is therefore assessed as being not significant (beneficial).

8.6.32 With respect to availability of agricultural land:

- It is considered that impacts as a result of the operation and maintenance phase of the Proposed Development will include a temporary reduction in availability of agricultural land, with there being no discernible change in ALC grade. The area within the Order Limits that is classified as BMV land is 660.9 Ha (53.3% of the surveyed land and 46.9% of the whole Order Limits). Therefore, given a temporary (long term) and reversible reduction in availability of agricultural land, the magnitude of impact is categorised as minor.
- For very high sensitivity soils, the significance of effect on availability of agricultural land is categorised as being in the range moderate to large adverse. Given that the ALC grade will not be changed by the Proposed Development (with works all being completed in accordance with the measures detailed in the Outline Soil Management Plan [EN010159/APP/7.10] and Outline Operational Environmental Management Plan [EN010159/APP/7.5], professional judgement has been used to adjust this range to a significance of effect of moderate adverse.
- For high sensitivity soils, the significance of effect is categorised as being within the range slight to moderate adverse. Given that the ALC grade will not be changed by the Proposed Development (with works all being completed in accordance with the measures detailed in the Outline Soil Management Plan [EN010159/APP/7.10] and Outline Operational Environmental Management Plan [EN010159/APP/7.5], professional judgement has been used to adjust this range to a significance of effect of slight adverse.
- For medium sensitivity soils, the significance of effect is categorised as slight adverse.
- The effect on the availability of very high sensitivity agricultural land from the works associated with the operation and maintenance phase of the Proposed Development is therefore assessed as being significant (this affects 19.7% of the surveyed land (ie the Grade 2 land), of which 123.5ha are areas of ecological enhancement, 32.4ha are areas occupied by the substation or BESS facilities and 538.7ha are occupied by solar PV panels). The effect on high and medium sensitivity soil is assessed as being not significant.

8.6.33 It is noted that at the time of the statutory consultation from 29th May to 9th July, we presented our preliminary assessment on the likely significant effects to agricultural land. At that point in time we anticipated there would be no likely significant effects. That preliminary assessment was based on the information available at the time, and as noted in the Preliminary Environmental Information Report (PEIR), ALC surveys were ongoing. Those surveys have now been completed and, as noted in the PEIR, we are now able to report on likely significant effects based on a full assessment. The nature and the impact on this soil resource that we consulted in the PEIR has not changed, however, the survey results have shown a slight increase in high sensitivity soils which has resulted in the significance of the effect increasing so that it's now reported as a significant effect.

Operation and Maintenance: Mineral safeguarding areas

8.6.34 As shown on **ES Volume 3, Figure 8.5: Mineral extraction sites and mineral safeguarding areas [EN010159/APP/6.20]**, mineral safeguarding areas are present within the Order Limits in the following locations:

- An extensive safeguarding area for sand and gravel is present across much of the eastern area of the Order Limits, extending to the west of the River Trent around Fledborough and Ragnall;
- A sand and gravel area of search is located within Lincolnshire in the north-eastern section of the Order Limits;
- A large area of the Order Limits located in Lincolnshire is within a Petroleum Exploration and Development Licence (PEDL) area (as is a large area of Lincolnshire north of Lincoln) and one petroleum licence has been granted adjacent to the Order Limits (reference EXL141) at the Newton on Trent Oil Well. This is addressed further in the Planning Statement **[EN10159/APP/5.3]**. These features are shown on Figure 8.5 **(ES Volume 3 [EN010159/APP/6.20])**.

8.6.35 A **Mineral Safeguarding Assessment [EN010159/APP/7.3]** is submitted in support of the DCO application, which provides further details on issues relating to mineral safeguarding.

8.6.36 The sensitivity of the mineral resources as a receptor is categorised as medium, as a considerable proportion of the Order Limits is underlain by sand and gravel reserves and areas with potential for petroleum extraction, but the mineral reserves would remain accessible for extraction. The Proposed Development is temporary (with a lifespan of 60 years), therefore the impact on minerals will also be temporary. The magnitude of impact on mineral resources is assessed to be minor, as there is a temporary and reversible lack of access to the resources during the lifespan of the Proposed Development. The significance of effect is therefore determined to be slight adverse and the effect is not significant.

Operation and Maintenance: Groundwater

8.6.37 The potential for contamination affecting groundwater resources to arise from ordinary operations is minor, with the proposed SuDS features (see **ES Volume 2, Chapter 7: Hydrology and Hydrogeology [EN010159/APP/6.7]**) designed to provide sufficient treatment for any potential contamination in line with CIRIA guidance, prior to discharge being made. Most on-site activities during operation will not have the potential to release pollutants under normal conditions.

8.6.38 Should especially polluted runoff be produced (for example, polluted fire water in the event of a fire at one of the BESS compounds), the SuDS strategy has been designed to capture the polluted water within a sufficiently-sized attenuation feature. From here, the polluted water will be removed from the Site by tanker to avoid any polluted water discharging to the natural environment and impacting on

groundwater resources. Arrangements for the removal of polluted firewater would be put in place and agreed in advance of the Proposed Development being operational, as part of the drainage maintenance plan which is to be confirmed during detailed design.

8.6.39 The receptor importance for groundwater resources is considered to be medium. Based on the embedded mitigation measures in the form of the drainage strategy and OEMP, and the procedures in place to avoid and address any fire incidents, the magnitude of impact is considered to be minor.

8.6.40 Taking into account the above, the nature of effect to the groundwater abstractions is considered to be slight adverse, and therefore is deemed not significant.

8.6.41 Subsurface infrastructure is proposed in the form of below ground cabling, foundations and piles. Foundations will comprise concrete pads of up to 2m in depth to serve the substation, welfare, storage, BESS and Power Conversion Station buildings. Piles of up to 3m in depth will serve the solar modules. These features have the potential to impact on groundwater flows. However, as the below ground infrastructure will be relatively localised and of a small scale, it is envisaged that groundwater would flow around and below the proposed below-ground elements of the development, and would not be significantly impacted by their presence.

8.6.42 The receptor importance is considered to be medium, and based on the above, the magnitude of the impact to the groundwater flow regime would be minor adverse. Therefore, the nature of effect would be slight adverse, and not significant.

Summary of Likely Significant Effects During Operation and maintenance phase

8.6.43 The likely effect of activities during the operation and maintenance phase on soil quality for **very high sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **moderate beneficial significance**. This effect is significant.

8.6.44 The likely effect of operation and maintenance works on soil quality for **high sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight beneficial significance**. This effect is not significant.

8.6.45 The likely effect of operation and maintenance works on soil quality for **medium sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight beneficial significance**. This effect is not significant.

8.6.46 The likely effect of activities during the operation and maintenance phase on the availability of ALC for **very high sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **moderate adverse significance**. This effect is significant.

8.6.47 The likely effect of operation and maintenance works on the availability of ALC for **high sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.48 The likely effect of operation and maintenance works on the availability of ALC for **medium sensitivity** soils is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.49 The likely effect of operation and maintenance works on mineral safeguarding areas is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.50 The likely effect of operation and maintenance works on the quality of the groundwater resources of **medium importance** is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.51 The likely effect of operation and maintenance works on groundwater flow (affecting a resource of **medium importance**) is considered to be a **direct** effect of **long-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

Decommissioning: Land

8.6.52 The following sensitive receptors related to land require assessment with respect to likely significant effects associated with the decommissioning phase:

- Geological units (superficial and bedrock units);
- Mineral safeguarding sites.

8.6.53 Contamination of land could occur as a result of decommissioning activities (including spills or refuelling activities). There is also the potential for contaminated material to be encountered that is associated with past developments, although there is significantly reduced likelihood of this compared to during the construction phase. The sensitivity of the geological units (in terms of risks from contamination) is categorised as low, because the units do not support any noticeable geodiversity. With the implementation of environmental measures detailed in the oDEMP (see **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**) to ensure that significant contamination events do not occur, the magnitude of impact is

considered to be negligible, as there would be no discernible loss or reduction in value of the geological units. The significance of effect is therefore considered to be neutral or slight adverse. Therefore, the effect on geological units (superficial and bedrock) during the decommissioning phase is considered to be not significant with respect to potential contamination issues.

Decommissioning: Groundwater

8.6.54 The following important receptors related to groundwater require assessment with respect to likely significant effects associated with the decommissioning phase:

- Groundwater abstraction points;
- Groundwater in bedrock and superficial geological units.

8.6.55 Contamination of groundwater could occur as a result of decommissioning activities (including spills or refuelling activities). There is also the potential for contaminated material associated with past developments to be encountered during works (although this is significantly less likely than during construction), and to adversely impact groundwater receptors. In areas within the Order Limits where there is a secondary aquifer, and in areas where groundwater abstraction points are present, the receptor importance is medium, as the receptor is an aquifer providing water for agricultural use. Methods for ensuring the safe storage and use of fuels or chemicals, and details response plans for addressing leaks and spills are detailed in the oDEMP. With the implementation of these environmental measures, the potential for leaks and spills will be minimised, and in the event of spillage events, the impacts would be localised and limited in duration. Procedures detailed in the oDEMP to manage the presence of unexpected contamination will also minimise any effects on groundwater. The magnitude of impact is categorised as minor adverse, with the potential for some measurable change in quality or vulnerability of attributes. The significance of effect is considered to be slight adverse. The effect on medium importance groundwater receptors during decommissioning is considered to be not significant.

8.6.56 In relation to the potential for impact on groundwater from earthworks, the groundwater is deemed to have a medium importance where there are areas of secondary aquifer, and where groundwater abstraction points are present. After consideration of the environmental measures detailed in the oDEMP, the magnitude of any impact from earthworks during decommissioning is considered to be minor adverse, with potential for a minor shift away from baseline conditions. The significance of effect is slight adverse. Therefore, the effect on medium importance groundwater resources (including abstraction points) from earthworks is considered to be not significant.

Decommissioning: Soil and Agricultural Land

8.6.57 The following sensitive receptors related to soil and agricultural land require assessment with respect to likely significant effects associated with the decommissioning phase:

- Soil resources of ALC grade 2, 3a and 3b, with respect to the physical properties of the soil and access to the soil and agricultural land.

8.6.58 The following receptor sensitivities apply with respect to soil and agricultural land, as there will be no change to the ALC grade during the operational phase:

- 19.7% of soils are classified as grade 2 and have 'very high' sensitivity
- 33.6% of soils are classified as grade 3a and have 'high' sensitivity
- 46.7% of soils are classified as grade 3b and have 'medium' sensitivity; and
- There are no areas where the soils is classified as being of 'low' sensitivity (grade 4 or 5, or urban soils).

8.6.59 With respect to soil, adverse effects to the physical structure of soil could potentially occur during the decommissioning phase, as a result of activities such as topsoil stripping, earthworks, replacement of stockpiled material and vehicle movements.

8.6.60 In terms of adverse impacts to the ALC grade of the soil, it should be noted that decommissioning works would not have sufficiently great impacts on the soil resource to result in a downgrade to the ALC grade. Machinery that is used in the decommissioning phase will be of similar size, or smaller/lighter, than plant used in standard agricultural processes. Therefore, the decommissioning works will not result in additional loads on the soil compared to the current agricultural use.

8.6.61 Correct soil management techniques will ensure that soil compaction is minimised, and any impacts could be reversed by techniques that are common in normal agricultural land management. Given that the environmental measures for the Proposed Development include an **Outline Soil Management Plan [EN010159/APP/7.10]** and **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6]**, which will protect soil resources in terms of physical and chemical characteristics, it is considered that a change to existing ALC grades as a result of the decommissioning phase of the Proposed Development is highly unlikely to occur.

8.6.62 Soil and agricultural land within the Order Limits are classified as very high sensitivity (grade 2 land), high sensitivity (grade 3a) and medium sensitivity (grade 3b land). It is considered that any impact as a consequence of decommissioning activities will not result in a discernible change in the physical structure of the soil or the ALC grade. The potential for damage to field drains (with possible subsequent effects on drainage of agricultural land) will be

managed by the measures detailed in the oDEMP. Overall, the magnitude of impact (change) to soil and agricultural land during the decommissioning phase is likely to be negligible, as soils are expected to be managed to prevent damage to the soil resource, so far as practicably possible, and would be returned to agricultural use on completion of decommissioning.

8.6.63 For very high and high sensitivity soils the significance of effect is categorised as slight adverse.

8.6.64 For medium sensitivity soils, the significance of effect is categorised as neutral or slight adverse.

8.6.65 The effect on very high, high and medium sensitivity soil and agricultural land from the works associated with the decommissioning phase of the Proposed Development is therefore assessed as being not significant.

Summary of Likely Significant Effects During Decommissioning Phase

8.6.66 The likely effect of possible contamination on geological units during decommissioning is considered to be a **direct** effect of **short-term** duration, affecting the **Order Limits or local** environment and of **neutral or slight adverse significance**. This effect is not significant.

8.6.67 The likely effect of possible contamination, or earthworks, on **medium importance** groundwater resources during decommissioning is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits or local** environment and of **minor adverse significance**. This effect is not significant.

8.6.68 The likely effect of decommissioning works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains, for **very high sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.69 The likely effect of decommissioning works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains, for **high sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.6.70 The likely effect of decommissioning works on the physical properties of soil, the ALC grade or impact on soil quality due to damage to field drains, for **medium sensitivity** soils is considered to be a **direct or indirect** effect of **short-term** duration, affecting the **Order Limits** and of **slight adverse significance**. This effect is not significant.

8.7 Summary

8.7.1 **Table 8.8** sets out a summary of the likely significant environmental effects considered.

Table 8.8 Summary of Environmental Effects

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Construction								
Geological units	oCEMP	Contamination as a result of construction activities (including spills or refuelling activities or trenchless crossing works) and due to the presence of existing contaminated material	Direct	Short-term	Order Limits /Local	Neutral or Slight adverse	Not significant	CEMP to be approved by relevant local authority and implemented (as per the DCO)
Mineral safeguarding areas	Although this receptor will be affected to some degree during construction, the main impact will be during the operation and maintenance stage, so please see below for the result of the assessment							
Groundwater (medium importance)	oCEMP	Impacts to groundwater quality as a result of construction activities (including spills or refuelling activities or trenchless crossing works) and due to the presence of existing contaminated material	Direct or Indirect	Short-term	Order Limits /Local	Slight adverse	Not significant	CEMP to be approved by relevant local authority and implemented (as per the DCO)

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Groundwater (medium importance)	oCEMP	Impacts to groundwater quality as a result of trenchless crossing works, earthworks or piling activities	Direct or Indirect	Short-term	Order Limits /Local	Slight adverse	Not significant	CEMP to be approved by relevant local authority and implemented (as per the DCO)
Groundwater (medium importance)	oCEMP	Impacts on groundwater flows	Direct	Short Term	Order Limits	Slight adverse	Not significant	CEMP to be approved by relevant local authority and implemented (as per the DCO)
Very high sensitivity soils	oCEMP, oSMP and oCTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	CEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
High sensitivity soils	oCEMP, oSMP and oCTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	CEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Medium sensitivity soils	oCEMP, oSMP and oCTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	CEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
Operation								
Very high sensitivity soils	oOEMP, oSMP and oCTMP	Impact on soil quality	Direct	Long-term	Order Limits	Moderate beneficial	Significant	N/A
Very high sensitivity soils	oOEMP, oSMP and oCTMP	Impact on availability of agricultural land	Direct	Long-term	Order Limits	Moderate adverse	Significant	OEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
High sensitivity soils	oOEMP, oSMP and oCTMP	Impact on soil quality	Direct	Long-term	Order Limits	Slight beneficial	Not significant	N/A
High sensitivity soils	oOEMP, oSMP and oCTMP	Impact on availability of agricultural land	Direct	Long-term	Order Limits	Slight adverse	Not significant	OEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
Medium sensitivity soils	oOEMP, oSMP and oCTMP	Impact on soil quality	Direct	Long-term	Order Limits	Slight beneficial	Not significant	N/A

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Medium sensitivity soils	oOEMP, oSMP and oCTMP	Impact on availability of agricultural land	Direct	Long-term	Order Limits	Slight adverse	Not significant	OEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
Mineral safeguarding areas	Minerals Safeguarding Assessment	Potential for limiting access to mineral resources	Direct	Long-term	Order Limits	Slight adverse	Not significant	N/A
Groundwater (medium importance)	Sufficient water quality mitigation measures included within drainage strategy and OEMP	Impacts to groundwater quality	Direct	Long Term	Local	Slight adverse	Not significant	Detailed mitigation through detailed design / condition
Groundwater (medium importance)	Minimised dewatering	Impacts on groundwater flows	Direct	Long Term	Local	Slight adverse	Not significant	Detailed mitigation through detailed design / condition

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Decommissioning								
Geological units	oDEMP	Contamination as a result of decommissioning activities (including spills or refuelling activities) and due to the presence of existing contaminated material	Direct	Short-term	Order Limits /Local	Neutral or Slight adverse	Not significant	DEMP to be approved by relevant local authority and implemented (as per the DCO)
Groundwater (medium importance)	oDEMP	Contamination as a result of decommissioning activities (including spills or refuelling activities) and due to the presence of existing contaminated material	Direct or Indirect	Short-term	Order Limits /Local	Slight adverse	Not significant	DEMP to be approved by relevant local authority and implemented (as per the DCO)
Groundwater (medium importance)	oDEMP	Contamination as a result of earthworks activities	Direct or Indirect	Short-term	Order Limits /Local	Slight adverse	Not significant	DEMP to be approved by relevant local authority and implemented (as per the DCO)

Receptor	Environmental Measures	Description of the Effect	Direct / Indirect	Duration	Geographic Scale	Nature of Effect	Significant / Not Significant	Mechanism
Very high sensitivity soils	oDEMP, oSMP and oDTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	DEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
High sensitivity soils	oDEMP, oSMP and oDTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	DEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)
Medium sensitivity soils	oDEMP, oSMP and oDTMP	Impact on physical properties of soil, or on ALC grade of soil, or impact on soil quality due to damage to field drains	Direct or Indirect	Short-term	Order Limits	Slight adverse	Not significant	DEMP and SMP to be approved by relevant local authority and implemented (as per the DCO)

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