Tillbridge Solar Project
EN010142

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tillbridgesolar.com

@: info@tillbridgesolar.com T: 0800 046 9643

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10. Water Environment

10.1 Introduction

10.1.1 This chapter presents the findings of an assessment of the likely significant effects on the water environment as a result of the Tillbridge Solar Project (hereafter referred to as 'the Scheme'). This includes consideration of surface water features (such as rivers, streams, ditches, and lakes), groundwater assets, flood risk and demand for water resources. However, any impacts on ponds are assessed in **Chapter 9: Ecology and Nature Conservation** of this Environmental Statement (ES) **[EN010142/APP/6.1]**, which also includes details of relevant protected species and aquatic ecology surveys. Any effects of contaminated land on surface or groundwater are presented within Preliminary Risk Assessments (PRAs) completed for the Principal Site (**Appendix 17-3** of this ES **[EN010142/APP/6.2]**) and the Cable Route Corridor (**Appendix 17-4** of this ES **[EN010142/APP/6.2]**). This is also covered in **Chapter 17: Other Environmental Topics** of this ES **[EN010142/APP/6.1]** under Section 17.5 Ground Conditions. For more details about the Scheme, refer to **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**.

10.1.2 This assessment is supported by the following appendices of this ES **[EN010142/APP/6.2]**:

a. **Appendix 10-1: Water Environment Legislation, Policy and Guidance**;

b. **Appendix 10-2: Water Framework Directive (WFD) Extended Screening and Scoping Assessment**;

c. **Appendix 10-3: Flood Risk Assessment (FRA)**;

d. **Appendix 10-4: Outline Drainage Strategy**; and

e. **Appendix 10-5: Water Environment Stakeholder Meeting Minutes**.

10.1.3 The chapter is supported by the following figures of this ES **[EN010142/APP/6.3]**:

a. **Figure 10-1: Surface water features and their attributes**.

b. **Figure 10-2: Groundwater features and their attributes**.

c. **Figure 10-3: Bedrock Geology and Aquifer Status**.

d. **Figure 10-4: Superficial Geology and Aquifer Status**.

e. **Figure 10-5: Watercourses, Flood Zones and Internal Drainage Boards**.

10.1.4 At Deadline 3, this chapter has been updated in response to comments received from the Environment Agency. The document references have not been updated from the original submission. For the most up-to-date documents, the reader should access these through the **Guide to the**

Application [EN010142/APP/1.2 (Rev05)] and Schedule 13 of the **draft DCO [EN010142/APP/3.1(Rev04)].**

10.2 Legislation, Planning Policy, and Guidance

10.2.1 **Appendix 10-1: Water Environment Legislation, Policy and Guidance** of this ES **[EN010142/APP/6.2]** identifies the legislation, policy, and guidance of relevant to the assessment of likely significant water environment effects of the Scheme.

10.3 Assessment Assumptions and Limitations

10.3.1 The assessment is based on the Scheme design set out **in Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1**], and the design is that shown on **Figure 3-1: Indicative Principal Site Layout [EN010142/APP/6.3]**.

10.3.2 The quality of the water environment receptors has been defined using published data sources and observations from walkover hydromorphological surveys of the watercourses crossed by the Scheme. This chapter also draws on ecological surveys undertaken between 2022 and 2023. The availability of data with which to define the receptor importance of these attributes is considered robust and therefore this approach is considered acceptable.

10.3.3 Groundwater levels for the Scheme area are estimated based on published sources (Ref. 10-38). These will be confirmed by ground investigation post consent to investigate the viability of infiltration. This will take place as part of detailed design after Development Consent Order (DCO), in line with the **Framework Construction Environmental Management Plan (CEMP)** [**EN010142/APP/7.8]**.

10.3.4 Within **Table 9-2** in **Chapter 9: Ecology and Nature Conservation** of this ES **[EN010142/APP/6.1]**, there is a summary of field surveys undertaken to date. These include: Phase 1 habitat, terrestrial habitats and flora, aquatic surveys including scoping and ditch surveys noting the presence of any invasive non-native species, bats, badgers riparian mammals, wintering (non-breeding) birds, breeding birds, reptiles, amphibians, including Great Crested Newts, fish, terrestrial invertebrates, and aquatic macro-invertebrates. The importance of water features has been determined taking into account any relevant ecological nature conservation designation, and also aquatic protected species that may be present.

10.3.5 The methodology of the cable route construction and installation below watercourses is outlined in **Section 10.7** of this chapter and will follow good industry practice methods. The dimensions stated are indicative but represent the likely maximum parameters, with the exact dimensions of excavations for send and receive pits to be determined following future site and ground investigations within the detailed design stage which will take place after receipt of any DCO consent.

10.3.6 Watercourses may be crossed anywhere within the Order limits along the Cable Route Corridor. It is impractical to survey the entire length of all watercourses within this zone. However, the survey data that has been obtained is considered to be representative of each watercourse and sufficient for the prediction of effects. Site specific variances for final crossing locations will be surveyed as part of pre-works surveys and used to inform reinstatement (with enhancement where possible). With regards to culverts for access roads, only a slight change in location is anticipated and it is assumed that these may vary by up to 50m upstream or downstream.

10.3.7 The route assessed in the Cable Route Corridor is the preferred route, with a specific number of crossing locations. There may be a variation in the number of crossing points if there is a slight variation in the exact route chosen. Should this occur, it is not considered there would be any significant variation to the level of impact as a result of the Scheme due to the variation in the exact number of crossings, or the location.

10.3.8 A minimum headroom of 3m below the watercourse bed will be maintained for trenchless, nonintrusive, crossings. With regards to the proposed crossing of the River Trent, cables will be installed by non-intrusive, underground techniques (e.g. either Horizontal Directional Drilling (HDD) or Thrust Bore techniques that will not disturb the watercourse), with the depth of the cable below the river bed to be a minimum of 5m beneath the bed, and expected to be a maximum of 25m, and subject to appropriate consents being obtained.

10.3.9 The solar PV panels will be offset from watercourses by a minimum of 10m measured from the water’s edge/channel extents under normal flow conditions as typically shown on digital Ordnance Survey (OS) maps (as described in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**). This will ensure the majority of construction activities for these panels, and associated infrastructure, will take place a minimum of 10m from surface watercourses. The purpose of this buffer is to reduce the risk of any pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) should they be required.

10.3.10 During operation of the Scheme, there will be up to 12 permanent staff on site. This will be during office hours and located in the ‘Proposed Solar Farm Control Centre’ in the north-west corner of field 51 as shown in **Figure 3-1: Indicative Principal Site Layout Plan** of this ES **[EN01042/APP/6.3]**. This will contain welfare facilities for the anticipated up to 10-12 permanent members of staff on shift during the operational phase (i.e. relatively low volumes of foul drainage will be generated on site). There will be no discharge to the public sewer system. The foul drainage will be directed to a self-contained foul drainage system such as a cess pit or similar sealed tank. These tanks will be regularly emptied under contract with a registered recycling and waste management Contractor in accordance with all relevant waste management requirements prevailing at the time.

10.3.11 The assessment of the construction phase impacts has been based on a 24 month construction programme. It is noted that the construction duration may extend up to 36 months construction. However, the impacts described in this chapter are considered to be a reasonable worst case because it represents a higher peak demand and discharge, and the effect will therefore be the same or lesser if the construction programme was extended.

10.3.12 The risk from surface water runoff to surface or groundwater features has been assessed qualitatively on the basis of design principles that have been presented in the outline drainage strategy included within **Appendix 10-4** of this ES **[EN/010142/APP/6.2]**.

10.3.13 The solar PV panels will be held above ground on narrow diameter piled legs. This prevents sealing the ground with an impermeable surface and will allow any rainwater to infiltrate into the ground to replicate the current hydrological situation. In order to limit the potential for channelisation from rainfall dripping off the end of the panels, the areas between, under and surrounding the solar PV panels will be planted with native grassland and wildflower mix. This planting will intercept and absorb rainfall running off the panels, preventing it from concentrating and potentially forming channels in the ground. The pollution risk from this runoff is minimal as solar PV panels do not contain any liquid (hazardous or not) that could contaminate rainwater.

10.3.14 Water will be used once a year for cleaning the solar panel modules. This will require approximately 3m^3 of water required for every 1000 panels, with an estimated water requirement per year of 2,355m^3 of water once per year. This water will be sourced from local water supplier and thus will not lead to any pollution risk.

10.3.15 The assessment has assumed that during the decommissioning phase, the cable will be left in situ.

10.3.16 The Sustainable Drainage Systems (SuDS) Manual (Ref. 10-9) only provides a limited number of land use types and so those selected will be the most suitable for the components of the Scheme, based on professional judgement. Where more than one pollution hazard category applies to a component of the Scheme, the worst pollution hazard will be selected for the conveyance features.

10.4 Assessment Methodology

Study Area

10.4.1 For the purposes of this assessment, a general Study Area of 1km around the Order limits has been considered in order to identify water features that are hydrologically connected to the Order limits and potential works associated with the Scheme that could cause lead to impacts.

10.4.2 Given that watercourses flow and water quality and flood risk impacts may propagate downstream, where relevant, the assessment also considers a wider Study Area as far downstream as a potential impact may influence the quality or quantity of a water feature. In this case, watercourses across the Study Area generally drain to the River Trent, which is considered the final receiving water feature that could conceivably be significantly affected due to its size and factor of dilution available.

Sources of Information

Desktop Survey

10.4.3 The water environment baseline conditions have been determined by a desk study of available Site and Scheme information, and a range of online data sources including:

a. Online Ordnance Survey (OS) maps viewed to identify any surface water features within 1km of the Scheme (Ref. 10-10);

b. Online aerial photography (Ref. 10-11);

c. Part 1: Anglian and Humber River Basin District River Basin Management Plans (RBMPs) (Ref. 10-7 and Ref. 10-8);

d. The Met Office website (Ref. 10-12);

e. National Rivers Flow Archive website (Ref. 10-13);

f. Environment Agency's Catchment Data Explorer Tool (Ref. 10-14);

g. Environment Agency's Water Quality Archive website (Ref. 10-15);

h. Environment Agency's Fish & Ecology Data Viewer (Ref. 10-16);

i. Multi-agency geographical information for the countryside (MAGIC) website (Ref. 10-17);

j. British Geological Survey (BGS) Borehole and Geology Mapping Geoindex website (Ref. 10-18);

k. The Cranfield University Soilscape website (Ref. 10-19);

l. Natural England Designated Site website (Ref. 10-20);

m. DEFRA Hydrology Data Explorer website (Ref. 10-38);

n. West Lindsey District Council (January 2024) and Bassetlaw District Council (January 2024) for information on Private Water Supplies;

o. Environment Agency information on pollution incidents and water activity (discharge consent) permits; and

p. Gov.uk Online Interactive Maps:

   i. Flood map for planning (rivers and sea).

   ii. Risk of flooding from surface water.

   iii. Risk of flooding from reservoirs.

   iv. Flood warning areas and risk.

10.4.4 The FRA presented within **Appendix 10-3** of this ES **[EN010142/APP/6.2]** provides further details of relevant catchment and flood risk data, and flood risk desktop survey information.

Surveys

10.4.5 A walkover Site survey was undertaken on 30 March 2023, along the Cable Route Corridor and the Principal Site. This visit was a general and hydromorphological survey of the Order limits to visit the watercourses which will be crossed by the cable route, and in the vicinity of the Principal Site. The hydromorphological character of the watercourses has been confirmed during the field surveys undertaken.

10.4.6 No water quality monitoring has been carried out for the assessment of the Scheme. The Environment Agency currently carries out monitoring of the more significant watercourses in the area. This data has been used as a proxy for watercourses within the area of the Scheme. Importance of water features has been determined from a holistic review of water feature attributes. The importance level does not rely on whether water quality is Poor, or Good, due to the principle that no controlled water may be polluted (with a controlled water having the meaning as set out in Section 104 Part 3 of the Water Resources Act 1991 (Ref. 10-2); i.e. essentially all water features that are not sewers and drains to sewers). Water quality impacts have also been based on a qualitative risk assessment that does not require input of raw background water quality data.

Impact Assessment Methodology

Source-Pathway-Receptor Approach

10.4.7 Based on professional judgement and experience of other similar schemes, a qualitative assessment of the likely significant effects on surface water quality and water resources has been undertaken.

10.4.8 The qualitative assessment of the likely significant effects has considered the construction, operation, and decommissioning phases, as well as cumulative effects with other developments. It is based on a source-pathway-receptor approach. For an impact on the water environment to exist, the following is required:

a. An impact **source** (e.g. such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body, or the change to water volume or flow rate within a watercourse);

b. A **receptor** that is sensitive to that impact (i.e. water features and the services they support); and

c. A **pathway** by which the two are linked.

10.4.9 The first stage in applying the source-pathway-receptor approach is to identify the causes or ‘sources’ of potential impact from a development. The sources have been identified through a review of the details of the Scheme, including the size and nature of the proposed development, potential construction methodologies and timescales.

10.4.10 The next step in the model is to undertake a review of the potential receptors, that is, the water environment receptors themselves that have the potential to be affected. Water features, including their attributes, have been identified through desk study and site surveys.

10.4.11 The last stage of the model is, therefore, to determine if there is a viable exposure pathway or a ‘mechanism’ linking the source to the receptor. This has been undertaken in the context of local conditions relative to water receptors within the Study Area, such as topography, geology, climatic conditions and the nature of the impact (e.g. the mobility of a liquid pollutant or the proximity to works that may physically impact a water body).

10.4.12 To support the assessment, a number of sub-topic specific assessments will be undertaken. These are described in more detail in the following sections.

Hydromorphology

10.4.13 The hydromorphological character of the watercourses within the Principal Site and along the Cable Route Corridor has been determined from desk study, site walkovers, and professional judgement. This has considered aspects such as valley form, river type, substrate characteristics, bank material, and erosional and depositional processes.

10.4.14 Potential hydromorphological impacts have been qualitatively appraised based on a desk study, and a review of the Scheme components that may affect the physical form of water features.

10.4.15 Consideration has also been given to how the Scheme is likely to impact upon the WFD objectives for the relevant watercourses within **Appendix 10-2** of this ES **[EN010142/APP/6.2]**. Effects are described according to the method for determining effect significance set out in **Chapter 5: EIA Methodology** of this ES **[EN010142/APP/6.1]**.

10.4.16 Information on the hydromorphology of the watercourses is included within the baseline and as part of the WFD Assessment that is presented within **Appendix 10-2** of this ES **[EN010142/APP/6.2]**.

Flood Risk Assessment

10.4.17 A site-specific FRA has been prepared for the Scheme. This is presented within **Appendix 10-3** of this ES **[EN010142/APP/6.2]**. The FRA has been prepared in accordance with the requirements of the relevant national policy statements (NPS EN-1 (Ref. 10-42), EN-3 (Ref. 10-43) and EN-5 (Ref. 10-44), the National Planning Policy Framework 2023 (Ref. 10-45) and the accompanying Planning Practice Guidance (Ref. 10-46), regional and local policy, and taking into account future climate change. It includes a full review of the flood risk to the Principal Site and the Cable Route Corridor as separate entities. The FRA presents mitigation measures included within the design and demonstrates how the Sequential Test and Exception Test have been met.

10.4.18 The FRA identifies one area within the Principal Site Order limits where the extents of Flood Zone 2 and 3 from a tributary to the River Eau, overlap with proposed Solar PV Panels areas. A Fluvial Flood Risk Technical Note annexed to the FRA establishes the minimum required bottom of solar PV Panel level within the area to ensure 300mm freeboard above the predicted flood levels for the 1 in 100 year + Climate Change design event is provided, resulting in no increased risk from fluvial flooding to the solar PV panel infrastructure within this area. The FRA assesses the credible maximum scenario for the solar panels to ensure the Scheme can remain operational in times of extreme flooding. The credible maximum scenario is a sensitivity test to test the highest climate change allowances to ensure the site can remain operational in times of flood.

Outline Drainage Strategy

10.4.19 An outline surface water drainage strategy has been prepared and is presented within **Appendix 10-4** of this ES **[EN010142/APP6.2]**. The Outline Drainage Strategy solely relates to the outline drainage design of the Principal Site, with regards to handling surface water generated by new impermeable areas such as the Battery Energy Storage Systems (BESS) and on-site substations. The design includes above ground attenuation features, which will attenuate surface water from new impermeable areas to equivalent greenfield rates before discharge to the nearest watercourse.

Assessment of Surface Water Runoff for the Operational Phase

10.4.20 During operation, surface water runoff from the Scheme may contain pollutants derived from impermeable surfaces (e.g. inert particulates, litter, hydrocarbons, metals, nutrients and de-icing salts). This mixture of pollutants is collectively known as ‘urban diffuse pollutants,’ and although each pollutant may itself not be present in harmful concentrations, the combined effects over the long term can cause chronic (i.e. persistent and long lasting) adverse impacts. Changes in impermeable surface area within the Site may lead to increases in the rate and quantities of these pollutants being runoff to receiving watercourses. An assessment is therefore undertaken to determine the potential risk to the receiving water features and to inform the development of suitable mitigation and treatment measures.

10.4.21 The appropriateness of design within the Outline Drainage Strategy has been assessed with reference to the Simple Index Assessment method described in the SuDS Manual (Ref. 10-9). This is included within the Outline Drainage Strategy within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**. The Simple Index Approach follows three steps:

a. Step 1 – Determine suitable pollution hazard indices for the land use(s);

b. Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index (for three key types of pollutants - total suspended solids, heavy metals and hydrocarbons). Only 50% efficiency should be applied to second, third etc. treatment train components; and

c. Step 3 – If the discharge is to a water body protected for drinking water, consider a more precautionary approach.

Water Framework Directive Assessment

10.4.22 A WFD Assessment (WFDa) has been prepared as part of the DCO Application for the Scheme and is presented in **Appendix 10-2: Water Framework Directive Assessment** of this ES **[EN010142/APP/6.2]**. The Scheme interacts with several WFD water bodies. Thus, each activity associated with the Scheme, such as the solar panels, infrastructure and cable crossings of water bodies, have been assessed against the biological, physico-chemical and hydromorphological, and groundwater quality elements that comprise the WFD.

10.4.23 **Appendix 10-2: Water Framework Directive Assessment** of the ES **[EN010142/APP/6.2** considers the compliance of the Scheme against the WFD objectives for those WFD water features which are within or close to the Order limits and that may be impacted. It assesses the impact of relevant aspects of the Scheme on relevant WFD quality elements of each WFD water body. This includes the evaluation of the potential construction, operational and decommissioning phase impacts of the Scheme on hydromorphological, biological and physico-chemical parameters with respect to the WFD objectives of no deterioration and failure to prevent improvement.

10.4.24 The WFDa also takes into account any impact on improvement measures that the Environment Agency has already proposed for waterbodies that are not already at Good Ecological Status / Potential or better. It also considers where there are opportunities for environmental enhancement that could support improving water body status. The WFDa assessment is based on available baseline and Scheme design information, data from open sources, and the general/hydromorphological walkover carried out on 30 March 2023. The WFDa details the survey data on which the assessment has been based.

Water Supply and Demand

10.4.25 The area of the Scheme is located within an area of Water Stress, as confirmed from the scoping responses from the Planning Inspectorate (refer to **Table 10-4**), and from Anglian Water (refer to **Table 10-6**).

10.4.26 During construction there would be a need for water usage which would be temporary.

10.4.27 The anticipated need for water during construction would be for use in concrete production, concrete curing, and internal road construction works. It is anticipated that any concrete required for the construction would be obtained from a local batching plant. It is anticipated, however, that the use of water for concrete curing and internal road construction may not be required where rainfall can be utilised.

10.4.28 The batching plant would be a plant that is currently in operation, and not a new construction specifically for this Scheme. This plant is currently in existence and therefore, this is not considered further in this assessment.

10.4.29 During construction there will also be a need to supply water for construction workers. The workers on Site during construction are anticipated to be using circa 12 litres per day to cover drinking water and toilet usage during construction phase, which is less than the 90 litres per day industry standard for industrial use for a permanent industrial facility. There are anticipated to be a maximum of 1,395 construction staff using the Site per day, however, this will only be for a short period of time.

10.4.30 It is not proposed to have a permanent connection to the mains water during the construction. The provision for water supply will be from commercial sources with dedicated clean water tanks provided to supply the various temporary welfare facilities. Given the temporary nature of the demand, it is anticipated that the Scheme will not result in any significant changes to the water stress. Therefore, it has been scoped out from further assessment.

10.4.31 During the operational phase there will be a requirement once a year for washing of the panels. This will use clean water with no added chemicals. This will be at $3m^3$ for every 1000 panels, with a requirement of approximately $2,355m^3$ of water once per year. This water will be sourced from local water suppliers, and will not lead to any significant pollution risk or risk to supply due to its temporary nature.

10.4.32 There are anticipated to be up to 12 permanent staff during operation on site which would result in an estimated usage of 1,080 litres per day (or $1.08m^3$/d) based on the industry standard of 90 litres per person. This is less than the Anglian Water development proposals for dwellings of 110 litres per person per day.

10.4.33 The operation of the Scheme would also require the storage of water in the event of a fire. A volume of water is required to be stored on site for use in the event of a fire. The National Fire Chiefs Council guidance states that the volume of water required 'should be capable of delivering no less than 1,900 litres per minute for at least 2 hours'. Once present on site the stored water is unlikely to be required, and therefore would not cause an ongoing demand for the area of Water Stress.

10.4.34 Based on the small number of employees to be present at the operational Scheme, it is considered the Scheme would cause no significant impact to the area of Water Stress. Therefore, it has been scoped out from further assessment.

Further Matters Scoped out of the Assessment

10.4.35 Within the Planning Inspectorate's Scoping Opinion (refer to **Appendix 1-2** of this ES **[EN010142/APP/6.2])**, as tabulated in **Table 10-4**, the following are agreed to be scoped out from this assessment:

a. Scoping out of non-statutory designated sites. The Applicant proposes to scope out an assessment of Whites Wood Local Wildlife Site (LWS), Birch Wood LWS and Wharton Wood LWS as they are not hydrologically linked to the Scheme due to their location upstream or in different hydrological catchments.

b. Scoping out of Highfield Lane Drinking Water Safeguarding Zone (groundwater) as it is located over 20km northwest of the Scheme.

10.4.36 During the operational phase there will be no discharge to the public sewer system, with between 10-12 permanent staff there will be low volumes of foul drainage generated on site. The foul drainage will be directed to a self-contained foul drainage system such as a cess pit or similar sealed tank. These tanks will be regularly emptied under contract with a registered recycling and waste management Contractor in accordance with all relevant waste management requirements prevailing at the time. Therefore, this is scoped out of further assessment.

Determining the Significance of Effects

10.4.37 The significance of effects has been determined using the principles of the guidance and criteria set out in the Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment (Ref. 10-22) and LA 104 adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The criteria that has been used to determine receptors importance is presented in **Table 10-1**. Further information on the general assessment methodology is included within **Chapter 5: EIA Methodology** of this ES **[EN010142/APP/6.1].**

10.4.38 Whilst other technical assessments within the ES may consider 'receptor sensitivity', this chapter refers to 'receptor importance' instead when determining the significance of effects on the water environment. This is because, when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water body. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects. Irrespective of importance, all controlled waters in England are protected by law from being polluted.

10.4.39 In accordance with the stages of the methodology, there are three stages to the assessment of effects on the water environment, which are as follows:

a. A level of importance (low to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity, and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding.

b. The magnitude of potential and residual impact (classed as very low, low, medium and high adverse / beneficial) is determined based on the criteria listed in **Table 10-2** and the assessor's professional judgment. Embedded or standard mitigation measures are taken into account in the initial assessment, but any other mitigation is not considered until the assessment of residual effects.

c. A comparison of the importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in **Table 10-3**. The significance of each identified effect (both potential and residual) is classed as major, moderate, minor, negligible or neutral significance, either beneficial or adverse.

10.4.40 The following significance categories have been used for both potential and residual effects:

a. No change: An imperceptible effect or no effect to a water resource receptor;

b. Beneficial: A beneficial / positive effect on the quality of a water resource receptor; or

c. Adverse: A detrimental / negative effect on the quality of a water resources receptor.

10.4.41 In the context of this assessment, an effect can be temporary or permanent, with effects quantified temporally as being short-term (0-5 years), medium term (6-10 years) and long-term (>10 years).

10.4.42 At a spatial level, 'local' effects are those affecting the Scheme within the Order limits and neighbouring receptors within the Study Area, while effects upon receptors beyond the vicinity of the Study Area are considered to be at a 'regional' level. Effects which affect different parts of the country, or England as a whole, are considered being at a 'national' level. Spatial importance is built into the criteria for determining importance as outlined in **Table 10-1** and is therefore taken into account in the process of determination significance of effects.

10.4.43 The importance of the receptor (refer to **Table 10-1**) and the magnitude of impact (refer to **Table 10-2**) are determined independently from each other and are then used to determine the overall significance of effects (refer to **Table 10-3**). Options for mitigation are considered and secured where possible to avoid, minimise and reduce adverse impacts, particularly where significant effects may have otherwise occurred. The residual effects of the Scheme with identified mitigation in place are then be reported. Effects of moderate or greater are considered significant.

Table 10-1: Criteria to Determine Receptor Importance (Adapted from LA113) (Ref. 10-22)

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	Salmonid fishery. Watercourse having a WFD classification as shown in a RBMP and Q95 ≥ 1.0m^3/s; site protected / designated under international or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site. Critical social or economic uses (e.g. public water supply and navigation).	Source Protection Zone (SPZ) 1; Principal aquifer providing a regionally important resource and/or supporting a site protected under international and UK legislation; Groundwater locally supports Groundwater Dependent Terrestrial Ecosytems (GWDTE); Water abstraction: >1,000m^3/day	Unmodified, pristine (or near to) conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	Watercourse having a WFD classification as shown in a RBMP and Q95 < 1.0m^3/s; Major Cyprinid Fishery; Species protected under international or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply,	Principal Aquifer providing locally important source supporting rover ecosystem; SPZ2; Groundwater supports GWDTE; Water abstraction: 500- 1,000m^3/day.	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	More vulnerable development.

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
		navigation or mineral extraction.			
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small / limited population of protected species. Limited social or economic uses.	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water abstraction: 50-499m^3/day.	Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class ‘Poor’ or undesignated in its own right. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.	Generally Unproductive strata. Water abstraction: <50m^3/day	Substantially modified by past land use, previous engineering works or flow / water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted	Water compatible development.

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
				by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category	
Negligible	The receptor is resistant to change and is of little environmental value.	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Table 10-2: Magnitude of Impact Criteria (Adapted from LA113) (Ref. 10-22)

Magnitude of Impact	Description	Examples
High Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute.	**Surface water:** • Loss or extensive change to a fishery. • Loss of regionally important public water supply. • Loss or extensive change to a designated nature conservation site. • Reduction in water body WFD classification. **Groundwater:** • Loss of, or extensive change to, an aquifer. • Loss of regionally important water supply. • Loss of, or extensive change to, groundwater dependent terrestrial ecosystem (GWDTE) or baseflow contribution to protected surface water features. • Reduction in water body WFD classification. • Loss or significant damage to major structures through subsidence or similar effects. **Flood Risk:** • Increase in peak flood level >100mm. • Change in flood risk to receptor from low or medium to high. • Permanent adverse effect on local drainage system and subsequent capacity implications.
Medium Adverse	Results in impact on integrity of attribute, or loss of part of attribute.	**Surface water:** • Partial loss in productivity of a fishery. • Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. • Contribution to reduction in water body WFD classification.

Magnitude of Impact	Description	Examples
		Groundwater: • Partial loss or change to an aquifer. • Degradation of regionally important public water supply or loss of significant commercial/industrial/agricultural supplies. • Partial loss of the integrity of GWDTE. • Contribution to reduction in water body WFD classification. • Damage to major structures through subsidence or similar effects or loss of minor structures. **Flood Risk:** • Increase in peak flood level > 50mm. • Change in flood risk to receptor from low to medium. • Severe temporary adverse effect on local drainage system and subsequent capacity issues.
Low Adverse	Results in some measurable change in attribute's quality or vulnerability.	**Surface water:** • Minor effects on water supplies. **Groundwater:** • Minor effects on an aquifer, GWDTEs, abstractions and structures. **Flood Risk:** • Increase in peak flood level >10mm. • Change in flood risk to receptor from no risk to low risk. • Minor effect on local drainage system and subsequent capacity issues.
Very Low Adverse / Beneficial	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.	**Surface / Groundwater:** • The proposed project is unlikely to affect the integrity of the water environment. **Flood Risk:**

Magnitude of Impact	Description	Examples
		• Negligible change to peak flood level (≤ +/- 10 mm). • No change in flood risk to the receptor. • Negligible change on local drainage system.
Low Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.	**Surface Water:** • Contribution to minor improvement in water quality, but insufficient to raise WFD classification. **Groundwater:** • Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding. **Flood Risk:** • Creation of flood storage and decrease in peak flood level (>10 mm). • Change in flood risk to receptor from low risk to no risk. • Minor reduction in surface water run-off and subsequently the impact on the local drainage system.
Medium Beneficial	Results in moderate improvement of attribute quality.	**Surface Water:** • Contribution to improvement in water body WFD classification. **Groundwater:** • Contribution to improvement in water body WFD classification. • Improvement in water body catchment abstraction management strategy (CAMS) (or equivalent) classification. • Support to significant improvements in damaged GWDTE. **Flood Risk:** • Creation of flood storage and decrease in peak flood level (>50 mm). • Change in flood risk to receptor from medium to low.

Magnitude of Impact	Description	Examples
		• Moderate reduction in surface water run-off and subsequently the impact on the local drainage system.
High Beneficial	Results in major improvement of attribute quality	**Surface Water:** • Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse. • Improvement in water body WFD classification. **Groundwater:** • Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification. **Flood Risk:** • Creation of flood storage and decrease in peak flood level (>100 mm). • Change in flood risk to receptor from high to medium or low. • Major reduction in surface water run-off and subsequently the impact on the local drainage system.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

Table 10-3: Matrix for Assessment (Adapted from DMRB LA113), (Ref. 10-22)

Importance of Receptor	Magnitude of Impact				
	High	Medium	Low	Very Low	No change
Very High	Major	Major	Major	Minor	Neutral
High	Major	Major	Moderate	Minor	Neutral
Medium	Major	Moderate	Minor	Negligible	Neutral
Low	Moderate	Minor	Negligible	Negligible	Neutral
Negligible	Minor	Negligible	Negligible	Negligible	Neutral

10.5 Stakeholder Engagement

10.5.1 A request for an EIA Scoping Opinion, **Appendix 1-2: EIA Scoping Opinion** of this ES **[EN010142/APP/6.2]**, was sought from the Secretary of State through the Planning Inspectorate in 2022 as part of the EIA Scoping Process. The Planning Inspectorate's scoping responses in relation to water environment, are presented in **Table 10-4** below.

10.5.2 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information Report (PEIR).

10.5.3 **Table 10-5** outlines the statutory consultation responses relating to the water environment and how these have been addressed through the ES. Responses have been grouped thematically where relevant, but all relevant consultees are listed. Additional comments from subsequent targeted consultation completed between December 2023 and January 2024 are also included.

10.5.4 Consultation has also been undertaken directly with key stakeholders and via statutory processes managed by the Planning Inspectorate, who have contacted the Environment Agency, Upper Witham, and Witham Third and Isle of Axholme & North Nottinghamshire Water Level Management Board, Scunthorpe and Gainsborough Water Management Board, and the relevant local authorities. Witham Third consultation response is combined with Upper Witham Internal Drainage Board (IDB). Isle of Axholme & North Nottinghamshire Water Level Management Board is located on the west bank of the River Trent, over 20km north and downstream of the Scheme. This IDB is outside of the Study Area, and not considered further. The most recent consultation took place on Monday 4 September 2023 with representatives from the Environment Agency, Scunthorpe and Gainsborough Water Management Board, Upper Witham IDB (including Witham Third IDB), Trent Valley IDB (now part of the Water Management Consortium), Lincolnshire County Council, and Nottinghamshire County Council present. A summary of this engagement is presented in **Table 10-4**~~Table 10-4~~ below.

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Table 10-4: Scoping Opinion Responses (Water Environment)

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Planning Inspectorate		
Scoping out of non-statutory designated sites. The Applicant proposes to scope out an assessment of Whites Wood Local Wildlife Site (LWS), Birch Wood LWS and Wharton Wood LWS. The inspector agrees.	Assessment of these LWS have not been included in this ES.	Justification of the scoping out of the relevant LWS included in paragraph 10.4.35 of this chapter.
Scoping out of Highfield Lane Drinking Water Safeguarding Zone (groundwater). The inspector agrees.	Assessment of this Zone has not been included in this ES.	Justification of the scoping out of the Zone included in paragraph 10.4.35 of this chapter.
Temporary Works: the Inspectorate is unclear as to what is considered to be 'temporary works', and whether this means the comprehensive scoping out of comprehensive construction or decommissioning phases. On the basis of the information provided the Inspectorate is not in a position to scope out this matter at this stage. The ES should provide a description of the temporary works envisaged as well as an assessment of likely significant effects associated with these works.	**Chapter 3 Scheme Description** of this ES [**EN010142/APP/6.1],** and this chapter include description of the temporary works which have been assessed, which are considered to be part of the Construction Impacts. Construction impacts have been assessed.	**Section 10.7** includes a description of the embedded mitigation within the proposed construction, or temporary, works. There potential effects over construction and temporary works are assessed within **Section 10.8** of this chapter.
Potential risks to watercourse: Paragraph 11.78 identifies the risks on the water environment that are likely to arise during the construction phase. It is noted that the potential of sediment mobilisation from the riverbed arising through the use of directional drilling is omitted from this list. The ES should	The potential for drilling fluid breakout, or 'break out' has been assessed as a potential impact on watercourses during the construction of the cable connections in the Cable Route Corridor. The **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]**	This information is included within **Section 10.7**, Embedded Mitigation of this chapter. **Section 10.8** includes the assessment of potential effects taking the Embedded Mitigation into account.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
assess the potential for sediment mobilisation from drilling to impact on water quality and the potential for significant effects to occur, including on ecological receptors (see Box 3.4.4 above). Paragraphs 5.4 and 5.5 of Appendix C: WFD Screening set out the assumed mitigation measures that will be contained within the CEMP. The CEMP should also include a method statement outlining how pollution will be prevented during the construction phase and a silt management plan.	includes measures outlining how pollution will be prevented during the construction phase, including from fine sediment being mobilised during drilling and in runoff. The **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]** includes a measures for managing silt during construction.	
Water Quality sampling: The Scoping Report states that no water quality sampling is proposed beyond a site walkover survey on the basis that a qualitative risk-based approach will be undertaken. No further justification is provided for this approach. The ES should describe the existing quality of water affected by the Proposed Development. Given that there are waterbodies within the Proposed Development boundary, the Proposed Development is located within multiple WFD catchments, and construction and operational impacts may alter water quality (as highlighted in paragraphs 11.78 and 11.82), surface water quality surveys should be undertaken to inform the baseline and reported in the ES, unless otherwise agreed with relevant consultation bodies.	Water quality of the more significant watercourses near the Site boundary, and just beyond, will be determined with reference to background water quality data from routine Environment Agency monitoring where available. The importance of water bodies will be determined from a holistic review of water body features and their attributes and will not rely on water quality alone due to the principle that no controlled water may be polluted (i.e. just because water quality may be poorer at a point in time does not mean a greater impact can be allowed). In keeping with standard practice and reflecting the level of risk from the Scheme, water quality impacts will be based on a qualitative risk assessment that does	Paragraph 10.4.6 of this chapter sets out the reasons why quantitative baseline water quality monitoring is not required.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	not require input of raw background water quality data. General baseline monitoring is not standard, as it is only effective when there is a clear purpose for it, and where monitoring can over a long period of time to ensure reliable and robust results. This methodology is consistent with the approach adopted and accepted on previous solar Nationally Significant Infrastructure Projects (NSIPs). Examples include the Sunnica Energy Farm, Gate Burton Energy Park, and Longfield Solar Farm, which all utilised Environment Agency monitoring data for watercourses in the area of their respective schemes. If water quality monitoring would be useful during construction, this will be identified as an outcome of the water environment impact assessment so pre-works baseline data could be collected.	
Attenuation Ponds: The Scoping Report states that surface water will be stored using on site attenuation. Further details of proposed attenuation ponds should be provided within the ES, including their size, capacity, and location. The ES should include this information as part of a plan to aid understanding.	The Outline Drainage Strategy in **Appendix 10-4** of this ES **[EN010142/APP/6.2]**, presents the outline drainage design, including proposed above ground attenuation features, alongside their locations.	The Outline Drainage Strategy is included in **Appendix 10-4** of this ES **[EN010142/APP/6.2]**.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Methodology: it is proposed that the impact assessment reported within the ES will not consider the flood risk impacts on the Proposed Development itself, but this will be considered within the Flood Risk Assessment (FRA) which will be provided as an appendix to the ES. The Inspectorate is of the opinion that the ES should report the likely significant effects relating to flood risk, including both flood risk impacts on the Proposed Development and the potential for the Proposed Development to impact flood risk elsewhere.	The FRA is included within **Appendix 10-3** of this ES **[EN010142/APP/6.2]**. The ES chapter has utilised the findings of the FRA in order to assess the likely significant effects relating to flood risk, including both flood risk impacts on the Scheme and the potential for the Scheme to impact flood risk elsewhere.	The **FRA** is included in **Appendix 10-3** of this ES [**EN010142/APP/6.2]**, and within this chapter.
Water Resources: The proposed development is located within an area of 'serious water stress' designated by the Environment Agency. The ES should provide details relating to water supply and demand requirements during the construction and operational phases.	The ES includes an estimate of the likely water usage for the Scheme within the operational phases based on the number of proposed full time employees for construction and operation, together with the comparison with industry standards on demand per person, and the likely requirement for panel cleaning. Estimates of demand requirements during construction are considered to be minor and temporary.	The ES contains an estimate of likely water usage during operation. This is included under 'Water Supply and Demand' in **Section 10.4** of this chapter.
Scunthorpe and Gainsborough Water Management Board		
Scunthorpe and Gainsborough Water Management Board: If surface water were to be disposed of by soakaway system, the IDB would have no objection in principle but would advise the	These comments are noted. The Outline Drainage Strategy (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**) confirms that infiltration is not proposed. The strategy also	The **Outline Drainage Strategy** is included in **Appendix 10-4** of this ES **[EN010142/APP/6.2]**. The **Consents and Agreements Position Statement**

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
ground conditions may not be suitable. Infiltration testing will be required to establish if conditions suitable through the year. If surface water were to be disposed of to a mains sewer, the IDB would have no objection providing the Water Authority agree to accept the additional flow. If surface water were to be discharged to any Ordinary Watercourse, consent would be required from the IDB in addition to Planning Permission, and would be restricted to 1.4 litres/sec/hectare or greenfield runoff. No obstructions within 9 metres of the edge of Ordinary Watercourses are permitted without consent from the IDB.	outlines the proposed discharge rates to Ordinary Watercourses.	[**EN010142/APP3.3**] sets out what permissions are required for the Scheme.

Table 10-5: Main matters relevant to water environment impacts raised through the statutory consultation

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Anglian Water		
The area of the Scheme is within an area of 'serious water stress'. The ES should provide details relating to water supply and demand requirements during the construction and operational phases.	The water supply and demand requirements of the construction and operational phases has been outlined within **Section 10.4** of this chapter. This includes an estimate of the likely water usage for the Scheme within based on the number of proposed full time employees for construction and operation and comparison with the industry standards on demand per person, and the likely requirement for panel cleaning during operation. Estimates of demand requirements during construction are considered to be minor and temporary. Estimates of demand requirements during operation are limited and proposed to be sourced from local licensed suppliers.	The ES contains an estimate of likely water usage during construction and operation. This is included in **Section 10.4** of this chapter.
Anglian Water further have a Policy Position on new non-domestic water demands. In summary, new water demands and connections may be declined if these could compromise domestic supply for current and planned housing and domestic use.	The ES contains an estimate of likely water usage during construction and operation. During the operational phase, the Solar Farm Control Centre water supply will come from a mains water supply connection. The water for the Panel PV cleaning will come from off-site suppliers rather than the main connection, similar to other Solar Schemes.	The proposed water demands for operation and construction are included in **Section 10.4** of this chapter.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
The project should investigate rainwater collection for the non- potable supply for the fire tanks as well as non-potable uses for the construction stage. This would avoid the use of scarce water resources and the embodied (capital) carbon that such mains water supply may entail. If a new water supply connection is required, then an application should be made via Inflow. Inflow is a website supported by Anglian Water.	During detailed design stage following DCO consent the use of rainwater harvesting for non-potable water supplies for operational compounds will be investigated. However, the use of rainwater collection for fire supply tanks is not suitable as the tanks must be at full capacity at all times, which cannot be guaranteed if they are solely supplied by rainwater.	This is noted in the Outline Drainage Strategy within **Appendix 10-4** of the ES **[EN010142/APP/6.2]**.
The quantum of demand for the Scheme is small and temporary and would likely constitute a 'domestic' demand. Provided no new connection is required which exceeds this demand, the impact may be assessed as not significant	Comment is noted.	Comment is noted. The ES contains an estimate of likely water usage during operation. This is included under 'Water Supply and Demand' in **Section 10.4** of this chapter.
Canal and River Trust (targeted consultation)		
We note within the PEIR: Flood Risk, Drainage and Surface Water, paragraph 10.3.4 that crossing of the River Trent is expected to be by non-intrusive, underground techniques (e.g. horizontal directional drilling techniques that would not disturb the watercourse), with the depth of the cable below the bed expected to be 10-15m and subject to appropriate consents being obtained. We welcome that this would be undertaken via trenchless techniques such as HDD. Whilst a	A pre-works morphology survey will be carried out for each watercourse to ensure the correct depth for passing under the watercourse channels, including the River Trent crossing. The **Framework CEMP** is submitted alongside the DCO application [**EN010142/APP/7.8]**.	Paragraph 10.7.36 states a tidal river bed survey is required prior to carrying out the trenchless crossing. The **Framework CEMP** is submitted alongside the DCO application [**EN010142/APP/7.8]**.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
depth of the HDD method is proposed at 10-15m below the riverbed we consider that surveying the tidal riverbed would be a necessary precaution to establish its depth relative to neighbouring land, the geological substrate and depth of riverbed silt in order to calculate an appropriate depth for HDD beneath the River Trent. The requirement to survey the riverbed is included in the draft protective provisions. This survey would inform the design process and prevent the mobilisation of silt from the riverbed. Mobilised silt would have potentially detrimental impacts on the navigational safety of the River Trent and its ecology. For consistency with the other projects we recommend the inclusion of the following description within the application documentation (e.g. those describing design principles): The HDD depth will be a maximum of 25m below the bottom of the river bed and a minimum of 5m below the lowest surveyed point of the River Trent riverbed in order to prevent risk of any scour exposing cable.		
Local resident (targeted consultation)		
Request that a full drainage survey is undertaken to ensure that the Scheme does not adversely affect current drainage.	There is currently no known formal piped surface water drainage system within the Principal Site. This was confirmed by DigDat searches, and streetview to view the presence of foul water mains in the area.	N/a

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	Therefore, it is currently understood a drainage survey is not required.	
Bassetlaw District Council, Flood Risk Management (targeted consultation)		
Due to the nature of the proposals however it do not appear that they seek to significantly increase the impermeable area of the site, and as such the Lead Local Flood Authority (LLFA) would only comment that surface water runoff from the site should be prevented from being increased. Any runoff from any hardstanding/small buildings on the site should be captured on site, to prevent increasing runoff from the site.	Comment is noted. The Outline Drainage Strategy ensures that the drainage from the Scheme will mimic natural drainage with the use of swales.	The **Outline Drainage Strategy** within **Appendix 10-4** of the ES **[EN010142/APP/6.2]**.
Nottinghamshire County Council (targeted consultation)		
Due to the nature of the proposals these do not appear to seek to significantly increase the impermeable area of the site, and as such the only comment is that surface water runoff from the site should be prevented from being increased. Any runoff from any hardstanding/small buildings on the site should be captured on site, to prevent increasing runoff from the site.	Comment is noted. The Outline Drainage Strategy ensures the drainage from the Scheme will mimic natural drainage with the use of swales.	The **Outline Drainage Strategy** within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**.

Table 10-6: Main matters relevant to water environment raised through additional stakeholder meetings

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
Meeting with Water Environment Stakeholders, 5 September 2023: Environment Agency, Scunthorpe and Gainsborough Water Management Board (WMB), Upper Witham IDB, Trent Valley IDB (now part of the Water Management Consortium), Lincolnshire County Council, Nottinghamshire County Council.		
All Channels in Trent Valley IDB (Water Management Consortium) to be crossed using trenchless (non-intrusive) techniques.	Included within the Scheme design.	This is stated within **Section 10.7** Embedded Design Mitigation of this chapter.
All Channels in Scunthorpe and Gainsborough WMB to be crossed using trenchless (non-intrusive) techniques	Included within the Scheme design.	This is stated within **Section 10.7** Embedded Design Mitigation of this chapter.
Agreed for a minimum of 9m buffer from bank top / berm/ highest part of bank to new infrastructure to allow future maintenance of watercourses.	Included within the Scheme design.	This is stated within **Section 10.7** Embedded Design Mitigation of this chapter.
WFD monitored reaches of EA watercourses to be crossed using trenchless (non-intrusive) techniques	Included within the Scheme design.	This is stated within **Section 10.7** Embedded Design Mitigation of this chapter.
Agreement of the Drainage Strategy Approach: an Framework Battery Safety Management Plan has been designed in consultation with Lincolnshire Fire Service to agree firewater storage requirements for the BESS areas.	Agreed – no further work required.	The **Outline Drainage Strategy** is included within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**. The **Framework Battery Safety Management Plan** is submitted alongside the DCO application **[EN010142/APP/7.13]**.
Flood Risk Technical Note. No BESS/ on-site substations within the Flood Zone 2 or 3, only some panels in Flood Zone 3.	FRA is appropriate for the scale, nature and location of the proposed development. No comments, FRA agreed. There are no BESS or on-site substations located within Flood	The **FRA** is included as **Appendix 10-4** of this ES **[EN010142/APP/6.2].**

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	Zone2 and Flood Zone 3. Some panels will be located within Flood Zone 3 associated with the River Eau/Yawthorpe Beck in the north of the Principal Site. The risk to the infrastructure has been mitigated by setting the minimum height of the Solar PV modules above the estimated flood level to ensure they remain operable in times of extreme flooding.	
Foul Water Drainage: location of compounds and foul drainage. The Environment Agency preference is for connection to sewers. This would be expected if construction compounds within 30m of public sewers.	Location of construction compounds has been checked against location of public sewers from Severn Trent Water. No assets are shown in the area of the compounds or within 30m.	The Outline Drainage Strategy is included as **Appendix 10-4** of this ES **[EN010142/APP/6.2]**.
A SoCG would be produced for each IDB.	The Applicant is committed to agreeing a SoCG with Scunthorpe and Gainsborough Water Management Board, Upper Witham IDB (including Witham Third), and Trent Valley IDB (Water Management Consortium).	The SoCG documents are in preparation and will be finalised following submission of the DCO application.

10.6 Baseline Conditions

Existing Baseline: Principal Site

Topography, Climate and Land Use

10.6.1 The topography of the area is relatively flat, with existing ground levels in the region of 20-25m Above Ordnance Datum (AOD) according to online Ordnance Survey (OS) and Bing mapping (Ref. 10-10 and Ref. 10-11). The land levels decline to the west, and the River Trent floodplain. There are many small watercourses and drainage ditches on the Principal Site, which is currently used mainly for agriculture, with a mosaic of agricultural fields, and the village of Harpswell and Glentworth on the eastern boundary.

10.6.2 Based on the Meteorological Office website (Ref. 10-12), the nearest weather station is located at Scampton (SK 95080 79300), approximately 11km south-east from the Principal Site. Using data from this weather station for the period 1991-2020, it is estimated that the Study Area experiences approximately 619mm of rainfall per year, with it raining more than 1mm on approximately 118 days per year, which are both low in the UK context. Rainfall is highest from mid-winter to mid-spring and generally peaks in November, with the least rainfall occurring in May on average (refer to **Plate 10-1**).

10.6.3 The Scampton weather station also reports that the area generally gets around 55 days of air frost per year, distributed across all months except July and August, whereas the majority (11.7 days) occurs in the month of February.

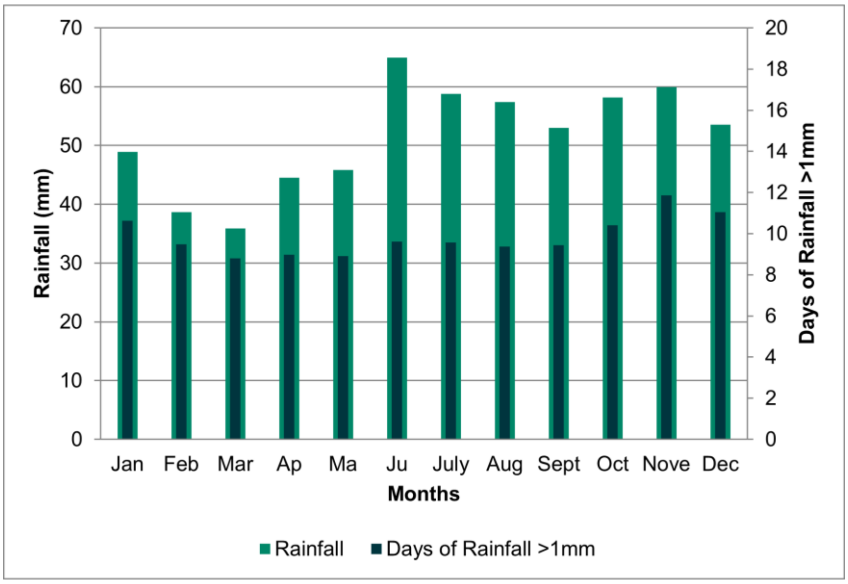

Plate 10-1: Scampton weather station: monthly rainfall and days of rainfall >1mm.

Geology, Groundwater and Soils

10.6.4 The Principal Site is primarily underlain by two bedrock geologies comprising mudstone formations (Ref. 10-18). **Figure 10-3** of this ES

[EN010142/APP/6.3] displays the Bedrock and superficial geology. These include the Lias Group which include the following formations:

a. Scunthorpe Mudstone Formation (mudstone and limestone, interbedded) to the western side of the Principal Site; and

b. Charmouth Mudstone Formation to the eastern side of the Principal Site.

10.6.5 These units overlay the Marlstone Rock Formation, the Whitby Mudstone Formation, both part of the Lias Group shown on **Figure 10-3** of this ES **[EN010142/APP/6.3]**. East of these are the Grantham Formation and the Lincolnshire Limestone Formation, both part of the Inferior Oolite Group shown on **Figure 10-3 [EN010142/APP/6.3]**. These are situated to the eastern side of the Principal Site.

10.6.6 The bedrock on the Principal Site is largely overlain by Mid-Pleistocene Till-Diamicton deposits as shown on **Figure 10-4** of this ES **[EN010142/APP/6.3]**. These comprise diamicton, with pockets of glaciofluvial deposits, comprising sand and gravel. Alluvium is situated along ditches and streams in the northeast of the site along the River Eau and its tributary (NGR 490884, 389670 and 491922, 390437), comprising clay, silt, sand and gravel.

10.6.7 The western area of the Lias Group (comprising the Scunthorpe Mudstone Formation) beneath the Principal Site is generally classified as a Secondary B aquifer. Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

10.6.8 There is a strip of Secondary (undifferentiated) aquifer, which is associated with the eastern area the Principal Site and the Lias Group - the Charmouth Mudstone (**Figure 10-3** of this ES **[EN010142/APP/6.3]**). Secondary (undifferentiated) aquifer is where it is not possible to apply either a Secondary A or B definition. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

10.6.9 The superficial deposits within the Principal Site are classified as a Secondary (undifferentiated) aquifer, with the exception of alluvium deposits which are classified as a Secondary A aquifer. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers. **Figure 10-3** of this ES **[EN010142/APP/6.3]** shows the groundwater features and their attributes.

10.6.10 There are three borehole scans available online on the BGS Geoindex website across the Study Area, which supply groundwater level information. These are shown on **Figure 10-3** of this ES **[EN010142/APP/6.3]**. These boreholes include:

a. Upton Gainsborough 2 (reference SK88NE13, NGR 486422, 386705) – groundwater level 1m bgl (described as ‘seepage’) – west of Study Area;

b. Alsby (reference SK89SE117, NGR 486409, 392693) – groundwater level 27m bgl – north of Study Area; and

c. Dog Kennel Farm Glentworth (reference SK98NE3) – groundwater level 9m bgl – located 1km east of B1398 off to east of Study Area.

10.6.11 Although there is limited groundwater level data available in the vicinity of the Principal Site, based on the available borehole scans it is considered likely that groundwater is shallow (approximately 2m bgl) within the Alluvium and River Terrace Deposits.

10.6.12 The Environment Agency also have some groundwater monitoring boreholes in the area, with the nearest ones shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**. Glentworth (Limestone) monitoring borehole at Hemswell Cliff, is the nearest observation borehole to the Principal Site, located approximately 1.4km to the north east (Ref. 10-38). This is shown in the northeast area of **Figure 10-2** of this ES **[EN010142/APP/6.3]**. The records indicate that between January 2019 and November 2023, the groundwater level in the limestone bedrock varied between 1.9m and 6.8m bgl. The remaining monitoring boreholes are closer to the Cable Route Corridor area.

10.6.13 According to the Bassetlaw District Council and the West Lindsey District Council, there are no private water supplies (PWS) within the Principal Site or within the 2km buffer. PWS are private supplies of potable water that by virtue of the amount abstracted do not need to be licenced by the Environment Agency.

10.6.14 The Study Area falls within two WFD groundwater bodies (Ref. 10-14). The majority of the Principal Site area falls within the Witham Lias groundwater body (GB40502G401400) within the Anglian RBMP. The north to northeast of the Principal Site falls within the Lower Trent Erewash (GB40402G990300) within the Humber RBMP. These are shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**.

10.6.15 The Witham Lias groundwater body (WFD ID: GB40502G401400) covers a total area of 683.57km^2 and under the WFD Cycle 3 classifications (2019), was classified as being at Good Status, overall, quantitatively and chemically. The Lower Trent Erewash – Secondary Combined groundwater body (WFD ID: GB40402G990300) covers a total area of 1,924.4km^2 and during 2019 Cycle 3, was given Good Status, overall, quantitatively and chemically (Ref. 10-14).

10.6.16 There are no SPZ situated within the Principal Site. A SPZ I is situated approximately 5.5km east of the Scheme with the associated SPZ II which is located east of the B1398 within the Study Area. These are shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**.

10.6.17 The Soilscape map viewer (Ref. 10-19) describes the soils beneath the Principal Site as ‘Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils’. These have moderate fertility and are most at risk from overland flow from compacted or poached fields. East of the Scheme, there is a patch of ‘Very acid loamy upland soils with a wet peaty surface’ (NGR 494274, 388442). There are also small patches of ‘Loamy and clayey floodplain soils with naturally high groundwater within the south end of the Study Area (NGR 490632, 386361). These have moderate fertility and are most at risk from pollution from floodwater scouring.

Surface Water features

10.6.18 The following surface water features are present within the Principal Site: (shown on **Figure 10-1** of this ES **[EN010142/APP/6.3]**):

a. The River Eau (Ordinary Watercourse) flowing west along the northern boundary, and its tributary flowing to the north within and beyond the Principal Site;

b. A tributary to Fillingham Beck, an Ordinary Watercourse, flowing westwards from the Glentworth area across the south-eastern part of the Principal Site;

c. A tributary to the River Till flowing southwards in the extreme west of the Principal Site. This is a Main River.

d. A square water holding reservoir located within the north of the Principal Site, south of Harpswell Grange. Other water reservoirs are located just outside the area of the Principal Site and are not hydrologically connected so will not be considered further.

10.6.19 The surveys carried out for the Aquatic Ecology Report (**Appendix 9-3** of this ES **[EN010142/APP/6.2]**) notes that the surveyed watercourses within the Principal Site suffer from high levels of siltation affecting the water quality.

WFD Classifications

10.6.20 The Principal Site is located within the WFD management catchments of Lower Trent and Erewash (within Humber RBMP), and Witham (within Anglian RBMP). The surface water body WFD catchments are shown in **Figure 10-1** of this ES **[EN010142/APP/6.3]**. These include:

a. Eau from Source to Northorpe Beck (GB104028057970) - WFD designated water body;

b. Fillingham Beck (GB105030062490) – tributaries to this WFD designated water body;

c. River Till (GB105030062411) – tributaries to this WFD designated water body; and

10.6.21 Further details for the Eau from Source to Northorpe Beck WFD designated water body from the Cycle 3 2022 data is given in Table 10-7: WFD Surface Waterbodies within the Principal Site~~Table 10-7: WFD Surface Waterbodies within the Principal Site~~**Table 10-7**~~**Table 10-7**~~ (Ref. 10-14). Information on the other WFD watercourse catchments are included within the Cable Route Corridor baseline.

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Table 10-7: WFD Surface Waterbodies within the Principal Site

Water body: Eau from Source to Northorpe Beck (GB 104028957970)

Ecological Status / Potential	Moderate Ecological Potential (note that Physico-chemical Status is Moderate despite a Bad classification for phosphate as status

Water body: Eau from Source to Northorpe Beck (GB 104028957970)	
	lower than Moderate can only be given for failing biological quality elements).
Chemical Status	Does not require assessment.
Overall Target Objective	Good 2027.
Hydromorphological Designation	Not designated artificial or heavily modified.
Designated Reach	The water body is designated from Harpswell and flows north to Northorpe Beck and the Eau from Manton Sewer to Trent. The reach is c.17km long and drains an area around 49.5km^2.
Reasons for Not Achieving Good Status	Poor nutrient management and point source continuous sewage discharge.

Surface Water Quality and Flow

10.6.22 The Environment Agency's Water Quality Archive website (Ref. 10-15) has been viewed to obtain information on baseline water quality within the area. The Principal Site is located upstream of several locations of water monitoring. These are listed within the Cable Route Corridor section below.

10.6.23 There are no National River Flow Archive (Ref. 10-13) monitoring sites for flow on any of the watercourses in the 1km Study Area of the Principal Site. One site is located over 20km south, and upstream, of the Cottam area on the River Trent at North Muskan. This shows a Q95 flow of 28.7m^3/sec (data 1968-2022). The flow of the River Trent, the ultimate receptor for this assessment, in the area of the Scheme will therefore be higher and offer a large degree of dilution. One local site where the flow is monitored is located outside of the Study Area. Site 30002 east of Lincoln (Ref. 10-13), and 9km east of the Scheme. Barlings Eau at Langworth Bridge has a catchment area of 210km^2, and a Q95 flow of 0.048m^3/s (48l/s). Using the UK Centre for Ecology and Hydrology Website (Ref. 10-78) the area of the River Eau has been estimated as 5.72km^2. On a proportionate basis, as an estimate, this would lead to a Q95 flow of approximately 1l/s, and potentially much smaller than this or be ephemeral. For the portion of the Principal Site catchment draining towards the River Till, the catchment area is estimated to be 4.5km^2, which would lead to an estimated flow of 1l/s, and potentially much smaller than this or be ephemeral. For the area draining towards Fillingham Beck the area is estimated to be 3.2km^2, leading to an estimated flow of under 1l/s, or be ephemeral.

Hydromorphology

10.6.24 The Scheme interacts with a large number of watercourses within the Principal Site. Yawthorpe Beck extends through the Principal Site, covering approximately 2.3km with a straightened channel in this segment. Historical mapping suggests limited local changes in the river since the early 1900s (Ref. 10-40), indicating that much of the river modification occurred before this era.

10.6.25 During the site visit, Yawthorpe Beck was not in a state of high or low flow. It is unlikely that the modified banks of the watercourse will allow water to spill onto the floodplain, even during particularly wet periods of the year, so there is expected to be only partial connectivity between the channel and the floodplain.

10.6.26 Within the Principal Site, Yawthorpe Beck is culverted at two points as it flows under farm tracks, influencing flow dynamics, sediment transport, and disrupting the watercourse's longitudinal and lateral connectivity. Cultivated fields extend to the channel margins with minimal riparian buffer, raising concerns about the potential ingress of agricultural pollution and fine sediment. Although no poaching was observed during the site visit, there was noticeable bed siltation, consistent with findings from the aquatic survey in **Appendix 9-3 Aquatic Ecology baseline report** of this ES **[EN010142/APP/6.2]**. However, during the site visit, Yawthorpe Beck did display lower turbidity compared to many watercourses within the Principal Site, and the presence of some in-channel macrophytes was observed. It's crucial to note that turbidity levels can vary based on factors such as flow conditions, land use, and biological activity. Higher turbidity might be expected during periods of increased flow, when fields are bare and have been dry for an extended period, or during autumn recharge events.

10.6.27 A number of smaller unnamed watercourses (i.e. ditches) are present within the Study Area. These watercourses are predominantly artificial, likely created or modified to aid agricultural land drainage. Historical mapping of the Study Area demonstrates that this occurred during the second half of the 20th century (Ref. 10-40). Characteristics of these watercourses include straightness, uniformity, and an overdeep profile. The majority of these straightened channels are ephemeral in nature due to both natural processes and human activities in agricultural landscapes. The design of these modified watercourses aims to facilitate drainage and prevent waterlogging in fields. The grading of land and the installation of drainage systems may influence the intermittent nature of these ditches. Flow within these unnamed watercourses is expected to be seasonal, with little to no flow in summer, and the channels exhibit relatively low energy compared to larger watercourses within the Study Area. It's improbable that the modified banks of these watercourses will permit water spillage onto the floodplain, even during particularly wet periods of the year. Consequently, there is expected to be limited connection between the channel and the floodplain. However, these channels may contribute to providing aquatic habitat within the area.

Aquatic Ecology

10.6.28 An Aquatic Ecology baseline report has been completed and is included as **Appendix 9-3 Aquatic Ecology baseline report** of this ES **[EN010142/APP/6.2]**, together with its supporting reports. This section provides a brief summary for both the Principal Site and the Cable Route Corridor, which is compiled from desk-based data as well as observations from walkover surveys, aquatic macroinvertebrate surveys, and aquatic macrophyte surveys.

10.6.29 Aquatic macroinvertebrate surveys revealed that watercourses within the WFD catchments sampled within the Principal Site are all subject to low habitat diversity and water quality pressures throughout. Current scores suggest that all surveyed watercourses suffer from Very Poor, Heavily Polluted water quality with high levels of siltation. In line with these results, the aquatic macroinvertebrate community of all surveyed watercourses generally had a low conservation value, except for a small number of surveyed sites.

10.6.30 Aquatic macrophyte surveys for Fillingham Beck correspond to a moderate WFD status, with other sites on the River Eau having no value due to a lack of scoring macrophyte taxa present within the watercourses. Macrophyte assemblages were highly suppressed, most likely due to high levels of shading from terrestrial herbs, scrub, and farmland hedgerows, together with regular dredging and weed cutting to support agricultural drainage. Terrestrial encroachment was present across the majority of watercourses, signifying prolonged periods of drying.

10.6.31 A survey report for Great Crested Newts (GCN) has been completed and is included as **Appendix 9-5** of this ES **[EN010142/APP/6.2]**. The report includes the results of eDNA surveys of bodies of water within the Principal Site and a 250m buffer. Figure 9.5.1 shows the water body ponds surveyed. Ponds 7, 26 and 52 were positive for the presence of GCN through laboratory eDNA analysis. Pond 7 is within the Principal Site, but offline to any watercourses in that area. Pond 26 is outside of the Principal Site, and offline to watercourses in that area. Pond 52 is inside the Cable Route Corridor boundary, north of Fillingham Lane, and is off line to watercourses. This ponds is located approximately 50m east of Fillingham Beck. As these ponds are offline to watercourses, they are scoped out of this chapter, and assessed within **Chapter 9: Ecology and Nature Conservation [EN010142/APP/6.1]**.

10.6.32 A survey report for riparian mammals has been completed and is included as **Appendix 9-10** of this ES **[EN010142/APP/6.2]**. Surveys were undertaken between June to August 2023. No evidence of water vole or otter were found within the Principal Site. However, there are records of both species being present within the Cable Route Corridor. Water Vole records are located within the River Trent corridor, and to the east of Willingham by Stow within ditches. Otter records have been recorded using the River Trent, but no evidence was recorded during the surveys. Water Vole are present where trenchless crossings are proposed with Seymour Drain (trenchless crossing point 13), Marton Drain (trenchless crossing point 14) and Fillingham Beck (trenchless crossing point 22). These are shown on Figure 10-5 of this ES [**EN010142/APP/6.3**]. Another location where Water Vole were recorded was close to Open Cut 28 in the River Till catchment, but these were present in adjacent ditch and not the watercourse to be crossed. More information is provided in **Chapter 9: Ecology and Nature Conservation** of this ES **[EN010142/APP/6.1]** and **Appendix 9-10: Baseline Report for Riparian Mammals** of the ES **[EN010142/APP/6.1]**.

Nature Conservation Sites

10.6.33 Statutory sites that are designated for nature conservation and with the potential for a hydrological link were identified through a review of the Multi-Agency Geographic Information for the Countryside (MAGIC) (Ref. 10-17) (refer also to **Chapter 9: Ecology and Nature Conservation** of this ES **[EN010142/APP/6.1]**). There are no international or national sites designated for nature conservation within the Study Area.

10.6.34 There are no non-statutory sites designated for nature conservation identified within 1km of the Principal Site.

Water Resources

10.6.35 Within the Study Area, to the north-east of the B1398, a large area is contained within a Drinking Water Safeguard Zone for surface water (designation SWSGZ1000 Humber River Ancholme). Drinking Water Safeguard Zones are established around public water supplies where additional pollution control measures are needed. Here, water supplies are at risk from several pesticides (Ref. 10-17).

10.6.36 The whole of the Study Area is contained within Nitrate Vulnerable Zones (NVZ). NVZs are areas designated as being at risk from agricultural nitrate pollution (Ref. 10-17). The designations are made in accordance with the Nitrate Pollution Prevention Regulations 2015 (Ref. 10-47). To the west of the River Trent, the Scheme is contained within NVZ343, Seymour Drain catchment (tributary of River Trent). East of the River Trent is contained within several NVZs: NVZ347 R Trent from Carlton on Trent to Laughton Drain, NVZ375 Lower Witham, NVZ334 River Eau from Kirton Lindsey Tributary to River Trent.

10.6.37 From the information received from the Environment Agency, there is one licenced surface water abstraction within the Study Area. This is located approximately 350m east of the Site west of Glentworth Hall (and is shown in **Figure 10-1** of this ES **[EN010142/APP/6.3]** with the label 4/30/06/*s/0018). The abstraction is for agricultural spray irrigation / storage, and the water is abstracted from an un-named watercourse at Glentworth. There were no groundwater abstractions from the area. As stated earlier, there are no PWS in the Study Area.

10.6.38 Information on pollution incidents which have occurred in the area have been obtained from the Environment Agency. Pollution incidents to water are classified as Category 1 (serious impact) through to Category 4 (No impact). Category 1 to Category 3 (minor impact) incidents have been reviewed within the last 7 years (2015 – 2022). There has been one water pollution incident within the Study Area for the Principal Site. Incident number 2088489 was a category 3 (minor incident), which occurred at Grove Farm to the west of the Principal Site. The cause was listed as ‘natural causes, dry weather’.

Consented Discharges

10.6.39 Information on consented discharges was obtained from the Environment Agency (i.e. permanent Water Activity Permits). There are five consented discharges within the Study Area for the Principal Site. Four are located outside of the Principal Site, with one located on the road adjacent to the Principal Site. The discharge consents are summarised below, and shown on **Figure 10-1** of this ES **[EN/010142/APP/6.3]**:

a. T/80/02264/O: located on the northern edge of the Site west of Harpswell, the discharge consent is for emergency pumping station on sewerage network;

b. AW3NF112: located east of the Site in Glentworth, for discharges from Glentworth Waste Water Treatment Works (WWTW);

c. AW3NF690: located east of the Site in Glentworth, for discharges from Glentworth WWTW;

d. AW3NF100: located 1km west of the Site, for discharges from Corringham WWTW; and

e. PR3LF253: located approximately 250m west of the Site, for a single domestic property discharge.

Flood Risk

10.6.40 The existing flood risk for the Principal Site is summarised in **Table 10-8**~~**Table 10-8**~~, details of which have been taken from Table 3-2 of the **FRA** (**Appendix 10-3** of this ES **[EN010142/APP/6.2]**). To view the full size figure, refer to the **FRA** at the reference above.

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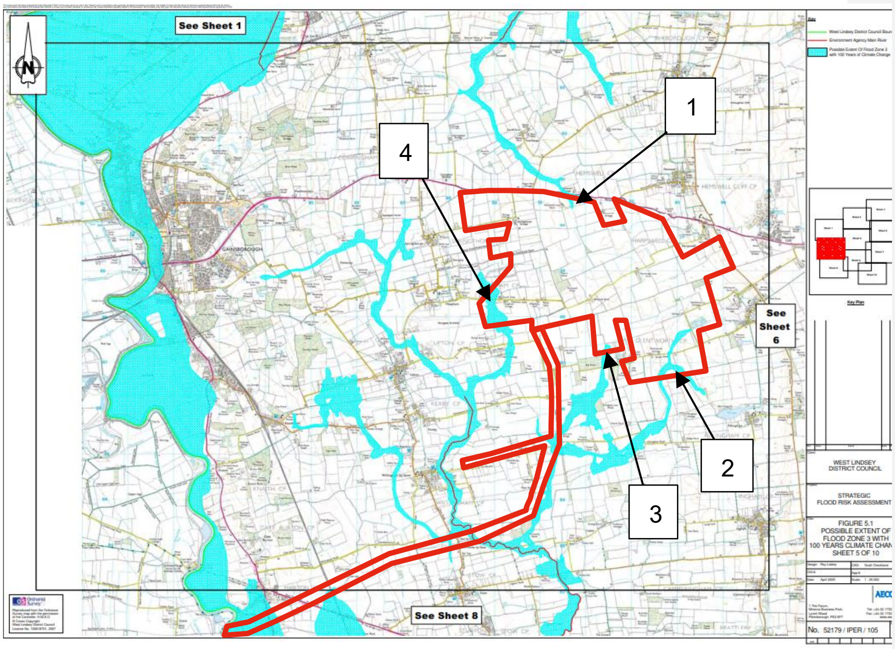
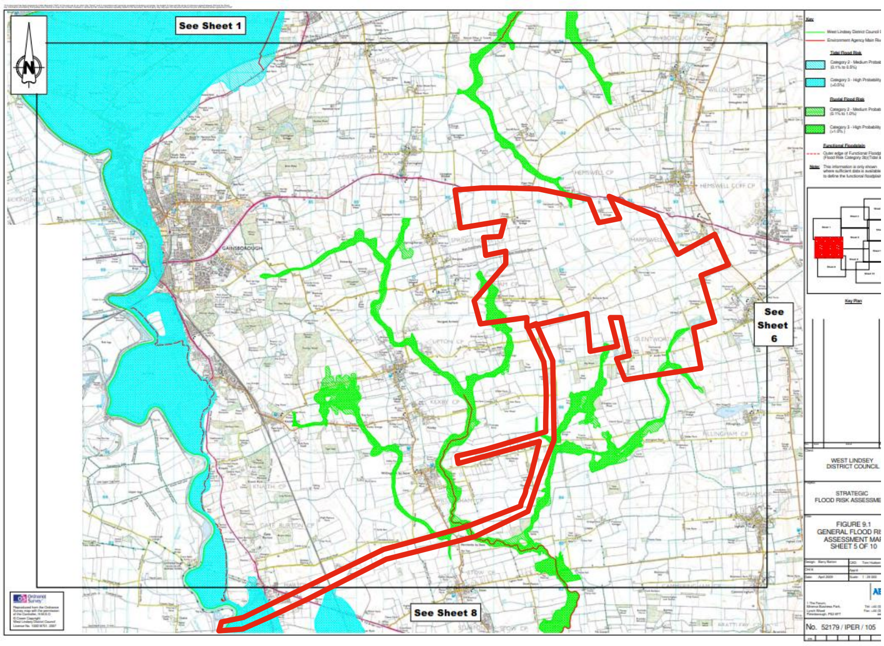
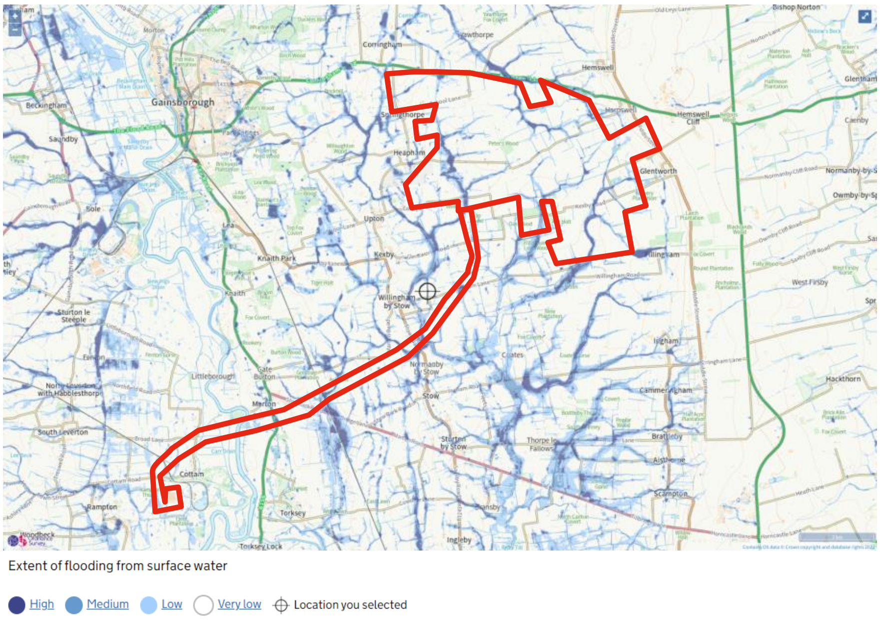
Table 10-8: Flood Risk for the Principal Site

Flood Risk Source	**Flood Risk Level**	**Comments**
Fluvial	Low - High	

Flood Risk Source	Flood Risk Level	Comments
		Plate 10-2 – West Lindsey Distric Council (WLDC) Strategic Flood Risk Assessment (SFRA) – Fluvial Flood Risk Map WLDC's Strategic Flood Risk Mapping indicates majority of the Principal Site is located within Flood Zone 1, with four small areas of Flood Zone 2 and 3 extents located near the Principal Site Boundary (Labelled 1 – 4 on Figure 3-1 in the **Appendix 10-3: Flood Risk Assessment [EN010142/APP/6.2]**, and shown as Plate 10-2 above). There is one area where Flood Zone 2 and 3 extend into the Principal Site where PV panel infrastructure is proposed (area 1 on Figure 3-1 in **Appendix 10-3** of this ES **[EN010142/APP/6.2]**), and Plate 10-2 above.
Tidal	Low	 **Plate 10-3 – WLDC SFRA – Tidal Flood Risk Map (Blue hatch: Tidal Flood Risk, Green Hatch Fluvial Flood Risk)** The WLDC SFRA mapping indicates tidal flood risk only exists along the tidal estuary of the River Trent where flood defences are in place. The Principal Site is not in close proximity to this risk area.

Flood Risk Source	Flood Risk Level	Comments
Pluvial (surface water)	Very Low – High (areas associated with watercourses)	 **Plate 10-4 – Gov.uk – Flood Map for Surface Water (accessed January 2023)** Gov.uk Online Flood Maps (Ref. 10-48) indicate the majority of the Order limits lie in areas of very low risk from surface water flooding. There are small areas ranging from low to high risk associated with watercourses.
Ground water	Low	The majority of boreholes are confidential, with restricted access across the Principal Site (Ref. 10-18). Lincolnshire County Council Preliminary Flood Risk Assessment (PFRA) notes groundwater flooding in the region of Louth, far east of the Order limits (approximately 20 km); this area is not impacted by the Scheme. No other areas at risk of groundwater flooding are identified within the Principal Site. The Principal Site lies atop mudstones and clays, with little ability to store and transmit water due low permeability. Given the Principal Site's high elevation, including at the top of any river catchment, groundwater risk is considered low.
Sewers	Low	The WLDC SFRA indicates the risk of sewer surcharging resulting in flooding events is limited to urbanised areas of the district. The Principal Site's rural location means that the risk of flooding from sewers exceeding their hydraulic capacity is low.

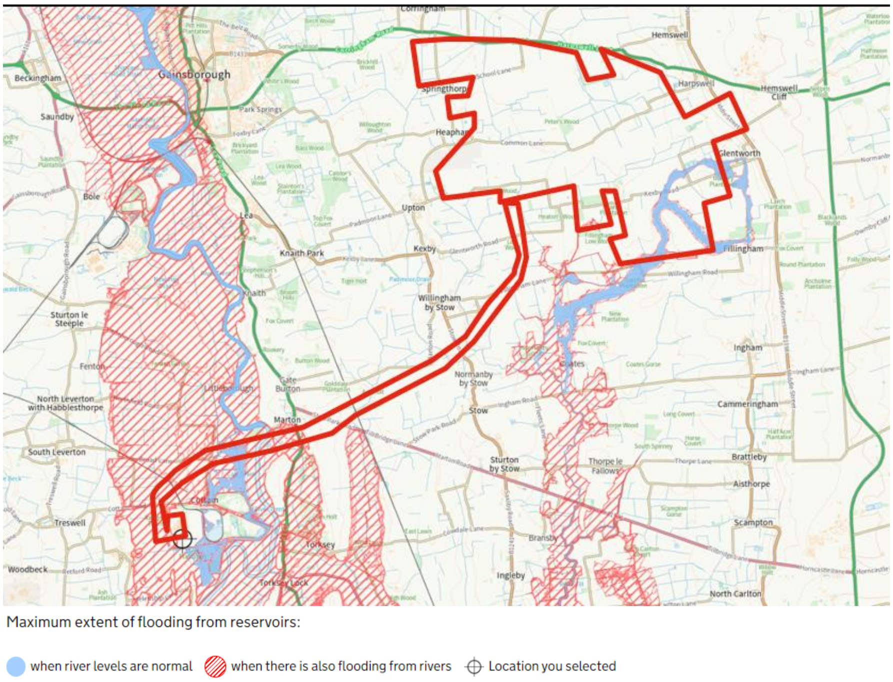
Flood Risk Source	Flood Risk Level	Comments
Artificial sources	Low	

Plate 10-5 – Gov.uk – Reservoir Flood Risk Mapping (accessed January 2024)

Online Flood Maps show the maximum extent of flooding from reservoirs extends into a small area within the Principal Site boundary towards the southeast near Kexby Road. This is associated with the unnamed Ordinary Watercourse which acts as a tributary to the canalised downstream end of the River Till (Fossdyke Canal). The WLDC SFRA indicates the Canal is infrequently full and can be considered a minor flood risk source.

Existing Baseline: Cable Route Corridor

Topography, Soils, Land Use and Climate

10.6.41 The area of the Cable Route Corridor is from the higher ground to the east of the River Trent floodplain, to the River Trent, and then continuing to the west of the River Trent to Cottam Power Station. At the eastern end of the Cable Route Corridor, the ground levels are in the region of 20m AOD, decreasing westwards to approximately 5m AOD in the area of Cottam Power Station. As well as the water features listed in the section below, there are also minor watercourses and drainage ditches in the area of the Cable Route Corridor, which is mainly used for agriculture, with a mosaic of agricultural fields, and the villages of Willingham by Stow, Stow, and Marton.

10.6.42 The climate for the Cable Route Corridor is considered to be the same as for the Principal Site, as outlined previously in this chapter.

Groundwater, Hydrogeology and Soils

10.6.43 The Cable Route Corridor is primarily underlain by four bedrock geologies which are all mudstone formations (Ref. 10-18). These are shown on **Figure 10-3** of this ES **[EN010142/APP/6.3].** These are, from east to west:

a. Lias Group Charmouth Mudstone Formation to the eastern side of the Cable Route Corridor;

b. Lias Group Scunthorpe Mudstone Formation – mudstone and limestone interbedded which covers the majority of the Cable Route Corridor;

c. Triassic Rock Penarth Group – Mudstone, a thin band between the Mercia Mudstone and the Scunthorpe Mudstone Formation; and

d. Triassic Rocks Mercia Mudstone Group – Mudstone to the western side of the Cable Route Corridor.

10.6.44 Not all of the Cable Route Corridor is underlain by superficial deposits (refer to **Figure 10-4** of this ES **[EN010142/APP/6.3]**. There are deposits of Till and Alluvium in the north-east of the Cable Route Corridor, north of Willingham by Stow. Towards the southwest, there are deposits of the Holme Pierrepoint Sand and Gravel Member, comprising sand and gravel, which are overlain by deposits of Alluvium that coincide with the River Trent and associated ditches and streams. There are also patches of glaciofluvial deposits between Stow and Sturton by Stow. River Terrace Deposits, comprising sand and gravel, are also situated northeast of Normanby by Stow. To the east and west of Normanby by Stow, no superficial deposits are present, as shown on **Figure 10-4** of this ES **[EN010142/APP/6.3]**.

10.6.45 There are small patches of peat present between Marton and Torksey (located to the south east of the Cable Route Corridor), but these are not extensive. They will provide some groundwater storage to slowly leak into local watercourses. However, the peat overlies a sand and gravel aquifer, which is considered to provide almost all of the baseflow to the streams.

10.6.46 The Scunthorpe Mudstone Formation and the Mercia Mudstone beneath the Cable Route Corridor is generally classified as a Secondary B aquifer. Aquifer status of the bedrock and superficial geology are shown on **Figure 10-3** and **Figure 10-4** of this ES respectively **[EN010142/APP/6.3]**. Secondary B aquifers are predominantly lower permeability layers, which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

10.6.47 The Penarth Group and the Charmouth Mudstone Formation have been designated as a Secondary (undifferentiated) aquifer, as it is not possible to apply either a Secondary A or B definition. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

10.6.48 The Till deposits within underlying the Cable Route Corridor in the northeast are classified as Secondary (undifferentiated) aquifer, with the exception of alluvium deposits, which are Secondary A aquifer. The deposits of the Holme Pierrepont Sand and Gravel Member and Alluvium deposits southwest of the

Study Area are also classified as a Secondary A aquifer. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.

10.6.49 There are six borehole scans available online on the BGS Geoindex (Ref. 10-18) website across the Study Area which supply groundwater level information. The list of boreholes below is shown on **Figure 10-3** of this ES **[EN010142/APP/6.3]**):

a. Upton Gainsborough 2 (reference SK88NE13, NGR 486422, 386705) – groundwater level 1 mbgl (described as 'seepage') – northwest of Study Area;

b. Dog Kennel Farm Glentworth (reference SK98NE3) – groundwater 9 mbgl – northeast of Study Area to east of the extent of **Figure 10-3** of this ES **[EN010142/APP/6.3]**;

c. Hill Top Farm Kexby (reference SK88NE10) – groundwater level 3 mbgl – northeast of Study Area;

d. Tidal Trent (reference SK87NW150, NGR 483704, 378117) – groundwater level 6.5 mbgl – south of the Study Area;

e. Torksey (SK87NW48, NGR 483920, 378440) – groundwater level 3.7 mbgl – south of Study Area; and

f. C.E.G.B Cottam Station C3 (reference SK87/22A, NGR 481370, 379400) – groundwater level 23.64 mbgl – south of the Study Area.

10.6.50 Although there is limited groundwater level data available in the vicinity of the Cable Route Corridor, it is likely that groundwater is shallow (~2m bgl) within the Alluvium and River Terrace Deposits.

10.6.51 The Environment Agency also have groundwater monitoring boreholes in the area, with the nearest ones shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**.

10.6.52 Data from two boreholes at Cottam Power Station on the Hydrology Data Explorer (Ref. 10-38), at the south western edge of the Cable Route Corridor monitors shallow (Cottam Shallow) and deep (Cottam Deep) groundwater. These are shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**. According to the Environment Agency data (Ref. 10-38), the Cottam Shallow monitoring borehole indicates that in the last five years of monitoring, between January 2015 and January 2020, the groundwater was between 68m and 120m bgl based on datum of 7.8 to 8m AOD. For Cottam Deep from July 2017 to June 2022 the level varied between 15.9m and 38m bgl.

10.6.53 According to data obtained from Bassetlaw District Council and West Lindsey District Council, there are no PWS within the Cable Route Corridor. West Lindsey District Council do note one PWS located approximately 3km south of the Scheme (NGR 482859, 375267). However, no information concerning the abstraction borehole is available at the time of writing, however it is considered that as it is over 1km from the Principal Site and Study Area, it is not of concern and not considered further.

10.6.54 The Study Area falls within two WFD groundwater bodies (Ref. 10-14). The majority of the Cable Route Corridor falls within the Witham Lias groundwater body (GB40502G401400) within the Anglian RBMP. To the west of Marton the Cable Route Corridor falls within the Lower Trent Erewash (GB40402G990300) within the Humber RBMP. These are shown on **Figure 10-2** of this ES **[EN010142/APP/6.3]**.

10.6.55 The Witham Lias groundwater body (WFD ID: GB40502G401400) covers a total area of 683.57km^2 and under the WFD Cycle 3 classifications (2019), was classified as being at Good Status, overall, quantitatively and chemically. The Lower Trent Erewash – Secondary Combined groundwater body (WFD ID: GB40402G990300) covers a total area of 1,924.4km^2 and during 2019 Cycle 2, was given Good Status, overall, quantitatively and chemically (Ref. 10-14). The objective is stated as Good by 2015, therefore it has met this objective.

10.6.56 There are no SPZ situated within the Study Area of the Cable Route Corridor.

10.6.57 The Soilscape map viewer describes the majority of soils beneath Cable Route Corridor as ‘Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils’. These have moderate fertility and are most at risk from overland flow from compacted or poached fields. In the southeast of the Cable Route Corridor, there is an area of ‘Naturally wet very acid sandy and loamy soils’. Where cropped this soil is vulnerable to leaching of nitrate and pesticides to groundwater and is vulnerable to wind erosion in dry weather. Northeast of Torksey, there is a patch of ‘Sand dune soils’. Running along the A156 between Marton and Torksey there is a patch of ‘Freely draining lime-rich loamy soils’. The floodplain of the River Trent and a stream situated north-south running through Normanby by Stow is underlain by ‘Loamy and clayey floodplain soils with naturally high groundwater’, which has moderate fertility and is most at risk from pollution from floodwater scouring.

Surface Water features

10.6.58 The Cable Route Corridor, from east to west, contains the following surface water features (see **Figure 10-1** and **Figure 10-5** of this ES **[EN010142/APP/6.3]**). The catchments are shown, with the river name labels:

a. Fillingham Beck, an Ordinary Watercourse, is a heavily modified water feature with two tributaries. One rises close to the Principal Site west of Wentworth flowing westwards, and the other rises close to Heatons Wood approximately 2.5km east of Upton and flows southwards.

b. River Till is a heavily modified watercourse and a designated Main River from close to Willingham by Stow. This watercourse rises south of Gainsborough to the north-west of the Site and flows southwards, flowing to the south close to Kexby and Willingham by Stow. It is joined by a tributary rising from Corringham on the A631 to the north and tributary which rises west of the Principal Site in the area southeast of Springthorpe. A downstream location has records for juvenile Eel (*Anguilla Anguilla*) in 2013 and 2014.

c. Tributary of Till is an Ordinary Watercourse located west of Willingham by Stow. This watercourse rises east and west of Thurlby Wood south of Gainsborough. This water feature is not artificial or considered heavily modified.

d. Tributary to Skellingthorpe Main Drain, an Ordinary Watercourse flowing southwards west of Stow Park. This is a heavily modified watercourse.

e. Marton Drain is an Ordinary Watercourse, and a heavily modified watercourse, located downstream from Skellingthorpe Main Drain. The watercourse flow from south in the Brampton area northwards to Marton, where it confluences with the River Trent.

f. River Trent (Main River and WFD water body 'Trent from Carlton-on-Trent to Laughton Drain'). This is a major watercourse, which has an artificial channel, flowing northwards.

g. Seymour Drain and tributaries are heavily modified Ordinary Watercourses draining the area near Cottam Power Station. The watercourses in the catchment, and the main channel, flow northwards to confluence with the River Trent west of Marton area. Within the Seymour Drain catchment there is a named drain, called Carr Drain.

h. Rectangular surface water reservoir approximately 1km west of Willingham by Stow, scoped out of the assessment due to not being hydrologically linked.

10.6.59 There are also a number of pond features in the area, these are assessed within **Chapter 9: Ecology and Nature Conservation** of this ES **[EN010142/APP/6.1]**.

a. Surface water pond located northeast of Brampton within the Marton Drain catchment.

b. Four ponds to south of Brampton, south of the old railway line feature.

c. One surface water pond to south of Brampton and north of the old railway line feature.

d. One surface water pond to south of Torksey Lock, and two to the east of Torksey Lock.

e. Approximately 16 surface water ponds to west of Torksey between the River Trent and Cottam Power Station. These are included within the Cottam Wetlands LWS, and Cottam Ponds LWS.

10.6.60 The Upper Witham IDB catchment contains the River Till and Tributary of the Till watercourses. Marton Drain River Trent and Seymour Drain catchments are part of Trent Valley IDB (Water Management Consortium) area. **Figure 10-5** of this ES **[EN010142/APP/6.3]** shows the areas of the IDBs, fluvial flood zones and watercourses.

WFD Classifications

10.6.61 The Cable Route Corridor is located within the WFD management catchments of Lower Trent and Erewash, and Anglian RBMP. The Cable Route Corridor is shown on **Figure 10-1** and **Figure 10-5** of this ES

[EN010142/APP/6.3] and crosses the following WFD catchments, from east to west:

a. Fillingham Beck (GB105030062490);

b. River Till (GB105030062411);

c. Tributary of Till (GB105030062480);

d. Skellingthorpe Main Drain (GB105030062390);

e. Marton Drain Catchment (Tributary of Trent) (GB104028057840);

f. Trent from Carlton-on-Trent to Laughton Drain (GB104028058480); and

g. Seymour Drain Catchment (Tributary of Trent) (GB104028058340), which includes Carr Drain (SK 82726 80440).

10.6.62 Further details for these water bodies are given in **Table 10-9**~~**Table 10-9**~~.

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Table 10-9: WFD Surface Waterbodies in the Cable Route Corridor Cycle 3, 2022

Water body	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydro-morphological Designation	Designated Reach	Reasons for Not Achieving Good Status
Fillingham Beck (GB105030062490)	Moderate Ecological Status (due to invertebrates at Bad status)	Does not require assessment	Good (2027)	Heavily Modified	The watercourse is designated from east of Willingham by Stow and flows southwest to meet the River Till east of Normanby by Stow. The water course is 2.46km length and drains an area around 24.3km^2.	Physical modifications, sewage discharge pollution, and poor soil and nutrient management.
River Till water body (GB105030062411)	Moderate Ecological Potential	Does not require assessment	Moderate (2015)	Heavily Modified	The watercourse is designated from Gainsborough to west of Saxilby. It is c. 25km in length and drains a total area of c. 86km^2.	N/A
Tributary of the Till water body (GB105030062480)	Poor Ecological Status (due to Poor macrophytes and phytobenthos combined)	Does not require assessment	Moderate (2027)	Not Artificial or Heavily Modified	Designated from its source east of the Solar and Energy Storage Park, just north of Kexby Lane, and continues south along the eastern margin of the Principal Site, and then continues south to meet the River Till at Tilby Dale. The watercourse is 4.9km length and drains	Diffuse pollution from poor soil management and physical modification relating to land drainage.

Water body	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydro-morphological Designation	Designated Reach	Reasons for Not Achieving Good Status
					an area of around 17.1km^2.	
Skellingthorpe Main Drain water body (GB105030062390)	Moderate Ecological Potential	Does not require assessment	Moderate (2015)	Heavily Modified	Designated reach is 10.2km long and flows in a south-easterly direction towards the south of Lincoln where it feeds into the River Whitam after rising just to the south of the village of Broadholme.	Point source pollution from contaminated land, sewage discharge, and physical modifications.
Marton Drain Catchment (tributary of Trent) water body (GB104028057840)	Moderate Ecological Status (due to Moderate dissolved oxygen)	Does not require assessment	Good (2027)	Heavily Modified	The watercourse is designated from Torksey Village Green and flows north to meet the River Trent west of Marton. It is 3.14km in length and drains a total area of 5.04km^2.	Physical modifications, sewage discharge pollution and poor livestock management.
Trent from Carlton-on-Trent to Laughton water body (GB104028058480)	Moderate Ecological Potential (note that Biological Status is Bad due to a Bad classification for invertebrates)	Does not require assessment	Good (2027)	Artificial	The designation extends from the town of Carlton-on-Trent (approximately 18km south of Gate Burton as the crow flies) from where it flows predominantly north-northeast for 58.6km to	Physical modifications relating to navigation and agriculture, continuous sewage discharges, diffuse

Water body	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydro-morphological Designation	Designated Reach	Reasons for Not Achieving Good Status
					Laughton where the water body is then designated as the 'Humber Upper' WFD water body. The catchment has an area of 153km^2.	agricultural pollution, poor soil management in the catchment and transport drainage.
Seymour Drain Catchment (tributary of Trent) (GB104028058340)	Moderate Ecological Potential	Does not require assessment	Good (2027)	Heavily Modified	The watercourse rises in an agricultural region, south of the village of Rampton where it flows in a step-like fashion in a north easterly direction for 6.5km before reaching the confluence with Trent from Carlton-on-Trent to Laughton water body (River Trent). It is 6.5km in length and drains a catchment of 19.6km^2.	Physical modifications, sewage discharge pollution, poor soil management and transport drainage.

10.6.63 In addition to the WFD watercourses, there is one named undesignated ditch present within the Study Area. This is named as Carr Drain (SK82726 80440) and is contained within the Seymour Drain Catchment. This watercourse is located in the eastern extent of the Cable Route Corridor near to Cottam, east of Seymour Drain and west of the Trent. It generally flows parallel to both waterbodies before it discharges into Seymour Drain. It has as a total length of approximately 2 km.

River Trent – Hydrology and Tidal Cycle

10.6.64 The Non Tidal Limit (NTL) for the River Trent is approximately 21km south, and upstream of the Principal Site (Ref. 10-10) at Cromwell Weir, shortly north of, and downstream, of Newark-on-Trent.

10.6.65 The nearest Environment Agency gauging station on the River Trent is at North Muskham which lies approximately 21.5km south (upstream) of the Scheme near the village of Collingham. Annual mean flow at this station is 90.709m^3/s (based on data between 1968 and 2021). The flow that is exceeded 95% of the time (Q95) is 28.9m^3/s (Ref. 10-13). **Plate 10-6** shows the mean daily flow at North Muskham for the period 2018 to 2020 inclusive.

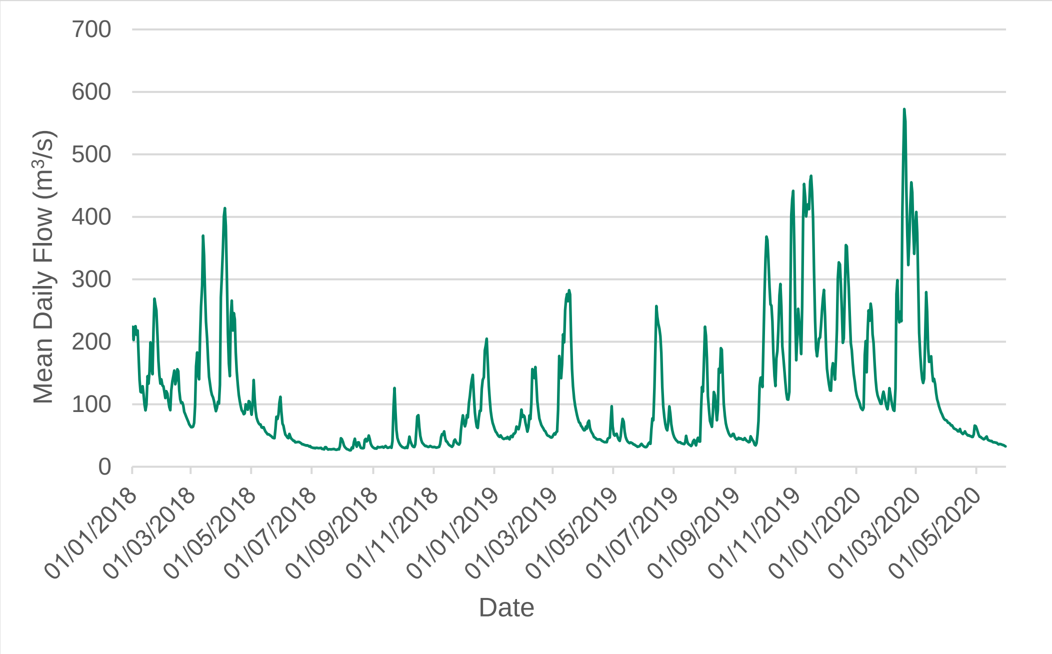

Plate 10-6: Mean daily flow for the River Trent at North Muskham Gauging Station, 2018-2020 (Source: National River Flow Archive Ref. 10-13).

10.6.66 The River Trent is characterised by a semi-diurnal tide (i.e. a cycle which has two high and two low tides a day). There is approximately 24 hours and 50 minutes between two tidal crests (for example, high– low–high–low–high) and so one tidal cycle (that is, high–low–high) has a period of approximately 12 hours and 25 minutes. In this regime, the two high tide levels are commonly unequal.

10.6.67 A complete tidal cycle from high tide to low tide to high tide comprises two distinct elements: the flood tide (the incoming tide when water levels are rising) and the ebb tide (the outgoing tide when water levels are falling).

10.6.68 There are two key variations in tides which occur over a 29-day cycle (i.e. spring and neap tides), with two spring and two neap tides occurring over this period. During neap tides, the tidal range is significantly reduced compared with that experienced during spring tides (that is, high tide levels are lower and low tide levels are higher during neap tides). The maximum spring and neap tides occur approximately 1.5 days after new/full Moon or first/last quarter, respectively. These two variations have a significant influence on the range of impact on water quality and suspended sediment.

10.6.69 The tides experienced in the River Trent estuary have very pronounced spring and neap tides. In addition, the tidal cycle seen in the River Trent estuary is not perfectly symmetrical (i.e. flood and ebb portions of the cycle are of unequal lengths). This is due to frictional resistance between oncoming and reflected tidal waves within the irregular coastline of the Humber estuary. In the River Trent, the time between ebb slack and flood slack is approximately three hours, while the difference between flood slack and ebb slack is approximately nine hours. This gives rise to a very rapid rise in tide level followed by a slow decline in the tide level. These times are subject to natural variation, particularly due to weather and flow within the River Trent itself (Ref. 10-23).

10.6.70 At Gainsborough, the usual range of the River Trent taking account of tidal variability is between 1.29m and 5.00m (Ref. 10-23).

10.6.71 There are two Trent Valley IDB (Water Management Consortium) pumping stations located on the banks of the River Trent in the Study Area, with one located on the west bank adjacent to Marton (NGR SK 82576 81524) and another on the east bank adjacent to Coates (SK 83487 81342) (refer to **Figure 10-1** of this ES **[EN010142/APP/6.3]**). The pumping station at Coates is located within the Cable Route Corridor. There are a further two pumping stations at Torksey Lock, south of the Study Area.

Surface Water Quality and Flow

10.6.72 Water quality data for the River Trent (at Dunham, approximately 5km and upstream of Cottam area, NGR 481920 374460), Seymour Drain at Cottam (NGR 481970 380370) in the area north of Cottam Power Station, Marton Drain (at Brampton Grange, NGR484160 380980) and the Tributary of the Till (Carr Drain) at Kexby Lane (NGR 486156 385553) has been obtained from the Environment Agency's Water Quality Archive website (Ref. 10-15) and is summarised in **Table 10-10~~Table 10-10~~** and **Table 10-11~~Table 10-11~~** for the period 2017-2021. Monitoring locations are shown on **Figure 10-1** of this ES **[EN/010142/APP/6.3]**. **Table 10-12~~Table 10-12~~** has the relevant WFD standards provided for comparison with the water quality data in **Table 10-10~~Table 10-10~~** and **Table 10-11~~Table 10-11~~**.

10.6.73 **Table 10-10~~Table 10-10~~** indicates that the River Trent is slightly alkaline with an average pH of 8.08. Ammonia concentrations are classified as High, which suggests pollution from organics such as treated/untreated sewage discharges are not having a detrimental effect on the water body. Nitrates and orthophosphate concentrations are elevated, which is not surprising given the agricultural landscape surrounding the River Trent in this stretch of the river.

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10.6.74 Table 10-10Table 10-10 indicates the water quality at Seymour Drain at Cottam is circum-neutral with a mean pH of 7.66 and this falls within the WFD High classification, based on the 44 samples considered here (2019-2023). A 10th percentile dissolved oxygen saturation of 49.40% falls within the Moderate WFD classification. This may occur as a result of the watercourse being tide locked at times, which will be checked during a future site visit. Biochemical Oxygen Demand (BOD) is within the High WFD classification with a concentration of 1.34 mg/l, suggesting low levels of organic pollution. Ammonia levels fall within the WFD classification for High at a 90th percentile value of 0.18 mg/l, which similarly suggests pollution from organics is limited. Nitrate values are elevated (mean of 8.37 mg/l N), as are orthophosphate concentrations (mean 0.76 mg/l), which indicates probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourse.

10.6.75 Table 10-11Table 10-11 indicates that Marton Drain at Brampton Grange is circum-neutral with a mean pH of 7.60 and falls within the WFD high classification, based on the 28 samples considered here. A 10th percentile dissolved oxygen saturation of 65.88% is Good which suggests the water body is well oxygenated. BOD falls within the High WFD classification with a 90th percentile value of 3.26 mg/l, suggesting moderate levels of organic pollution. However, the maximum value recorded is 19 mg/l, which indicates possible periodic episodes of greater organic pollution. Ammonia concentrations fall within the WFD classification for High at a 90th percentile value of 0.3 mg/l. Nitrate values are high (mean of 11.47 mg/l N) and indicate probable pressure from the surrounding agricultural land uses. Orthophosphate values have a mean of 0.1 mg/l.

10.6.76 Table 10-11Table 10-11 indicates that the tributary of the River Till at Kexby Lane is circum-neutral with a mean pH of 7.8 (within the WFD EQS), based on the 20 samples considered here. Dissolved oxygen saturation is within the WFD High classification range, with ammonia meeting the High EQS indicating low organic pollution. Nitrate values are low at 0.04 together with orthophosphate values being lower than at the other nearby monitoring sites with a mean of 0.04 mg/l.

10.6.77 The flow within the watercourses to be crossed by the Cable Route Corridor has been estimated based on Site 30002 east of Lincoln, and 9km east of the Scheme. The site, Barlings Eau at Langworth Bridge (Ref. 10-13), has a catchment area of 210km^2, and a Q95 flow of 0.048m^3/s (48l/s). The largest catchment area where the Scheme interacts with the water features is for the Tributary of the Till / Till and Fillingham Beck combined. This is a catchment area of approximately 82km^2. As the catchment area is much less that the Barlings Eau catchment area, it is considered the watercourses within the Study Area have a Q95 of less than 0.048m^3/s. The estimated flows for the catchment areas are 18l/s for the combination of Fillingham Beck / River Till catchment area, Seymour Drain 6l/s, and Marton Drain 5l/s.

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Table 10-10: Summary Environment Agency water quality monitoring data (2019-2023)

Determinant	Units	Seymour Drain					Tidal Trent – at Dunham				
		Average	Max	Min	90th%ile	10th%ile	Average	Max	Min	90th%ile	10th%ile
pH	pH Units	7.66	8.18	7.34	7.90	7.39	8.09	9.01	7.81	8.17	7.92
Temperature of Water	°C	11.67	16.70	5.60	16.00	6.35	10.87	20.70	4.60	18.70	5.00
Conductivity at 25°C	µs/cm	1700	1700	1700	1700	1700	829.3	1026.0	518.0	983.0	595.0
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	1.18	1.50	1.00	1.34	1.00	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.08	0.26	0.03	0.18	0.04	0.11	0.36	0.04	0.19	0.05
Nitrogen, Total Oxidised as N	mg/l	8.59	11.70	4.80	11.00	6.67	8.29	12.0	4.40	10.14	6.42
Nitrate as N	mg/l	8.37	10.90	4.72	10.46	6.50	0.06	0.12	0.02	0.10	0.03
Nitrite as N	mg/l	0.05	0.11	0.02	0.09	0.02	0.0019	0.003	0.0013	0.0028	0.0014
Ammonia un-ionised as N	mg/l	0.0007	0.0026	0.0002	0.0015	0.0003	-	-	-	-	-
Alkalinity to pH 4.5 as CaCO3	mg/l	237.14	280.00	200.00	267.00	210.00	0.247	0.540	0.120	0.391	0.140

Determinant	Units	Seymour Drain					Tidal Trent – at Dunham				
		Average	Max	Min	90th%ile	10th%ile	Average	Max	Min	90th%ile	10th%ile
Orthophosphate, reactive as P	mg/l	0.76	1.77	0.29	1.26	0.32	96.75	118.40	57.0	102.1	90.10
Oxygen, Dissolved, % Saturation	%	73.10	98.90	38.60	92.40	49.40	96.75	118.40	57.00	102.10	90.10
Oxygen, Dissolved as O2	mg/l	7.93	11.60	3.74	10.48	4.76	10.80	13.00	5.10	12.70	8.98

Table 10-11: Summary of Environment Agency water quality monitoring data (2020-2023)

Determinant	Unit	Marton Drain at Brampton Grange					Tributary of the Till at Kexby Lane				
		Average	Max	Min	90th%ile	10th%ile	Average	Max	Min	90th%ile	10th%ile
pH	pH Units	7.60	7.97	7.32	7.74	7.41	7.74	8.45	7.30	8.03	7.48
Temperature of Water	°C	10.02	19.30	3.50	19.12	4.16	10.41	19.20	2.20	15.52	3.52
Conductivity at 25°C	µs/cm	-	-	-	-	-	686.52	853.0	499.0	822.4	543.8
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	3.00	19.00	1.00	3.26	1.20	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.20	0.64	0.05	0.30	0.07	0.07	0.13	0.03	0.12	0.04
Nitrogen, Total Oxidised as N	mg/l	11.56	33.00	5.80	20.80	6.64	7.36	19.0	1.2	13.4	2.18
Nitrate as N	mg/l	11.47	32.90	5.71	20.70	6.51	6.71	19.0	0.20	13.38	1.89
Nitrite as N	mg/l	0.09	0.34	0.03	0.14	0.03	0.03	0.11	0.0	0.05	0.02
Ammonia un-ionised as N	mg/l	0.0012	0.0040	0.0004	0.0017	0.0005	0.0009	0.0022	0.001	0.0022	0.0002
Alkalinity to pH 4.5 as CaCO3	mg/l	202.11	230.00	130.00	222.00	186.00	191.74	250.0	110.0	228.0	160.0

Determinant	Unit	Marton Drain at Brampton Grange					Tributary of the Till at Kexby Lane				
		Average	Max	Min	90th%ile	10th%ile	Average	Max	Min	90th%ile	10th%ile
Orthophosphate, reactive as P	mg/l	0.106	0.29	0.01	0.20	0.027	0.048	0.16	0.014	0.084	0.019
Oxygen, Dissolved, % Saturation	%	89.97	148.50	52.40	138.28	65.88	79.80	113.6	51.8	97.54	62.16
Oxygen, Dissolved as O2	mg/l	9.95	15.50	6.30	13.63	7.43	9.05	17.7	5.37	11.54	6.19

Table 10-12: Summary of WFD physio-chemical standards for watercourses in the Study Area (not relevant to River Trent which is a transitional water body)

Determinant	Unit	Statistic	High	Good	Moderate	Poor	Bad
BOD	mg/l	90%ile	4	5	6.5	9	>9
Ammonia	mg/l	90%ile	0.3	0.6	1.1	2.5	>2.5
Dissolved Oxygen	% sat	10%ile	70	60	54	45	<45
pH	pH units	High-Good: 5% and 95%ile	>6 &<9	>6 &<9	-	-	-
Mod-Poor 10%ile		- -	4.7	4.2	<4.2		
Temperature	Degr-ees Celsius (ºC)	98%ile (not in salmonid water bodies and canals)	25	28	30	32	>32

Hydromorphology

10.6.78 The Scheme interacts with numerous watercourses within the Cable Route Corridor. The baseline information on each watercourse is provided in Table 10-13~~Table 10-13~~.

Table 10-13: Hydromorphology of watercourses

Watercourse	Baseline Description
Fillingham Beck	The Fillingham Beck flows within the Cable Route Corridor for approximately 500m. It has a straightened channel that is 1m in width. Historic mapping (Ref. 10-40) shows no change in the section of river within the Study Area since the early 1900s, meaning it is likely that much of the modification to the river occurred prior to this date. Fillingham Beck exhibits a small degree of sinuosity in places, albeit in a sharply defined and over deep channel. The riparian zone of both banks demonstrates a lack of trees or dense shrubs meaning that the ingress of fines from the surrounding agricultural fields is likely high. This is demonstrated by the water having a high turbidity, which means that the bed substrate is not visible due to high sediment loads. Banks are also too deep for the volume of flow and so there is expected to be limited connection between the channel and the floodplain.

Watercourse	Baseline Description
Tributary of the Till	The Tributary of the River Till exhibits a small degree of sinuosity, albeit in a sharply defined and over deep channel. The flow is of reduced turbidity relative to many of the other watercourses, revealing the presence of some in-channel macrophytes. Banks are also too deep for the volume of flow and so there is expected to be limited connection between the channel and the floodplain. It shows minimal change in the lateral extent or position locally since the early 1900s (Ref. 10-40), meaning it is likely that much of the modification to the river occurred prior to this date.
River Till	The River Till exhibits a small degree of sinuosity, albeit in a sharply defined and over deep channel. The riparian zone has limited presence of trees and dense shrubs meaning that ingress of fines from agricultural fields is likely. The channel demonstrates a high turbidity, which means that the bed substrate is not visible due to high sediment loads. Banks are also too deep for the volume of flow and so there is expected to be limited connection between the channel and the floodplain. The whole section of the Till that flows through the Cable Route Corridor demonstrates limited change since the early 1900s (Ref. 10-40), meaning it is likely that much of the modification to the river occurred prior to this date.
Marton Drain	The Marton Drain has a straightened, trapezoidal channel and is c. 5m wide with imperceptible flow and little variation. Channel banks are covered in shortly cropped grass which confer few of the benefits usually associated with a functioning riparian zone. Banks are also too deep for the volume of flow and so there is expected to be limited connection between the channel and the floodplain. Historic mapping shows no change in the local river since the early 1900s (Ref. 10-40), meaning it is likely that much of the modification to the river and occurred prior to this date.
River Trent	The watercourse flows from south to north and is approximately 70m wide. The river occupies an expansive floodplain which is flanked by successions of terrace deposits that indicate the river's former dynamic character. However, the Trent has a long history of anthropogenic modification, resulting in a single-thread, passively meandering and morphologically homogenous river that is disconnected from its floodplain by extensive embankments. During the survey, flow within the channel was observed to be uniform and laminar, owing to the over-deep form maintained by artificial confinement, with no apparent hydraulic variance

Watercourse	Baseline Description
	present. It is assumed to have a substrate that consists of fine gravels, sands and silts (the latter of which is derived predominantly from catchment-wide intensive agriculture and urbanisation). The watercourse's riparian zone is severely depleted with only a thin yet fragmented strip adjoining the channel. However, embankments limit potential for development of a high-functioning riparian zone. The river is used for navigation and is managed by the Canal and River Trust within the Study Area.
Seymour Drain	Seymour Drain to the south of the Cottam Power Station is a straightened and artificial channel. It is approximately 1.5m wide, with banks rising 2-3m from the bed. Seymour Drain exhibits a small degree of sinuosity, albeit in a sharply defined and over deep channel. The riparian zone has a low density of scrubs and no trees. The flow is of reduced turbidity relative to many of the other watercourses, revealing the presence of some in-channel macrophytes. Historic mapping shows minimal change in the local river since the early 1900s apart from through Cottom Power Station where it has been straightened. It is likely that much of the modification to the river occurred prior to this date.

10.6.79 A number of smaller unnamed watercourses / ditches are present within the Study Area for the Cable Route Corridor. These watercourses are primarily artificial, likely created or modified to assist in agricultural land drainage. Historical mapping of the Study Area indicates that these modifications took place during the latter half of the 20th century (Ref. 10-40). The characteristics of these watercourses include straightness, uniformity, and an overdeep profile. These artificially straightened channels are likely to be ephemeral in nature due to both natural processes and human activities in agricultural landscapes. The modification of these altered watercourses is intended to facilitate drainage and prevent waterlogging in fields. The grading of land and the installation of drainage systems may affect the ephemeral nature of these ditches. Flow within these watercourses is anticipated to be seasonal, with minimal to no flow in the summer, and the channels display relatively low energy compared to larger watercourses within the Study Area. It is unlikely that the modified banks of these watercourses will allow water spillage onto the floodplain, even during particularly wet periods of the year. As a result, there is expected to be limited connection between the channel and the floodplain. However, individually they may contribute to the provision of aquatic habitat within the area, even if it is not the unaltered habitat of the area and therefore may still need to be considered.

Nature Conservation Sites

10.6.80 There are no statutory sites designated for nature conservation identified within the 1km Study Area. There is one statutory site designated for nature conservation outside of the Study Area, at 1.5km to the west of the Cable Route Corridor. The site is Ashton's Meadow SSSI, and is ancient meadow. This is scoped out of further assessment as the meadow lies at a higher elevation, in the region of 24m AOD, with the closest area of works for the Cable Route Corridor being at 8m AOD, and therefore down hydraulic gradient of the Meadow, so no pathway exists.

10.6.81 There are six designated LWSs within the Study Area with an aquatic component, listed at a local level and known to have supporting value to a wide variety of protected and ecologically important species and, or habitats. These are all within the Cable Route Corridor. These sites are shown on **Figure 10-1** of this ES **[EN010142/APP/6.3]** and summarised in Table 10-14~~Table 10-14~~.

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Table 10-14: Non-statutory Water Dependent Designated sites within 1km of the Cable Route Corridor

Site Name	Description (from site designation)	Distance and direction from closest point of the Site	Relevance to this assessment
Cottam Wetlands LWS	Part of the former Cottam Power Station, this excellent wetland mosaic comprises lagoons, marshy grasslands, swamp and a representative length of the River Trent.	Adjacent to the Cable Route Corridor	This water dependent LWS is located adjacent to the Cable Route Corridor area. The construction of the Cable Route Corridor has the potential to result in hydrological changes within the area. This LWS is hydrologically linked to the River Trent via surface water, and likely also via superficial deposits into groundwater.
Cottam Ponds	A number of ponds supporting abundant wildlife.	Within the Cable Route Corridor Study Area.	These are located upstream of where the Cable Route Corridor crosses the River Trent and Seymour Drain. As such it is considered there will be no hydrological pathway, and is therefore scoped out of further assessment.
Cow Pasture Lane	Ditch with notable aquatic and bankside	Within the Cable Route Corridor	This LWS is located to the north of, and into the area of the Cable Route

Site Name	Description (from site designation)	Distance and direction from closest point of the Site	Relevance to this assessment
Drains LWS	vegetation located within the Cable Route Corridor.		Corridor. The Cable Route Corridor crosses this LWS. Thus, there is the potential for impacts on this feature for both surface water and groundwater.
Torksey Ferry Road Ditch LWS	A ditch of interest for water beetles located within the Cable Route Corridor.	Within the Cable Route Corridor Study Area	This site is located south of the Torksey Ferry Road, and is upstream of the Cable Route Corridor works area where is crosses the River Trent. It is not linked to the Cottam Wetlands to the north side of the road. As such it is considered there will be no hydrological pathway, and is therefore scoped out of further assessment.
Coates Wetland LWS	A group of pools with rough grazing land near the River Trent.	Adjacent to the Cable Route Corridor west of Marton, and west of the River Trent.	This LWS is located north of, and adjacent to, the Cable Route Corridor west of the River Trent. There is the potential for both surface water and groundwater pathways to this LWS via a drain tributary to the River Trent, or the River Trent.
Mother Drain Upper Ings LWS	A drain notable for supporting many species of water beetle and water bug	Located 1km north of the Cable Route Corridor at its closest designated point, but downstream on Seymour Drain.	Mother Drain Upper Ings LWS is connected the Cable Route Corridor from Seymour Drain, it is the lower reaches of Seymour Drain.

Water Resources

10.6.82 Within the Study Area for the Cable Route Corridor, there is a Drinking Water Protected Area for surface water, which contains land to the east and west of the River Trent in the west of the Study Area (Water body GB104028058480 Trent from Carlton-on-Trent to Laughton Drain within the Lower Trent an Erewash Management Catchment). This is shown on **Figure 10-1** of this ES **[EN010142/APP/6.3]**.

10.6.83 Drinking Water Protected Areas (Surface Water) are where raw water is abstracted from rivers and reservoirs and additional measures are required to protect the raw water supply to reduce the need for additional purification treatment (Ref. 10-17) This drinking water protected area is designated as 'currently not at risk'.

10.6.84 As with the Principal Site, the whole of the Cable Route Corridor is contained within a NVZ.

10.6.85 From the information received from the Environment Agency, there is one licenced surface water abstraction within the Study Area. This is located approximately 1km south of the Site, east of the village of Stow. The abstraction is for agricultural spray irrigation / storage, and the water is abstracted from a dyke draining to the River Till. This is shown on **Figure 10-1** of this ES **[EN010142/APP/6.3]**. There are no groundwater abstractions licenced by the Environment Agency. No PWSs are located within the Study Area.

10.6.86 Information on pollution incidents that have occurred in the area have been obtained from the Environment Agency. The categories are explained under the previous Principal Site, Water Resources Section in paragraph 10.3.35. For the category 1 – 3 incidents within the last seven years (2015 – 2022), there has been three water pollution incidents within the Study Area for the Cable Route Corridor. These are shown on **Figure 10-1** of this ES.

a. Incident number 1324290 was a category 3 (minor incident) which occurred at Fillingham Lane within the Cable Route Corridor in March 2015. The cause was listed as sewage water.

b. Incident number 1370631 was a category 3, minor incident, which occurred approximately 800m east of the Cable Route Corridor, east of Willingham by Stow. The cause was listed as a pipe failure for above ground oil/diesel tank.

c. Incident number 1318541 was a category 3, minor incident, which occurred approximately 1km east of the Cable Route Corridor, east of Normanby by Stow. The cause was listed as unidentified oil.

Consented Discharges

10.6.87 Information on consented discharges (i.e. permanent Water Activity Permits) was obtained from the Environment Agency. There are four consented discharges within the Study Area for the Cable Route Corridor. The discharge consents are shown on **Figure 10-1** of this ES **[EN010142/APP/6.3]**. These are summarised below:

a. AW3NF819: located adjacent to the road access for the Cable Route Corridor, for discharges from a water company sewerage pumping station;

b. ANNNF1407: located adjacent to the road access for the Cable Route Corridor, for WWTW sewage treatment works discharge;

c. PR3LF373: located 900m north of the Cable Route Corridor, for discharge from a single domestic property; and

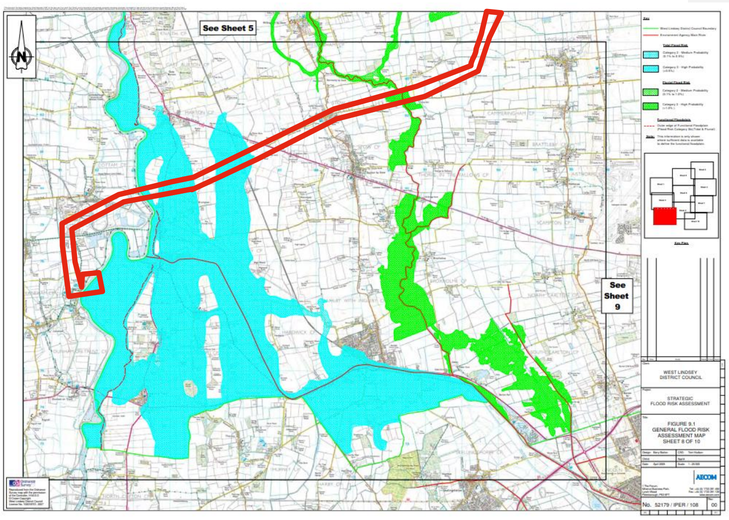
d. EPRPP3521XT: located 700m south of the Cable Route Corridor, for discharge from a single domestic property.

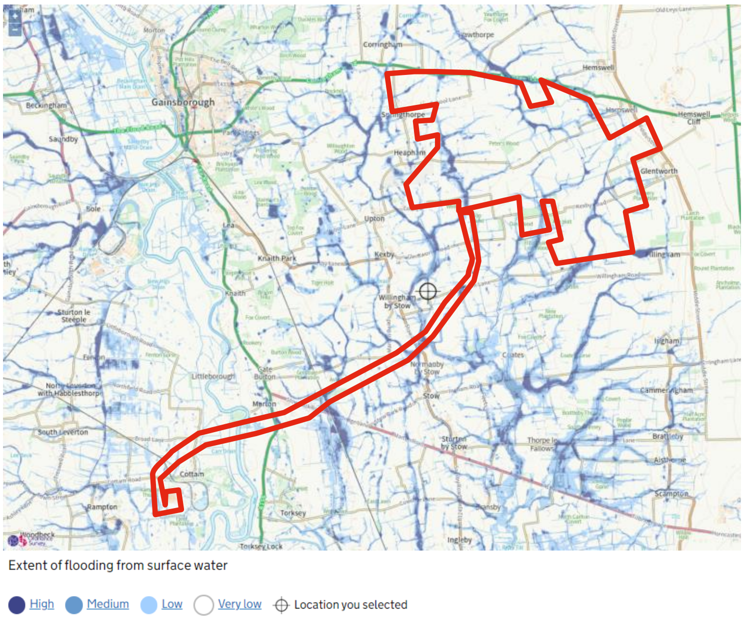
Flood Risk

10.6.88 The existing flood risk levels for the Cable Route Corridor is summarised in **Table 10-15**~~**Table 10-15**~~, details of which have been taken from Table 3-2 of **Appendix 10-3: Flood Risk Assessment** [**EN010142/APP6.2**].

Table 10-15: Flood Risk for the Cable Route Corridor

Flood Risk Source	Flood Risk Level	Comments
Fluvial	Low - High	The majority of the Cable Route Corridor is located within Flood Zone 1 with small areas of Flood Zone 2 and 3 associated with watercourses. The area of the Cable Route Corridor located west of the River Trent, surrounding Cottam sub-station sits within of Flood Zone 3 (refer to **Plate 10-7** below).
Tidal	Low– Medium	The WLDC SFRA mapping indicates tidal flood risk only exists along the tidal estuary of the River Trent where flood defences are in place.



Flood Risk Source	Flood Risk Level	Comments
		Plate 10-7 – WLDC SFRA – Tidal Flood Risk Map (Blue hatch: Tidal Flood Risk, Green hatch: Fluvial Flood Risk) The Cable Route Corridor passes through an area of High risk, associated with the River Trent as it is subject to tidal influence within this area.
Pluvial (surface water)	Very Low – High (areas associated with watercourses)	 **Plate 10-8 – Gov.uk – Flood Map for Surface Water (accessed January 2024)** Gov.uk Online Flood Maps (Ref. 10-48) indicate the majority of the Order limits lie in areas of Very Low risk from surface water flooding. There are small areas ranging from low to high risk associated with watercourses. The area of the Cable Route Corridor crossing the River Trent is shown to be generally low risk.
Groundwater	Low	Source: BGS Online (Ref. 10-18) and Lincolnshire County Council PFRA (Ref. 10-52). No historical groundwater flooding events are mentioned specifically within West Lindsey. However, where the Cable Route Corridor crosses the Rivers Trent and Till, groundwater may be elevated. There is no risk mapping for groundwater in this area, but as soils are largely impermeable, the risk is considered medium, as the bedrock geology would not support large amounts of water storage, such as an aquifer.
Sewers	Low	The WLDC SFRA indicates the risk of sewer surcharging resulting in flooding events is limited to urbanised areas of the District. The Cable Route

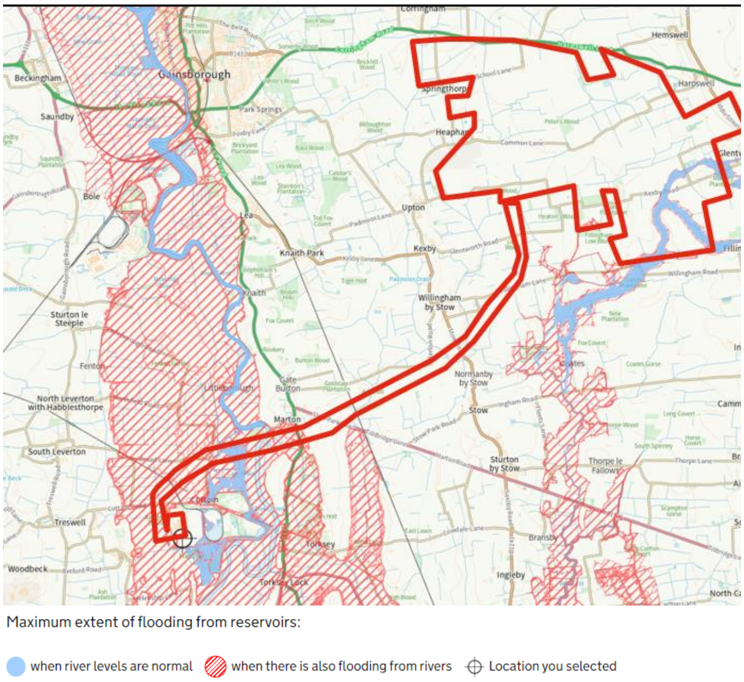
<table>
<tr><th>Flood Risk Source</th><th>Flood Risk Level</th><th>Comments</th></tr>
<tr><td></td><td></td><td>Corridor passes through various roads including the A156. Risk of flooding from sewers located within these roads during the construction phase is to be managed within the CEMP.</td></tr>
<tr><td>Artificial sources</td><td>Low</td><td>


Plate 10-9 – Gov.uk – Reservoir Flood Risk Mapping (accessed January 2024)
Online Flood Maps show the maximum extent of flooding from reservoirs, the mapping shows areas of the Cable Route Corridor lying over the flood extents “when river levels are normal” and “when there is also river flooding”., i.e. the flood extents of reservoir flooding are greater (higher risk) during flood events where the rivers are at capacity and utilising floodplain storage.</td></tr>
</table>

Future Baseline

10.6.89 The future baseline scenarios are set out in **Chapter 5: EIA Methodology** of this ES **[EN010142/APP/6.1]** and described below.

Future Baseline – 2025 – 2027 Construction, 2028 onwards Operation

10.6.90 Some of the surface WFD water bodies are already at their objective: The River Till WFD water body and Skellingthorpe Main Drain WFD water body are currently at their target WFD objective for 2015 (Moderate Ecological Potential). Some of the surface WFD water bodies are predicted to improve in the future: the remaining WFD water bodies have a target of Good by

2027 (Fillingham Beck, Marton Drain, Trent, and Seymour Drain) and Moderate by 2027 (Tributary of the Till).

10.6.91 It is likely that through the action of new legislative requirements and ever more stringent planning policy and regulation, the health of the water environment will continue to improve post-2027. The Environment Act 2021 (Ref. 10-1) and the Levelling-Up and Regeneration Act 2023 (Ref. 10-49) include measures to tackle storm sewage discharges and set new requirements on phosphate removal from sewage treatment works, although the Applicant is unaware of any sewage treatment works or combined sewer overflows that discharge into the Bourne Brook. There are, however, significant challenges such as adapting to a changing climate and pressures of population growth that could have a retarding impact. It is also difficult to forecast these changes with any certainty.

10.6.92 However, the current receptor importance criteria presented in **Table 10-1** is largely based on the presence or not of various attributes (e.g. Drinking Water Protected Area, designated nature conservation site or WFD designation) and flow (i.e. the size of the watercourse). The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future baseline in the absence of the Scheme, as the principal reasons for differences in water body importance are unlikely to change. For this reason, the impact assessment within this chapter is undertaken against existing baseline conditions.

Groundwater

10.6.93 The WFD groundwater bodies (Lower Trent Erewash – Secondary Combined and Witham Lias) are at their target WFD objective of Good Status, for Cycle 3 2019 data (Ref. 10-14).

10.6.94 No significant changes to current baseline conditions are predicted for the future baseline for the same reasons as outlined above for surface water. The impact assessment within this chapter is therefore undertaken against existing baseline conditions.

Flood Risk

10.6.95 Climate change is predicted to alter the future fluvial and pluvial flood risk with changing rainfall intensity, and thus it is important that it is taken into account by the FRA (**Appendix 10-3** of this ES **[EN010142/APP6.2]**). Climate change resilience has been accounted for within the outline surface water drainage strategy for the Scheme, accommodating current government climate change projections.

Future Baseline (Decommissioning, 2088)

10.6.96 It is considered that continued environmental improvements, tighter regulation at both national, regional and local scales, and environmental enhancements will lead to a gradual improvement over current baseline conditions in terms of water quality. However, the current receptor importance criteria presented in **Table 10-1** is largely based on the presence or not of various attributes. The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future for surface water or groundwater.

10.6.97 Climate change has the potential to significantly impact on drainage and flood risk, for example through increased storm intensity and changes in future rainfall patterns. The future decommissioning would take place under a decommissioning environmental management plan (the **Framework Decommissioning Environmental Management Plan (DEMP) [EN010142/APP/7.10]** is provided within the DCO Application). This would take into account any climate change induced changes regarding flood risk to ensure that potentially increased surface water flows are accounted for and managed during decommissioning.

Importance of Receptors

10.6.98 **Table 10-16**~~**Table 10-16**~~ provides a summary of the water features that may be impacted by the Scheme (i.e. there is a source and a possible pathway), a description of their attributes, and states the importance of the water feature as used in this environmental impact assessment. Importance is based on the criteria presented in **Table 10-1**. Separate importance classifications are provided for water quality and morphological aspects of water features as it is not always appropriate to have the same rating (e.g. a water body may be heavily modified or even artificial and thus have a low morphology importance, but the water quality may be high by virtue of supporting protected species or other important potable or socio-economic and recreational uses). Refer to **Figure 10-1** of this ES **[EN010142/APP/6.3]** for surface water features.

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Table 10-16: Importance of Receptors

Water feature	Importance
River Eau (Scunthorpe and Gainsborough Water Management Board Ordinary Watercourse)	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. However, there is expected to be pressure on water quality in the watercourse from agricultural pollution. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
Yawthorpe Beck	Low Importance for water quality and morphology. A small tributary to the River Eau which extends northwards for approximately 2.3km northwards through the Principal Site. This is a small surface watercourse, without WFD classification, which has minimal economic or social use based on its small size.

Water feature	Importance
Fillingham Beck (Upper Witham IDB Ordinary Watercourse)	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. However, there is expected to be pressure on water quality in the watercourse from agricultural pollution and there is one agricultural abstraction located east, and upstream, of the Scheme. Water Vole (*Arvicola amphibius*) are present within Fillingham Beck. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
River Till (Upper Witham IDB Ordinary Watercourse)	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. However, there is expected to be pressure on water quality in the watercourse from agricultural pollution and there is one agricultural abstraction located south, and downstream of the Scheme, for agricultural spray irrigation / storage. Downstream location on the River Till has records for juvenile Eel (*Anguilla Anguilla*) in 2013 and 2014. Water Vole (*Arvicola amphibius*) are present within ditches close to River Till. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
Tributary of Till (Upper Witham IDB Ordinary Watercourse)	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution. Downstream location on the River Till has records for juvenile Eel (*Anguilla Anguilla*) in 2013 and 2014. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
Skellingthorpe Main Drain (part of the catchment area of this drain is within Trent Valley IDB [Water Management Consortium]	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution as well as urban and transport. Low importance for morphology due to the heavily modified nature of the channel, particularly along the banks.

Water feature	Importance
and LLFA Ordinary Watercourse)	
Marton Drain (Trent Valley IDB [Water Management Consortium] Ordinary Watercourse)	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution. It also receives treated sewage from Marton STW and is therefore of importance for dispersal of this effluent. Water Vole (*Arvicola amphibius*) are present within Marton Drain. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
River Trent (Main River)	Very High importance receptor for water quality on the basis of its scale, being WFD designated and having a Q95 flow greater than 1m^3/s. It is also important for the dilution and dispersion of treated/ untreated sewerage/ trade/ process wastewater, which at the same time influence water quality and present a risk of chemical spillages. The river's importance for water supply and navigation add to its importance. This catchment contains Cottam Wetlands LWS and Coates Wetland LWS, with pathways available within groundwater for the Coates Wetland LWS and a direct link via a channel to the Cottam Wetlands LWS. Though the Cottam Wetlands are adjacent to the works area, these are upstream of any works for the Cable Route Corridor to cross the River Trent. There are records of Otter (*Lutra lutra*) present for the river. Low importance for morphology due to the heavily modified nature of the channel, particularly along the banks.
Seymour Drain **(Trent Valley IDB [Water Management Consortium] Ordinary Watercourse)**	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0m^3/s. Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution. It also receives treated sewage from Cottam Sewage Treatment Works (STW) and is therefore of importance for dispersal of this effluent. This catchment contains Cow Pasture Lane LWS. Seymour Drain is also linked to Mother Drain Upper Ings LWS and Cow pasture Lane Drain LWS. Water Vole (*Arvicola amphibius*) are present within Seymour Drain.

Water feature	Importance
	Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.
Other unnamed ditches (Ordinary Watercourses)	As artificial, generally ephemeral agricultural drains and ditches, these are considered Low Importance water features for water quality and morphology. These included unnamed drains within the River Eau catchment, unnamed drains within the River Till catchment and those unnamed drains within the Fillingham Beck catchment. All of these have an estimated Q95 flow of 1l/s, or are ephemeral.
Mercia Mudstone Group	Medium Importance: This is present beneath the Cable Route Corridor and is classified as a Secondary B aquifer. Groundwater may support some agricultural abstraction.
Penarth Group Mudstone	Medium Importance: Present beneath the Cable Route Corridor, and classified as Secondary (undifferentiated) aquifer, this is overlain by Glaciofluvial deposits. Groundwater may support some agricultural abstraction.
Scunthorpe Mudstone Formation	Medium Importance: Present beneath the Principal Site and Cable Route Corridor and is classified as a Secondary B aquifer. This is overlain by Glaciofluvial deposits classified as Secondary (undifferentiated) aquifer. Groundwater may support some agricultural abstraction.
Charmouth Mudstone Formation Secondary undifferentiated aquifers	Medium Importance: Present beneath the Principal Site and Cable Route Corridor, and is classified as Secondary (undifferentiated) aquifer, this is overlain by Glaciofluvial deposits. Groundwater may support some agricultural abstraction.
Alluvial and sand and gravel deposits	Medium Importance: Areas of superficial alluvial deposits are associated with the watercourses, include larger areas close to the River Trent. Areas of sand to the east of the River Trent alluvial deposits. These are classified as Secondary A aquifers.
Flood Risk Importance	The Scheme development is designated as Essential Infrastructure, and as such is very high importance. Within the Cable Route Corridor area there are areas of more vulnerable development in the area, comprising residential housing, and essential infrastructure for the existing sewage treatment works.

10.7 Embedded Design Mitigation

10.7.1 This section contains the mitigation measures relevant to this chapter that are already incorporated into the Scheme design and the management plans submitted with the DCO application, as described in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**. This includes measures that form part of the **Framework CEMP [EN010142/APP/7.8]**, the **Framework Operational Environmental Management Plan (OEMP) [EN010142/APP/7.9]**, the **Framework DEMP [EN010142/APP/7.10]**, and the **Outline Drainage Strategy** (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**). Some of these are standard mitigation, and some have been developed as the Scheme design has progressed (i.e. embedded). These measures are taken into account by the initial impact assessment. The application of additional mitigation measures is only considered prior to stating residual effects.

Standard Mitigation

10.7.2 The **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]** details the measures that will be undertaken during construction to mitigate temporary effects on the water environment. The **Framework CEMP [EN010142/APP/7.8]** sets out the structure and content for the detailed CEMP, which will be completed in accordance with the **Framework CEMP [EN010142/APP/7.8]** once a Contractor is appointed, following submission of the DCO application.

10.7.3 The **Framework CEMP** comprises good practice methods that are established and effective measures to which the Scheme will be committed through the development consent. The measures within the **Framework CEMP** focus on managing the risk of pollution to surface waters and the groundwater environment. It also considers the management of activities within floodplain areas (i.e. kept to a minimum and with temporary land take required for construction to be located out of the floodplain as far as reasonably practicable).

10.7.4 The CEMP will be reviewed, revised and updated as the Scheme progresses towards construction to ensure all potential impacts and residual effects are considered and mitigated as far as practicable, in keeping with available good practice at the relevant point in time. The principles of the mitigation measures set out below are the minimum standards that the Contractor will implement. However, it is acknowledged that for some issues, there are multiple ways in which they may be addressed and methods of dealing with pollutant risk will be continually reviewed and adapted as construction works progress (e.g. the management of construction site runoff containing excessive levels of fine sediments).

10.7.5 The CEMP will be standard procedure for the Scheme and will describe the principles for the protection of the water environment during construction. The final 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 potential for adverse impacts will be minimised by the adoption of the general mitigation measures outlined below, which will be described in the WMP and CEMP.

10.7.6 Where not disapplied through the DCO, there may be the need for a number of secondary permissions for temporary and potentially some permanent works affecting watercourses or groundwater (e.g. marine license from the Marine Management Organisation, flood risk activity permits, water activity permits, land drainage consents, and temporary abstraction / impoundment licences). It is assumed that all temporary works will be carried out under the necessary consents/permits and that the Contractor will comply with any conditions imposed by any relevant permission. Some of these secondary consents will be sought through the DCO.

10.7.7 Where not disapplied through the DCO, temporary and permanent consents will be obtained where necessary from the Environment Agency for works affecting Main Rivers or where there is a need for temporary abstraction or impoundment licences. However, it is acknowledged that trenchless techniques will be used in some locations to install power cables beneath watercourses which will not impact the channel or the bed. The cable installation depth below the firm riverbed will be a minimum of 3m, as agreed with statutory consultees. Similarly, where not disapplied through the DCO, Land Drainage consents will be applied for where necessary on the Ordinary Watercourses from the local authority and the Trent Valley (Water Management Consortium), and Upper Witham IDB, and the Scunthorpe and Gainsborough Water Management Board.

10.7.8 The high voltage cables associated with the Cable Route Corridor will be below ground, requiring trenching typically at a depth of around 2m, but will need to vary and go deeper depending on crossings and detailed design. Trenchless crossings will be used to install cables beneath the River Trent, and will be at a suitable depth to avoid impacting the channel or the bed, subject to design and ground conditions (at a minimum of 5m). Where underground techniques are not feasible, and it has been agreed with regulators, crossings will be installed using open-cut techniques. In such cases, water flow will be maintained and a dry working area temporarily created (e.g. by over-pumping or fluming around the works). It will be a requirement that the watercourses are reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from construction activity. Further details of the method of watercourse crossings are included within **Figure 10-5** of this ES **[EN010142/APP/6.3]** and provided later in this section.

10.7.9 The construction of the Scheme will be undertaken in accordance with good practice as detailed below.

Management of construction runoff

10.7.10 Mitigation measures for the management of construction runoff are described in detail below. These will be adhered to during the construction phase of the Scheme within the construction compound locations on the Principal Site and along the Cable Route Corridor. The proposed access roads are an important part of the Scheme construction area. The embedded mitigation measures identified below apply equally to the main construction areas and the access roads. These measures will apply to the construction compounds within the Principal Site and the Construction Route Corridor. There are to be five temporary construction compounds within the Principal Site. These are shown on **Figure 3-8** of this ES **[EN010142/APP/6.3]**. The construction compounds will contain offices, mobile welfare units, canteens, storage and waste skips, construction staff car parking areas and space for storage, download and turning areas. There will be six temporary construction compounds will also be located along the cable route to facilitate its construction as shown in **Figure 3-8** of this ES **[EN010142/APP/6.3]**. These compounds along the cable route will comprise site offices, storage containers, laydown areas, parking, welfare units and waste sorting areas

10.7.11 The construction of the Scheme, and management within the construction compounds, will be in accordance with good practice as detailed by the guidance documents which are listed in **Appendix 10-1** of this ES **[EN010142/APP/6.2]**.

10.7.12 The measures outlined below, which are included in the **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]**, will be required for the management of fine particulates in surface water runoff that may occur as a result of the construction activities:

a. All reasonably practicable measures will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse, arising from construction activities. The measures will accord with the principles set out in industry guidelines including the Construction Information Research and Information Association (CIRIA) report 'C532: Control of water pollution from construction sites' (Ref. 10-33) and CIRIA report 'C648 Control of water pollution from linear construction sites' (Ref. 10-31).

b. A temporary drainage system will be developed to prevent runoff contaminated with fine particulates from entering surface water drains without treatment. This will include identifying all land drains and water features in the Site and ensuring that they are adequately protected using drain covers, sand or pea gravel bags (the latter being more appropriate in or near watercourses), earth bunds, temporary lagoons, tanks, geotextile silt fences, straw bales, silt screens, and silt mats etc., or proprietary treatment (e.g. lamella clarifiers or flocculation if absolutely necessary and with the appropriate approvals from the Environment Agency) and road sweepers or wheel washes on entry and exit to the site. Infiltration to ground (e.g. by spraying water onto grass fields may also be an option). Consideration of the type of plant used, seeding or covering earth stockpiles, and the timing of works are all important factors contributing to the generation of fine sediment in runoff. Infiltration to ground (e.g. by spraying water onto grass fields may also be an option).

c. Scheme construction foul drainage will provide appropriate pollution control measures as agreed with the sewerage undertaker or the Environment Agency as appropriate. Holding or settling tanks, separators and other measures as may be required, will be provided and maintained;

d. The relevant sections of BS 6031: Code of Practice for Earthworks (Ref. 10-28) will be followed for the general control of site drainage.

e. Where practical, earthworks will be undertaken during the drier months of the year. When undertaking earth moving works periods of very wet weather will be avoided, where practicable, to minimise the risk of generating runoff contaminated with fine particulates. However, it is likely that some working during wet weather periods will be unavoidable, in which case other mitigation measures (see below) will be implemented to control fine sediment laden runoff. Water may also be required to dampen earthworks during dry weather to reduce dust impacts, and any runoff generated will need to be appropriately managed by the Contractor in accordance with the pollution prevention principles described in this chapter.

f. To protect watercourses from fine sediment runoff, topsoil/subsoil will be stored a minimum of 20m from watercourses on flat lying land. Where this will not be practicable, and it is to be stockpiled for longer than a two-week period, the material will either be covered with geotextile mats, seeded to promote vegetation growth, or runoff prevented from draining to a watercourse without prior treatment.

g. Appropriately sized runoff storage areas for the settlement of excessive fine particulates in runoff will be provided.

h. Construction site runoff will either be treated on Site and discharged under a Water Discharge Activity Permit to Controlled Waters from the Environment Agency (potentially also including infiltration to ground though this is unlikely to be suitable based on the geology of the area) or to the nearest public sewer with sufficient capacity for treatment following discussions with Anglian Water, or else removed from site for disposal at an appropriate and licensed waste facility.

i. Equipment and plant are to be washed out and cleaned in designated areas within the Scheme compounds only, where runoff can be isolated for treatment before disposal as outlined above.

j. Mud deposits will be controlled at entry and exit points to the Site using wheel washing facilities and/or road sweepers operating during earthworks activities or other times as required.

k. Debris and other material will be prevented from entering surface water drainage, through maintenance of a clean and tidy site, provision of clearly labelled waste receptacles, grid covers and the presence of site security fencing.

l. A Silt Management Plan will be produced as part of the detailed CEMP.

m. The WMP (which will be produced post consent) 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.

Management of spillage risk

10.7.13 The measures outlined below will be implemented to manage the risk of accidental spillages within the Scheme, and construction compounds, and potential conveyance to nearby water features via surface runoff or land drains. The following mitigation measures related to the control of spillages and leaks are included within the **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]** and will be adopted during the construction works:

a. Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002 (Ref. 10-50), and the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 10-51). Particular care will be taken with the delivery and use of concrete and cement as it is highly corrosive and alkaline.

b. Fuel and other potentially polluting chemicals will either be in self-bunded leak proof containers or stored in a secure impermeable and bunded area (minimum capacity of 110% of the capacity of the containers, which includes 10% more capacity than is needed).

c. Any plant, machinery or vehicles will be inspected before every use and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off site if possible or, if on-site, only at designated areas within the site compounds. Only construction equipment and vehicles free of all oil/fuel leaks will be permitted on the Site. Drip trays will be placed below static mechanical plant.

d. All washing down of vehicles and equipment will take place in designated areas and wash water will be prevented from passing untreated into watercourses.

e. All refuelling, oiling and greasing of plant will take place above drip trays or on an impermeable surface which provides protection to underground strata and watercourses, and away from drains as far as reasonably practicable. Vehicles will not be left unattended during refuelling.

f. As far as reasonably practicable, only biodegradable hydraulic oils will be used in equipment working in or over watercourses.

g. All fixed plant used will be self-bunded.

h. Mobile plant is to be in good working order, kept clean, fitted with absorbent plant 'nappies' at all times and are to carry spill kits.

i. The WMP (which will be produced post consent) will include details for pollution prevention and will be prepared and included alongside the final CEMP. Spill kits and oil absorbent material will be carried by mobile plant and located at high risk locations across the Scheme and regularly topped up. All construction workers will receive spill response training and tool box talks.

j. The area of construction will be secure to prevent any vandalism that could lead to a pollution incident.

k. Construction waste/debris are to be prevented from entering any surface water drainage or water body.

l. Surface water drains on public roads trafficked by plant or within the construction compounds will be identified and, where there is a risk that fine particulates or spillages could enter them, the drains will be protected (e.g. using covers or sand bags) or the road regularly cleaned by road sweeper.

m. Suitable facilities for concrete wash water (e.g. geotextile wrapped sealed skip, container or earth bunded area) will be adequately contained, prevented from entering any drain, and removed from the Site for appropriate disposal at a suitably licenced waste facility.

n. Water quality monitoring of potentially impacted watercourses will be undertaken to ensure that pollution events can be detected against baseline conditions and can be dealt with effectively.

10.7.14 In addition, any site welfare facilities will be appropriately managed, and all foul waste disposed of by an appropriate Contractor to a suitably licensed facility if it is not possible to connect to the public sewer.

Water Crossings with Non-Intrusive Techniques

10.7.15 In addition to the control and management measures for site runoff and spillage risk noted above, the methodology of the trenchless (non-intrusive) techniques, will include measures to minimise the risk to the environment. Although the use of this technique avoids the need to excavate a cable trench through the channel, there are risks associated with the use of drilling fluids and plant close to the channel. For example, although rare, without due care there is a risk that drilling fluids, including naturally occurring minerals, can ‘break out’ into watercourses leading to pollution. There is also a need to manage drilling fluids and wastewater so that this will not be spilt into the channel when working close to the banks of a watercourse.

10.7.16 The method of trenchless, or non-intrusive watercourse crossings, seeks to minimise the risk of pollution of nearby watercourse. The send and receive pit excavations will be located at least 10m from the watercourse (measured from the water’s/channel edge under normal flows) under which they will be directional drilled.

10.7.17 There are 20 trenchless watercourse crossings included as part of the Scheme construction:

a. Seymour Drain catchment: 11 trenchless crossings;

b. Trent from Carlton-on-Trent to Laughton catchment: 2 trenchless crossings;

c. Marton Drain catchment: 1 trenchless crossings;

d. Catchment of the Skellingthorpe Main Drain: 1 trenchless crossings;

e. Till catchment: 2 trenchless crossings; and

f. Fillingham Beck catchment: 4 trenchless crossings.

10.7.18 The exact dimensions of the send and receive pits will be determined by site and ground conditions but will be kept to a safe minimum in terms of length, width and depth. For this assessment, it has been assumed that launch and receive pits will be no greater than 4m by 3m by 2m deep. A shoring system appropriate to the ground conditions will be used to minimise water ingress into the pits. This may be timbers, sheet piling, or a modular system and will be chosen based on suitability for the site conditions. The ingress of any groundwater will be carefully managed through design of the send or receive pit, shoring method, and a pumping and treatment system. Excessive ingress of water will make the pit unsafe and thus it is important that ingress is minimised and that a suitable system of managing that water is implemented. Once the cable is installed beneath the watercourse the pits and any cable trenches will be backfilled to the original ground level and seeded to reduce the risk of runoff and fine sediments entering the watercourse. For HDD, the drilling fluids used will be water based, mixed with naturally occurring minerals like bentonite clay. The water component of the drilling fluid will be mains water, obtained from a nearby supply and tankered to site when required. There will be some recycling of drilling fluids by the drilling plant used.

10.7.19 The bentonite within the drilling fluid is a naturally occurring mineral and enables the fluid to have sufficient viscosity to carry the cutting chips back to the surface machine whilst lubricating and keeping cool the drilling bit. HDD, or other trenchless techniques, will be undertaken by a specialist Contractor and the water column above the drill path will be continuously monitored during drilling. It is acknowledged that drill fluid leakage into a watercourse is not a common problem. However, where any leakage of drilling fluid is observed in the watercourse or there is an increased perceived risk (i.e. lack of drilling fluid returns) the HDD operation will be suspended, remediation action implemented, and subsequently the methodology for that crossing re-evaluated. It may be that the excavation, or boring, in that area must take place at a deeper depth than the minimum 3m below the bed of the watercourse.

10.7.20 The reasonable worst case scenario for the River Trent crossing is drilling and installing the cable duct to maximum of 25m depth, and a minimum of 5m beneath the bed of the river. The cable ducts are 115mm diameter, and are anticipated to be below the water table in the area of the River Trent valley.

10.7.21 With some methodologies the drilling fluid returns to the drilling rig and is recycled within the drilling rig (e.g. the Ditch Witch). Any wastewater / drilling products which are not recycled must be stored and removed from the Scheme by a suitable waste management Contractor and disposed of at a licenced wastewater facility.

10.7.22 There is a small risk of drilling fluid break out from drilling to the watercourse if not appropriately mitigated for site specific conditions. A site-specific hydraulic fracture risk assessment will be produced prior to commencing works to define the mitigation required based on ground conditions. This requirement is included within the **Framework CEMP [EN010142/APP/7.8]**.

Watercourse Crossings with Trench (intrusive) Techniques

10.7.23 Intrusive watercourse crossing techniques will only be used for more minor watercourses/drains, some of which will be dry, ephemeral channels associated with field boundaries. For watercourses identified on site and from online digital OS maps, **Figure 10-5** of this ES **[EN010142/APP/6.3]** illustrates those that have been identified to be crossed with an intrusive method. The extent of excavations will be limited to a maximum width of 3.5m. The 18 trenched crossings shown on **Figure 10-5** are summarised as follows:

a. Till catchment (includes River Till and Tributary to Till catchments): 4 No. trenched;

b. Fillingham Beck catchment: 4 No trenched; and

c. Minor unnamed drains and ditches within Principal Site: 10 trenched.

10.7.24 Where intrusive crossing techniques will be used, a pre-works hydromorphological survey must be undertaken to record channel features and provide the baseline against which reinstatement will be provided. Reinstatement will aim to provide an improved channel form with enhancement works to be carried out (where relevant and appropriate to do so) between 5 and 10m upstream and downstream of the open trench to ensure the reinstated improved channel form merges into the existing channel form. It is anticipated that enhancements will consist of soft engineering techniques and improvements to the riparian corridor to improve channel diversity and biodiversity. Proposed reinstatement proposals will be set out in a WFD Mitigation and Enhancement Strategy secured through the **Framework CEMP [EN010142/APP/7.8]**. The overhead power cable easement for 33kV and 11kV lines will only be 10m wide and thus the Applicant will not have any control to ensure that enhancements beyond that distance are retained in perpetuity for the lifetime of the Scheme, although they are not being proposed as mitigation. Further details are set out in the **Appendix 10-2: Water Framework Directive (WFD) Extended Screening and Scoping Assessment** of this ES **[EN010142/APP/6.2]**.

10.7.25 Where possible intrusive watercourse crossings will be carried out during drier periods of the year or during a period of dry weather where flows in the watercourse are low (this may be baseflow or where the channels are very small and not as well connected to groundwater, they may even be dry). However, this cannot be guaranteed and so any water flow within the watercourse will need to be over-pumped/flumed through the works area to maintain a dry trench and to reduce pollution risks.

10.7.26 Bank and bed sediments must be stored separately and in distinct layers as excavated on geotextile layers so they can be reinstated as found following completion of the works. The banks and the bed will need to be appropriately reprofiled with the inclusion of suitable geomorphic features with the aim to provide betterment on the original channel. Banks will be replanted with suitable riparian species. A suitable geotextile will need to be pinned in place to provide bank protection while new planting establishes (or other suitable measures to prevent soil erosion and bank instability).

10.7.27 Temporary fencing may also need to be installed where local land use will remain unchanged and fields are used for livestock (to prevent bank poaching).

10.7.28 In addition to watercourse crossings, two railway crossings, B1241, Glentworth Road, A1500, A156 and Cottam Road and some other features (e.g. hedgerows) will be crossed by the Cable Route Corridor. Launch and receive pits for these crossings are expected to be no deeper than the excavations for watercourse crossings and thus are unlikely to result in significant ingress of groundwater and are of low sensitivity compared to watercourses.

Management of flood risk

10.7.29 The **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]** incorporates measures to prevent an increase in flood risk or pollution during the construction works, in addition to the provision of temporary settlement and drainage measures as detailed above.

10.7.30 Construction works undertaken adjacent to, beneath and within watercourses will comply with relevant guidance, including Environment Agency and Defra guidance documents. More details on guidance and legislation is included within **Appendix 10-1** of this ES **[EN010142/APP/6.2]**, and the **Framework CEMP [EN010142/APP/7.8]** incorporates the following measures aimed at preventing an increase in flood risk during the construction works:

a. Topsoil and other construction materials will be stored outside of the 1 in 100 year floodplain extent where feasible. If areas located within Flood Zone 2/3 are to be utilised for the storage of construction materials, this will be done in accordance with the applicable flood risk activity requirements of the regulating authority, if required.
b. Connectivity will be maintained between the floodplain and the adjacent watercourses, with no changes in ground levels within the floodplain as far as practicable.
c. During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly and daily basis, and plan works accordingly. For example, works in the channel of any watercourse will be avoided or halted were there to be a significant risk of high flows or flooding.
d. The construction laydown area site officer and supervisor will be notified of any potential flood occurring by use of the Floodline Warnings Direct or equivalent service.

10.7.31 The Contractor will be required to produce an Emergency Response Plan following grant of DCO and prior to construction. This will be relevant mainly for the temporary works within the Cable Route Corridor. This will provide details of the response to an impending flood and include:

a. A 24-hour availability and ability to mobilise staff in the event of a flood warning.

b. The removal of all plant, machinery and material capable of being mobilised in a flood for the duration of any holiday close down period where there is a forecast risk that the site may be flooded.

c. Details of the evacuation and site close down procedures.

d. Arrangements for removing any potentially hazardous material and anything capable of becoming entrained in floodwaters, from the temporary works areas.

e. The Contractor will sign up to Environment Agency flood warning alerts and describe in the Emergency Response Plan the actions it will take in the event of a flood event occurring. These actions will be hierarchical meaning that as the risk increases the Contractor will implement more stringent protection measures.

f. If water is encountered during below ground construction, suitable dewatering methods will be used. Any groundwater dewatering required in excess of the exemption thresholds will be undertaken in line with the requirements of the Environment Agency (under the Water Resources Act 1991 as amended) (Ref. 10-1) and the Environmental Permitting Regulations (2016) (Ref. 10-3).

g. Safe egress and exits are to be maintained at all times when working in excavations. When working in excavations a banksman is to be present at all times.

10.7.32 The design of the panels is for the panels to be raised above ground level at a minimum height of 0.6m above the ground for most of the Principal Site, when the panel is at maximum tilt. The panels are held on racks held by steel poles. In the area of the potential area of fluvial flooding associated with the River Eau, the panels will be raised to ensure they are above the level of a potential flood event.

10.7.33 The majority of the construction compounds are located outside areas of flood risk. The exception being two of the construction compounds within the Cable Route Corridor, west of Cottam Power Station. Whilst being located within Flood Zone 3, this is defended associated with the flood plain of the River Trent, so therefore this is a low residual risk. From ~~the publically available Gate Burton ES, the Gate Burton Scheme also includes~~Environment Agency Product 4 data, two construction compounds are shown to be located within ~~this area of~~ defended Flood Zone 3 from the River Trent. Safe refuge for these compounds has been assessed in detail in a technical note, included within Annex F of the **FRA [EN010142/APP/6.2]**. Safe refuge will be provided for both of these construction compounds, at a level above 7.66m AOD.

10.7.34 The other compound, east of Willingham by Stowe, is close to the Flood Zone 2/3 extent associated with Fillingham Beck. It is proposed to locate all staff and operational buildings within this temporary construction compound above 10.7m AOD. This would provide 300mm freeboard above the estimated current Flood Zone 3 extent. This will ensure the site remains operational and safe during a period of potential flooding during construction phase.

10.7.35 As the temporary construction compound would be in place during the period of construction only, and will be returned to the existing current conditions, it is considered there would be no change to long term flood risk from all sources.

Cable Route Corridor: Management of risk to morphology of watercourses

10.7.36 The River Trent will be crossed by trenchless (non-intrusive) techniques, together with WFD monitored reaches of watercourses, and the IDB controlled channels. Other smaller watercourse crossings are likely to be crossed using open cut installation techniques. A survey of the tidal riverbed will be required before the trenchless crossing of the River Trent is carried out, as described in the **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]**.

10.7.37 A pre-works morphology survey (as described in the **Framework CEMP** submitted alongside the DCO application **[EN010142/APP/7.8]**) of the channel of each watercourse to be crossed by high voltage cables or temporary construction access will be undertaken prior to construction. The pre-works survey is to ensure that there is a formal record of the condition of each watercourse prior to commencement of works to install cables beneath the channel. The survey is a precautionary measure so that should there be any unforeseen adverse impacts there is a record against which any remedial action can be determined.

Permanent Access Track Crossings of Watercourses

10.7.38 Permanent access tracks will be constructed across the Principal Site. These will typically be up to 4m wide compacted stone tracks with 1:2 gradient slopes on either side. The internal road layout has been designed to avoid drainage ditch and watercourse crossings wherever possible. The location of the access tracks crossing watercourses are summarised as:

a. West of Springthorpe Grand in the northwest of the Principal Site (River Till catchment area), two potential new crossings at NGR 488526 390212, and 488539 390424.

b. Four crossings of Yawthorpe Beck (tributary of the River Eau): in the north of the Principal Site south of Hemswell Grange Farm at NGR 490709 390379, northwest of the surface water storage reservoir (River Eau catchment area) at 490703 390382 and two crossings of Yawthorpe Beck southwest and south of the surface water storage reservoir (River Eau catchment area) (existing crossing at NGR 491135 389395 and new crossing at NGR491989 389279).

c. Across an unnamed ditch to northwest of Harpswell Wood / south of Springthorpe Grange (River Till catchment area) (existing crossing at NGR 489587 389577).

10.7.39 The majority of the access tracks within the Principal Site will utilise existing farm tracks, upgrading surfaces as required. The creation of new tracks will be minimised. This will result in a reduced need for new crossing locations.

For any additional access crossings, as a design principle, culverts will be avoided wherever possible. However, as a worst-case basis and adopting a precautionary approach, the use of culverts has been assessed in this chapter.

10.7.40 However, it will be expected that where culverts are necessary, the least impacting design that is reasonably practicable is proposed (e.g. arch rather than box culverts, and box culverts in preference to pipes etc.). The access tracks are up to 4m wide, therefore the watercourse crossings would need to be at least this in width, estimated at 5m wide. The unnamed channels to be crossed are estimated to be 1m wide for the unnamed drain west and south of Springthorpe Grange, and 1.5m wide for the Yawthorpe Beck. The crossings will be sized at detailed design in order to not impact on flow conveyance and be sized to ensure capacity for the peak flow rate. The culvert inverts will be buried below the natural bed level to allow for natural bed formation and passage of sediments, typically at least 0.3m. Where arch culverts are not provided, it has been assumed that the design of the structure will allow for a naturalised bed to be formed through the structure. There is varying guidance as to what minimum depth is required, but there are also design considerations. Therefore, this will be considered at detailed design stage.

10.7.41 Also to be considered at detailed design stage is to ensure the crossing is perpendicular to the flow, and connectivity is maintained for aquatic species and riparian mammals, with a mammal ledge if there is sufficient room. Perched inverts that create a drop from the structure to the downstream bed level will be avoided.

10.7.42 Where channel will be lost for an access track crossing, or for an open cut crossing, a pre-works hydromorphological survey must be undertaken to record channel features and provide the baseline against which reinstatement will be provided. Reinstatement will aim to provide an improved channel form with enhancement works to be carried out (where relevant and appropriate to do so) between 5 and 10m upstream and downstream of the open trench or access track crossing (within an easement of 10m either side) to ensure the reinstated improved channel form merges into the existing channel form. It is anticipated that enhancements will consist of soft engineering techniques and improvements to the riparian corridor to improve channel diversity and biodiversity. This is secured within the **Framework CEMP [EN010142/APP/7.8]**.

10.7.43 More detail on the watercourse crossings by access tracks will be produced during detailed design stage. The access track crossings of watercourses are assumed to be culverts as a worst-case scenario for assessment purposes at this stage, with the least impacting design proposed (e.g. arch rather than box culverts, and box culverts in preference to pipes as stated above).

Temporary Access Track Crossings of Watercourses

10.7.44 Temporary access tracks will be constructed to cross watercourses along the Cable Route Corridor. These will be temporary bailey bridge type construction. The configuration of the bridging units will be confirmed at detailed design stage. However, it is assumed that the length of the bridge deck would be sufficient to ensure no works within the 10m buffer zone from the watercourse. These would clear the channel, and ensure no construction works within the channel or banks of the watercourses to be crossed. There would be a temporary haul road of impermeable stone to access the temporary bridge crossings.

10.7.45 These will only be in place temporarily for a period of up to 36 months.

Permissions and Consents

10.7.46 The **Consents and Agreements Position Statement [EN010142/APP/3.3]** set out what permissions are required for the Scheme.

10.7.47 Various water related permissions may be required where it is not agreed with the relevant regulating authority to disapply them through the DCO. These permissions may include:

a. Land Drainage Consent(s) under Section 23 of the Land Drainage Act 1991 (as amended) (Ref. 10-41) for works affecting the flow in Ordinary Watercourses;
b. Flood risk activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 10-3) for temporary/permanent works in, over, under and within 8m of a Main River;
c. Water activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 10-3) during construction;
d. Full or Temporary Water Abstraction Licence under Section 24 of the Water Resources Act 1991 (Ref. 10-2) (if more than $20m^3$/d is to be dewatered / over-pumped and exemptions do not apply);
e. Temporary Water Impoundment Licence under Section 25 of the Water Resources Act 1991 (Ref. 10-2) where intrusive cable laying techniques may be required;
f. Approvals from the Trent Valley IDB (Water Management Consortium), Upper Witham IDB (includes Third Witham) and Scunthorpe and Gainsborough Water Management Board (Land Drainage Byelaw consents);
g. Trade Effluent Consent under the Water Resources Act 1991 (Ref. 10-2) for the purposes of discharging trade effluent from welfare facilities during construction; and
h. Marine licence from the Marine Management Organisation under the Marine and Coastal Access Act 2009 (Ref. 10-36).

10.7.48 There is the potential for requirement of either full or temporary Water Abstraction Licences from the Environment Agency for the abstraction of water from the send and receive pits associated with trenchless (non-intrusive) watercourse (and the railway) crossings, other than where exemptions apply. A full licence is required when more than $20m^3$ per day of water may need to be abstracted for longer than 28 days. A temporary licence is applicable where the abstraction is less than 28 days. Where less than 20m^3 per day of water needs to be abstracted no licence is required. However, in all circumstances it may be necessary to also obtain a Water Activity Permit from the Environment Agency to discharge the water to ground or a watercourse if the water is considered to be 'unclean.'

Design

10.7.49 Detailed information on Scheme design and infrastructure is provided in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**.

10.7.50 The Scheme is mostly located within Flood Zone 1 with the clearance of the PV panels generally no less than 0.6m above ground level. There are small areas of Flood Zone 3 within the Principal Site, these are within the floodplain of the River Till, Fillingham Beck and the River Eau. Where PV panels are to be located within these areas (field numbers 51, 56 and 57), the base of the PV modules, when at their lowest height, will be no lower than 20.06m AOD (i.e. to provide sufficient freeboard at a credible maximum scenario flood level). Mounting poles will generally be driven or screwed into the ground to a maximum depth of 4m. There will be no BESS or on-site substations located within Flood Zone 3.

10.7.51 The solar PV panels will be offset from watercourses by a buffer of 10m from the edge of wetted channel, or 9m from the top of the bank of watercourses. This protects the watercourses and riparian corridors and provides the space for any maintenance regulators may need to do, as was agreed in a meeting with the Stakeholders on 4 September 2023.

10.7.52 Indicative foundation depths associated with the Scheme include up to maximum depths of 4m for piling and erection of the PV module mounting structures, maximum trench depth of 2m and corridor working width of typically 40m for low voltage distribution cables installed using open trench techniques. The depth of any foundations required for the Principal Site infrastructure would be confirmed following Phase 2 Site Investigations. However, as a worst-case scenario, these are assumed to be a maximum depth of 2m for this assessment. In some scenarios there may be a need to construct piles for the foundations to a maximum of 12m bgl.

10.7.53 The Cable Route Corridor crosses areas at risk of flooding, within Flood Zone 2 and 3. These areas are indicated in **Figure 10-5** of this ES [**EN010142/APP/6.3**]. The areas of flooding are associated with the Fillingham Beck, River Till and the River Trent. The design of the Cable Route Corridor infrastructure is that it is buried under the surface of the ground.

Outline Drainage Strategy

10.7.54 An **Outline Drainage Strategy** has been prepared and is included within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**. This **Outline Drainage Strategy** will provide attenuation of surface water runoff from the Scheme, whilst minimising flood risk to the Scheme and surrounding areas. In accordance with planning policy guidance (as outlined in **Appendix 10-1** of this ES **[EN010142/APP/6.2]**), runoff from the Scheme will be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. This is secured through compliance with the **Outline Drainage Strategy**.

10.7.55 Individual solar PV panels will be held above the ground surface on mounting structures (see **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**). This prevents sealing the ground with an impermeable surface beneath the solar panels, allowing rainfall/runoff to infiltrate to ground throughout the Principal Site. The Solar PV Panels are on tracker systems, as they track they will direct any rainwater to different areas of ground. As a result, it is considered that the Principal Site's impermeable area within solar PV panel areas will remain substantively consistent to its pre-development state. Despite not contributing towards the impermeable areas, in order to limit the potential for channelisation from rainfall dripping off the end of the panels, the areas between, under and surrounding the solar PV panels will be planted with native grassland and wildflower mix. This planting will intercept and absorb rainfall running off the panels, preventing it from concentrating and potentially forming channels in the ground.

10.7.56 However, runoff from the solar PV panels will alter the existing routing of runoff. To prevent ponding occurring around the panels, a series of boundary (and some routing) swales will be constructed to mimic natural drainage conditions.

10.7.57 Attenuation in the form of swales have been incorporated to control any increase in the rate of flow towards the receiving watercourses. The rate of runoff from each Principal Site location within the Order limits will ensure nil detriment in terms of no increase in runoff rate from the Order limits to the receiving watercourses.

10.7.58 The **Outline Drainage Strategy** (see **Appendix 10-4** of this ES **[EN010142/APP/6.2]**) allows for 100% of the total area for the BESS and Solar Stations areas, solar farm control centre, equipment storage and on-site substations within the Order limits to be impermeable. Increases to existing runoff will be balanced by swales to encourage natural infiltration. The solar PV panel areas are to be treated as Greenfield runoff, as existing, i.e. permeable, with nil detriment to existing surface water runoff rates and volumes.

10.7.59 New access roads will be permeable, in accordance with paragraph 2.10.85 from the NPS EN-3 (Ref. 10-43). Therefore, the Principal Site's access roads will not lead to an increase in impermeable area. The drainage regime of the access roads is therefore assumed to remain consistent with its pre-developed agricultural land use.

10.7.60 No realignment of the unnamed watercourses will be necessary. As set out within the Consents and Agreements Position Statement **[EN010142/APP/3.3]**, Land Drainage Consent (s) under Section 23 of the Land Drainage Act 1991 (as amended) (Ref. 10-41) will be obtained for the design and construction of the watercourse crossings for the access roads, if those provisions are not disapplied by the DCO. There is the potential for these internal access roads to be moved at detailed design. Due to the linear nature of these watercourses, it is considered there would be no new or materially different impacts to those predicted in this chapter should access track crossings of the watercourses be moved within the Order limits.

10.7.61 In accordance with the **Framework CEMP [EN010142/APP/7.8]**, the onsite ground investigation works to take place during detailed design will investigate the use of potential infiltration. Groundwater monitoring will also take place alongside the infiltration testing to confirm the viability of an infiltration drainage scheme.

Foul Drainage

10.7.62 The Equipment Storage and Control Building will include accommodation for between 10 and 12 staff for management and maintenance of the Scheme (i.e. low volumes of foul drainage will be generated).

10.7.63 It is proposed to use a cess pit, fully contained, arrangement to drain the compound areas. Cess Pit tanks will be regularly emptied under contract with a registered recycling and waste management Contractor.

10.7.64 Another option may involve a direct discharge of treated effluent to a watercourse, but this will require much more detailed assessment and a permit from the Environment Agency. At this point in time, it is considered that this option will not be viable, and it is not considered any further. Should it be required in the future, it will be considered by the Environment Agency under the water discharge activity regime in accordance with the Environmental Permitting (England and Wales) Regulations 2016 (Ref. 10-4) which ensures the effects of any such discharge will be appropriately regulated.

Solar PV Panel Maintenance

10.7.65 A **Framework OEMP** submitted alongside the DCO application **[EN010142/APP/7.9]** will be in place for the operation and maintenance of the Scheme. The final OEMP (to be produced post-construction and prior to operation) will include measures to regulate the environmental effects of the operational phase of the Site, and to ensure any maintenance activities take place in a way to avoid and minimise any potential environmental impacts. This will include measures to manage the risk from pollution from small leaks and spillages from proposed infrastructure and maintenance activities.

10.7.66 The final OEMP for the Scheme is to be finalised prior to operation and will include a regular schedule for visual inspection of the panels. This will ensure that the structural integrity of the panels will be regularly observed. In this way, any panels which required maintenance / replacement will be removed before there was any leakage of chemicals from the sealed units. The panels are constructed in a robust manner and their components cannot be separated except with a considerable mechanical load. Therefore, the risk of any liquid leakage from the panels is very low, especially in any large quantities.

10.7.67 The final OEMP (to be produced post-construction and prior to operation) will also include measures to regulate the environmental effects of the operational phase of the Scheme, and to ensure any maintenance activities take place in a way to avoid and minimise any potential environmental impacts. This will include measures to manage the risk of pollution from proposed infrastructure spillages and maintenance activities, such as correct storage in appropriately bunded areas of any hazardous materials, and appropriate, regular inspection and maintenance of all equipment on site.

Operational Cleaning

10.7.68 In line with the **Framework OEMP [EN010142/APP/7.9]**, it is assumed that the solar PV panels will be cleaned around once per year, using clean water with no added chemicals. This will be at $3m^3$ of water required for every 1000 panels, with an estimated water requirement per year of $2,355m^3$ of water once per year. This water will be sourced from local water suppliers, not from the main supply, and will not lead to any significant pollution risk.

10.7.69 The operator of the Scheme will be required to obtain water from a suitable source for ongoing requirements for panel cleaning. This may involve purchasing water when needed from a suitable third-party provider.

Management of fire risk

10.7.70 The management strategy for battery fire safety is provided in the **Framework Battery Safety Management Plan** submitted alongside the DCO application **[EN010142/APP/7.13]**. BESS areas require stored fire water to supress a fire, should one break out. Associated with these fire water storage areas, the drainage design also allows for fire water containment by providing a penstock arrangement on the lined swales surrounding each BESS. It is not anticipated that active fire-fighting will be undertaken as this can spread chemicals used in the process and which are potentially harmful to the water environment. Instead, any apparatus or containers that catch fire will be allowed to burn out. Water will be sprayed onto adjacent containers to keep them cool and reduce the risk of the fire spreading. The water used will therefore be less likely to be contaminated but will still be directed to the fire water storage areas from where decisions about suitable disposal can be made post incident. In the unlikely event of fire water being discharged, the runoff will be contained and tested/treated before being allowed to discharge to the local watercourses.

10.7.71 The BESS containers will also possess an internal fire suppression system. As stated in the **Framework Battery Safety Management Plan [EN010142/APP/7.13]**, internal BESS water based fixed suppression systems will have a separate water containment system because water runoff is likely to contain higher levels of pollution.

10.7.72 It is proposed to contain the external fire water runoff within the swale surrounding the BESS, where it can be held and tested before either being released into the surrounding watercourses or taken off site by a tanker for treatment elsewhere. The swale will then be cleaned of all contaminants.

10.7.73 The swale will be underlain with an impermeable liner to prevent any contaminants entering the ground.

10.7.74 The swale will be controlled by a penstock valve that can be closed before a fire is put out.

10.7.75 Consultation with the Lincolnshire Fire Rescue Service has been carried out to agree the fire safety management plan. The National Fire Chiefs Council guidance states firefighting supplies ‘should be capable of delivering no less than 1,900 litres per minute for at least 2 hours’. On top of this supply requirement, a 30% additional capacity has been applied for storage in the swale. This equates to approximately 300m^3. The fire water management plan will include the containment, monitoring and correct disposal of any contained fire water. Infrastructure shall be provided for the containment and management of contaminated fire water runoff from BESS. This can include bunding, sumps, and purpose-built impervious retention facilities.

Drainage Outfalls

10.7.76 Where possible, surface water will drain from the Scheme’s swale based drainage system to local receiving watercourses via a new ditch, or the piped section will be shortened and the last 10m section of the outfall route will be open ditch unless this affects maintenance of the channel by the IDB. This will be secured as part of the **Outline Drainage Strategy** (refer to **Appendix 10-4** of this ES **[EN010142/APP/6.2]**). A green ditch outfall would avoid the need to construct an engineered outfall. However, if engineered outfalls are required, the location, position and orientation of them will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. Appropriate micro-siting of the outfall will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes (e.g. angled 30-60° downstream to the direction of flow). It will also avoid the creation of ‘dead’ spaces with sedimentation and vegetation blockage risks and to that effect it is not proposed that outfalls are recessed into the bank. It is assumed that the site survey and micro-siting of outfalls will occur following grant of the DCO in compliance with the **Outline Drainage Strategy**.

10.7.77 It is important that during the operation of the Scheme there is regular inspection and maintenance of the drainage systems, proposed SuDS and watercourse crossings. As set out within the **Framework OEMP [EN010142/APP/7.9]**, this will be carried out in accordance with good practice guidance. The drainage system will be designed in accordance with current guidance to ensure that the potential for siltation and blockages is minimised under normal operation. If there is any evidence of excessive erosion or sedimentation associated with new structures further actions will be considered to remedy that impact as sustainably as possible.

Decommissioning Stage

10.7.78 At the decommissioning stage the potential impacts to the water environment would be controlled by a DEMP. This would ensure that potential impacts are considered and controlled within the decommissioning process. A **Framework DEMP** is submitted with the DCO application **[EN010142/APP/7.10]**.

10.8 Assessment of Likely Impacts and Effects

10.8.1 The Scheme as outlined in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]** has been considered in assessing the likely impacts and effects on the water environment, whilst considering the embedded mitigation described in **Section 10.7**. More information on the methodology is included in **Section 10.4** of this chapter.

Construction (2025 to 2027): Principal Site

10.8.2 During construction, the following adverse impacts on the water environment may occur:

a. Pollution of surface water (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site run-off including dewatering of excavations;

b. Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required;

c. Potential impacts on groundwater resources, including licenced and unlicenced (private) water supplies;

d. Potential impact on baseflow to watercourses from temporary dewatering of excavations or changes in hydrology;

e. Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works) and exacerbation of localised flooding, due to deposition of silt, sediment in drains, ditches; and

f. Changes in flood risk due to the construction of PV panels, which may alter runoff from the Principal Site.

10.8.3 Any significant effects are summarised at the end of this section, with discussion presented below in the following paragraphs.

Pollution of Surface Water Features

Construction of Solar Array and Associated Infrastructure

10.8.4 Construction activities such as earthworks, excavations, site preparation, levelling and grading operations result in the disturbance of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction, and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, which may eventually be transported to watercourses where it can result in adverse impacts on water quality, flora and fauna.

10.8.5 Construction works within, along the banks and across watercourses can also be a direct source of fine sediment mobilisation. Other potential sources of fine sediment during construction works include water runoff from earth stockpiles, dewatering of excavations (surface and groundwater), mud deposited on site and local access roads, and that which is generated by the construction works themselves or from vehicle washing.

10.8.6 Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering riverbeds and plants, temporarily changing water quality (e.g. increased turbidity and reduced photosynthesis) and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion or irritation).

10.8.7 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on-site. Leaks and spillages of these substances could pollute the nearby surface watercourses if their use or removal is not carefully controlled, and spillages enter existing flow pathways or water features directly. Like excessive fine sediment in construction site runoff, the risk is greatest where works occur close to and within water features.

10.8.8 As stated in the assumptions, some watercourses will be crossed by a trenchless (or non-intrusive) method, with other smaller watercourses being crossed using trench (or intrusive open cut) techniques.

10.8.9 Within the Principal Site, there is the River Eau and its tributary from the south, Yawthorpe Beck, and many unnamed channels. It is likely there are more minor surface water channels within the catchment contained within the Principal Site which feed into these watercourses. The unnamed drains and Yawthorpe Beck within the Principal Site all considered to be of low importance for water quality.

10.8.10 There is a potential for pollution of indirect temporary short-term pollution of surface water features during construction works to install the PV solar array and associated infrastructure, or spillages of potentially polluting chemical substances. For the high importance receptor, being the River Eau in the north, and the low importance unnamed tributaries in the Fillingham Beck and Till catchments, it is considered that with the proposed embedded mitigation measures this will result in a very low adverse impact on the water features from the indirect temporary short-term impact from installation of PV solar array and associated infrastructure. This will result in a **minor adverse effect** (**not significant**) on the Eau and **negligible effect** (**not significant**) for the Yawthorpe Beck and unnamed tributaries.

Internal Cabling

10.8.11 There may also be a requirement to cross water features for internal cabling connections. The location of internal cabling crossings within the Principal Site is shown in **Figure 3-5** of this ES **[EN010142/APP/6.3]**. This shows there are 10 open cut watercourse crossings within the Principal Site. There are no monitored WFD reaches within the Principal Site as shown on **Figure 10-5** of this ES **[EN010142/APP/6.3]** and these open cuts are on smaller, often ephemeral unnamed agricultural ditches crossings of low importance, and the Yawthorpe Beck, also of low importance. with the proposed Embedded Mitigation measures, it is considered the impact to the low importance water features would be a direct, temporary and short term very low adverse impact is predicted on unnamed drainage ditches, resulting in a **negligible effect** (**not significant**).

Access

10.8.12 Permanent access tracks being constructed cross watercourses in several locations. These are summarised in **Section 10.7**, under Access Track Crossings of Watercourses.

10.8.13 Some of the crossings are existing but may require adaptation depending on their construction and/ or design, therefore, these have been assessed on a worst-case precautionary basis as described earlier. The unnamed ditches, and Yawthorpe Beck being crossed by access tracks are of low importance. If culverts are proposed they will need to be constructed online with the flow over-pumped or flumed through the works to create a dry working area that will reduce the risk of pollution. With the proposed standard mitigation a direct permanent long term very low adverse impact is predicted on Yawthorpe Beck and the unnamed drainage ditches, resulting in a **negligible effect** (**not significant**). However, in practice alternative options to culverts should be considered (or arch culverts that are less impacting as noted in the **Section 10.7**).

Outfalls

10.8.14 The BESS areas are separated throughout the Principal Site, with up to 140 separate BESS sites, across up to 50 locations, the future surface water outfalls will therefore be located throughout the Principal Site, linking to the Yawthorpe Beck and local unnamed drains. The current **Outline Drainage Strategy** (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**) shows engineered outfalls, though there remains an opportunity within the detailed planning stage for any SuDS or surface water drainage systems to connect to the existing waterways using ditches to avoid engineered outfalls entirely.

10.8.15 Although it is assumed that construction of any outfalls will be within a dry working area, their construction will result in some temporary disturbance to the bed and banks and the risk of chemical spillages, especially if pre-cast headwalls cannot be used requiring pouring of wet concrete close to water. The majority of the receptors within the Principal Site are unnamed channels, receptors of low importance, this will result in a localised, direct, temporary and short term very low adverse magnitude of impact, which, with embedded mitigation in place, will result in a **negligible effect** (**not significant**). BESS location to the east of Harpswell Grange, from its location, may require construction of and outfall of the swale drainage into the River Eau. With the embedded mitigation measures in place, this is considered to result in a localised, direct, temporary and short term very low adverse magnitude of impact, which will result in a **minor adverse effect** (**not significant**).

Temporary Impacts on the Hydromorphology of Watercourses

10.8.16 There is a requirement to cross water features for internal cabling connections, this includes unnamed drains and six cable crossings of Yawthorpe Beck. For small unnamed ditches of low importance, and the low importance Yawthorpe Beck, it is proposed that intrusive techniques will be used. With the proposed standard mitigation in place this would be an unavoidable direct, temporary short term low adverse magnitude of impact, resulting in a **negligible effect (not significant)** for the unnamed drains and Yawthorpe Beck.

10.8.17 Permanent changes in hydromorphology that may be associated with new surface water outfalls and access across watercourses are considered under the operational phase.

Groundwater

Risk of Pollution from Construction Works

10.8.18 As indicated in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1]**, the low-voltage on-site cabling to connect the solar PV modules to the inverters may require trenches of around 1.2m deep. The higher voltage cables required to connect the transformers to the on-site substations may require trenches around 1.7m deep. However, this may vary at different points along the cable route when required. Other structures included within the subsurface include the galvanized steel poles to support the PV module mounting structures. The depth of these poles is assumed to be around 4m bgl as a worst case. There may also be pilling up to 12m bgl for the foundation works of any infrastructure within the Principal Site.

10.8.19 There is limited groundwater level data across the Principal Site, however, it is likely that groundwater within the Alluvium and River Terrace Deposits is shallow at <1m below the ground surface and for the bedrock greater than 15m bgl. Therefore, shallow groundwater in the superficial deposits may be encountered during construction within the superficial deposits.

10.8.20 Taking into account the scale of the construction works that may encounter groundwater across the whole Principal Site, and taking into account the measures to be secured within the **Framework CEMP [EN010145/APP/7.8]**, are considered to be a no change magnitude of impact, which on medium importance groundwater features (i.e. Scunthorpe Mudstone Formation and Charmouth Mudstone Formation) results in a **neutral effect** (**not significant**) from construction of the PV modules.

10.8.21 No impacts on groundwater abstractions or PWS are predicted as none are situated within the Principal Site.

Groundwater Flow Impacts

10.8.22 As no continuous foundations are in the Scheme design and that groundwater is likely to be within the shallow superficial units across the majority of the Principal Site, the shallow, regularly spaced discrete solar PV panel mounting foundations and the cabling trenches are considered to have no impact on groundwater flow due to the relatively high permeability of the sand and gravel aquifer present across the Principal Site. Significant groundwater flows are not anticipated in the Till and Alluvium superficial deposits present across the majority of the Principal Site due to being largely clayey and of low permeability. On the basis of the above, as the importance of the receptor is classified as medium, the magnitude of impact from the cabling trenches is considered to be no change, this results in a **neutral effect** (**not significant**).

10.8.23 Cable routes beneath watercourses are anticipated to be below the water table over part of the routes as they pass through the Principal Site. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered to have a direct, temporary and short-term very low magnitude of impact on groundwater flow. A very low magnitude of impact on groundwater flow on medium importance groundwater features (Scunthorpe Mudstone Formation and Charmouth Mudstone Formation) results in a **negligible effect** (**not significant**).

10.8.24 No impacts on groundwater abstractions or PWS are predicted as none are situated within the Principal Site.

Groundwater Dewatering Impacts

10.8.25 Construction works to install cables beneath drains/streams using drilling or boring techniques may involve a temporary pit either side of the watercourse (>10m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits along the length of the cable route.

10.8.26 As outlined above, there may be shallow groundwater on parts of the Principal Site, and so there is potential for groundwater ingress to the pits. This will be managed following standard construction techniques potentially including pumping, damming or shoring up the pits with temporary sheet piling. Significant groundwater ingress is not anticipated due to the largely clayey low permeability Till and Alluvium superficial cover, and the discontinuous pockets of the sand and gravel aquifer across the Principal Site.

10.8.27 A temporary abstraction licence may be required from the Environment Agency when abstracting more than $20m^3$ of water per day. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April 2021) cannot be met. The potential risk identified from potentially contaminated land have been assessed as being very low to low within **Appendix 17-3: Ground Conditions Principal Site PRA** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**.

10.8.28 The pits will be backfilled with the original excavated material upon completion and will not affect groundwater baseflow in the longer term. Given the potential to encounter groundwater temporarily during construction, but taking into account that it will be appropriately managed in line with any required permit conditions and good industry practice as outlined in this chapter and the **Framework CEMP [EN010142/APP/7.8]**, there is the likelihood of a direct, short term, temporary and localised low adverse magnitude of impact on groundwater levels and flow. For the medium importance groundwater aquifers (Scunthorpe and Charmouth Mudstone Formations as bedrock, with some Alluvial deposits close to watercourses) this is considered to have a direct, temporary short-term negligible impact therefore resulting in a **minor adverse effect** (**not significant**).

10.8.29 No impacts on groundwater abstractions or PWS are predicted as none are situated within the Principal Site.

Mobilisation of Existing Contamination

10.8.30 The Study Area of the Principal Site is not known to have a significant history of potentially contaminating land uses such as landfill, although there are areas of infilled land and Made Ground associated with historic quarries and pits. The potential risk identified from potentially contaminated land have been assessed as being very low to low **Appendix 17-3: Ground Conditions Principal Site PRA** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**.

10.8.31 The installation of the module structures to a maximum depth of 4m below ground, and other foundations depths as outlined above, are not considered at this stage to create a significant risk of mobilising contaminants, creating a contaminant pathway or risking infiltration to the water table.

10.8.32 Therefore, the potential for impact to groundwater quality from any existing contamination within the underlying medium importance receptors (Scunthorpe and Charmouth Mudstone Formation, and alluvial deposits) is considered to be indirect, temporary and short-term very low adverse magnitude of impact, and a **negligible effect** (**not significant**).

10.8.33 Consequently, water quality impacts to rivers receiving baseflow, and groundwater abstractions down gradient are considered to be an indirect, temporary, and short term very low magnitude of impact, on groundwater receptors of medium importance, and a resulting **negligible effect** (**not significant**).

10.8.34 No impacts on groundwater abstractions or PWS are predicted, as none are situated within the Principal Site.

Flood Risk

10.8.35 During the construction phase, the flood risk resulting from the construction within the Principal Site is not envisaged to impact fluvial, tidal, groundwater, sewers, or artificial risk levels of flooding within or surrounding the Principal Site Order limits.

10.8.36 The increase in surface water runoff rates as a result of the with-Scheme scenario will be managed by the construction of sustainable drainage techniques proposed to mimic the pre-Scheme conditions detailed within **Appendix 10-4: Outline Drainage Strategy** of this ES **[EN010142/APP/6.2]**, resulting in no impact to flooding from surface water sources within or surrounding the Order limits during the construction phase.

10.8.37 A summary of the pre- and construction phase scenario flood risk levels for all sources within the Principal Site is provided in **Table 10-17** below, details of which have been taken from Table 5-1 of **Appendix 10-3: Flood Risk Assessment** of this ES **[EN010142/APP/6.2]**.

Table 10-17: Flood Risk pre-Scheme to Construction Phase assessment

Flood Risk Source	Pre-Scheme Flood Risk Level	Construction Phase Flood Risk Level	Comments
Fluvial	Low (Principal Site)	Low (Principal Site)	Discharge from impermeable areas detailed in the **Appendix 10-4: Outline Drainage Strategy** of this ES **[EN010142/APP/6.2]** are to be restricted to Greenfield rates, mitigating increases to peak river flow rates. Solar PV Panel infrastructure within Flood Zones 2/3 “interaction zone” is not envisaged to alter the existing flood extents’ topography and are proposed to be installed to enable 300mm freeboard during the 1 in 100 year plus climate change design scenario. The credible maximum scenario has also been assessed to ensure the site remains operational during times of flood.
Tidal	Low (majority of Order limits) – High (areas associated with watercourses)	Low (majority of Order limits) – High (areas associated with watercourses)	No change to flood risk level.
Pluvial (surface water)	Low	Low	Increased surface water runoff is proposed to be managed to mimic the pre-Scheme conditions for up to and including the 1 in 100 + 40% climate change event. No change in flood risk level.

Flood Risk Source	Pre-Scheme Flood Risk Level	Construction Phase Flood Risk Level	Comments
Groundwater	Low	Low	The **Outline Drainage Strategy** (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**) does not propose to utilise infiltration techniques to discharge increased surface water runoff. No change to flood risk level.
Sewers	Low	Low	No change to flood risk level.
Artificial sources	Low (Principal Site and majority of Cable Route Corridor) – Medium (small area of Cable Route Corridor where crossing the River Trent)	Low (Principal Site and majority of Cable Route Corridor) – Medium (small area of Cable Route Corridor where crossing the River Trent)	No change to flood risk level.

10.8.38 As noted in the **Table 10-17** above, with the drainage design mimicking the natural flow from the Principal Site, and this being commenced during the construction phase, the construction of the Scheme will result in a no change magnitude of impact for all sources of flood risk. Based on the essential infrastructure within the Principal Site, the receptor is of very high importance, resulting in a **neutral** (**not significant**) effect.

10.8.39 The change of land use within the Principal Site has the potential to result in a change in flood potential to off-site receptor, such as more vulnerable residential housing, high importance receptor. Based on **Table 10-17** above there will be a no change magnitude of impact on the high importance receptor. This results in a **neutral** (**not significant**) effect.

Summary of Construction Phase Impacts and Effects on the Water Environment for the Principal Site

10.8.40 Table provides a summary of the potential impacts and effects on the water environment during construction of the Principal Site.

Table 10-18: Summary of Magnitude of Impact and Significance of Effect for the Construction Phase of the Principal Site

Receptor	Importance	Description of Impact	Impact	Effect
River Eau	High	Potential pollution of surface water during construction of PV areas, fine sediments, any spillages of polluting substances from construction of solar array and associated infrastructure.	Very Low adverse	**Minor adverse** (**not significant**)
Yawthorpe Beck	Low	As above	Indirect, temporary short-term low adverse	**Negligible** (**not significant**)
Unnamed ditches	Low	As above	Indirect, temporary short-term low adverse	**Negligible** (**not significant**)
Yawthorpe Beck	Low	Impact on water quality of crossing of ditches for internal cabling by intrusive techniques	Direct, temporary, short-term very low adverse	**Negligible** (**not significant**)
Unnamed ditches	Low	Impact on water quality of crossing of ditches for internal cabling by intrusive techniques	Direct, temporary, short-term very low adverse	**Negligible** (**not significant**)
Yawthorpe Beck	Low	Impact on water quality of crossing of ditches for internal cabling by intrusive techniques	Direct permanent, long term very low adverse	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Impact	Effect
Unnamed ditches	Low	Crossing of watercourses by access tracks, using culvert construction.	Direct permanent , long term very low adverse	**Negligible** (**not significant**)
River Eau	High	Construction of any SuDS or surface water drainage system outfalls.	Direct temporary, short term very low adverse	**Minor adverse** (**not significant**)
Yawthorpe Beck	Low	Construction of any SuDS or surface water drainage system outfalls.	Direct temporary, short term very Low	**Negligible** (**not significant**)
Unnamed ditches	Low	Construction of any SuDS or surface water drainage system outfalls.	Direct temporary, short term very Low	**Negligible** (**not significant**)
Yawthorpe Beck	Low	Temporary impacts on hydro-morphology from open cut trenched techniques for internal cabling	Direct, temporary, short-term low adverse	**Negligible** (**not significant**)
Unnameddi tches	Low	Temporary impacts on hydro-morphology from open cut trenched techniques for internal cabling	Direct, temporary, short-term low adverse	**Negligible** (**not significant**)
Scunthorpe Mudstone Formation, Charmouth Mudstone Formation, and alluvial deposits	Medium	Potential impacts to quality of groundwater resources from construction works including any local water supplies (unlicenced abstractions)	No change	**Neutral** (**not significant**)
	Medium	Potential impact to groundwater flow from foundations /construction of the PV bases	No change	**Neutral** (**not significant**)

Receptor	Importance	Description of Impact	Impact	Effect
	Medium	Potential impact to groundwater flow from construction of internal cable routes.	Direct, temporary short term very Low	**Negligible** (**not significant**)
	Medium	Potential impact to groundwater levels and flow from temporary dewatering	Direct, temporary and short term low adverse	**Minor adverse** (**not significant**)
	Medium	Potential impact to groundwater quality from any mobilisation of existing contamination, and water quality impacts to river baseflow.	Indirect, temporary, and short-term very Low	**Negligible** (**not significant**)
Essential Infrastructure	**Very High**	Impact of flooding on essential infrastructure within Principal Site	No change	**Neutral** (**not significant**)
Residential housing	**High**	Potential for changing of flooding potential to vulnerable land uses off site, or on offsite flooding potential.	No change	**Neutral** (**not significant**)

Construction (2025 to 2027): Cable Route Corridor

10.8.41 During construction of the Cable Route Corridor the following adverse impacts may occur:

a. Pollution of surface water (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site runoff including dewatering of excavations;

b. Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required;

c. Potential impacts on groundwater resources, local water supplies (licenced and unlicenced abstractions) and potentially the baseflow to watercourses from temporary dewatering of excavations or changes in hydrology; and

d. Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works) and exacerbation of localised flooding, due to deposition of silt, sediment in drains, ditches; and changes.

10.8.42 These are summarised in Table ~~Table~~ at the end of this section, with discussion presented below in the following paragraphs.

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Surface Water Features

10.8.43 The Cable Route Corridor has six WFD designated water body catchments, within which there are a number of watercourses that may require crossing, depending on the route chosen. These catchments are shown on **Figure 10-1** of the ES **[EN010142/APP/6.3]**. The same impacts and effects as those discussed in **Section 10.8** (Principal Site, Surface Waterbodies – Construction Assessment) are likely to be present within the Cable Route Corridor.

10.8.44 The Cable Route Corridor will be constructed beneath the channel of the River Trent. Drilling or boring techniques are proposed to be used, which will not disturb the watercourse bed. However, launch and receiving pits will be required for drilling (no closer than 10m from the water's/channel edge) and there will be need for plant movements in the vicinity of the channel during construction. As such, there will be a risk of sediment mobilisation in runoff and for chemical spillages to occur that could enter the channel if not managed accordingly.

10.8.45 There is a small risk of hydraulic fluid break out from drilling to the watercourse if not appropriately mitigated for site specific conditions. A site-specific hydraulic fracture risk assessment will be produced prior to commencing works to define the mitigation required based on ground conditions. This requirement is included within the **Framework CEMP [EN010142/APP/7.8]** and will minimised the risk of such break outs. Water quality monitoring will also be undertaken prior to, during, and following on from the construction activity to ensure any spillages or other pollution is identified. These mitigation requirements will be outlined in a WMP and secured in the **Framework CEMP [EN010142/APP/7.8]**.

10.8.46 Watercourses crossed by trenchless techniques are shown in **Figure 10.5** of the ES **[EN010142/APP/6.3]**. Other more minor channels will be crossed by open cut techniques (i.e. a precautionary approach has been adopted).

Cable Crossings

10.8.47 The Cable Route Corridor, and internal cabling, will have a total of 39 watercourse crossing locations. 20 will be constructed with trenchless techniques, and 18 will be open cut construction. The open cut construction will take place on four unnamed ditches within the Fillingham Beck catchment east of Willingham by Stowe, and four unnamed ditches within the River Till catchment west of Normanby by Stow. The remaining 10 are within the Principal Site, with three being on Yawthorpe Beck, and seven on unnamed ditches. No WFD monitored reaches of watercourses are crossed using open cut techniques.

10.8.48 With regard to the River Trent, there is considered to be very low potential for impact from works to install a cable beneath it given the mitigation measures in place. For the very high importance River Trent, a direct temporary, and short term very low magnitude of impact results in a temporary **minor adverse effect** (**not significant**). Coates Wetland LWS are located within the catchment of the River Trent, as is assessed as part of the River Trent receptor.

10.8.49 Directional drilling will also be used for crossing the other WFD monitored reach watercourse channels. Therefore, as above it is considered there will be a direct temporary short term very low magnitude impact from the risk of water pollution including drilling fluid break out events, which on high importance water features (River Till and Till tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain) results in a temporary **minor adverse effect** (**not significant**) with embedded mitigation measures in place. Cows Pasture Drain LWS and Mother Ings Drain are within Seymour Drain catchment, and are assessed as part of the Seymour Drain receptor.

10.8.50 For the intrusive open cut crossings for the Cable Route Corridor there is likely to be unavoidable short term, temporary adverse impacts on the channel morphology, riparian habitats, and the hydrological and sediment regimes during construction. However, given mitigation measures in place, including over-pumping or fluming of the flow, reinstatement as found and implementation of good practice measures, which are outlined in the **Framework CEMP [EN010142/APP/7.8]**, these impacts will be a direct temporary and short term very low adverse magnitude of impact in terms of water quality. A very low adverse magnitude of impact on a low importance receptor will result in a **negligible effect** (**not significant**).

Temporary Impacts on the Hydromorphology of Watercourses

10.8.51 Watercourses crossed by trenchless techniques are shown in **Figure 3.5** of the ES **[EN010142/APP/6.3]**. Smaller watercourses will be crossed by open cut techniques (i.e. a precautionary approach has been adopted).

10.8.52 With regard to the River Trent, there is considered to be no change impact on hydromorphology from works to install a cable beneath it given the mitigation measures in place and the distance of the launch/receiving pits from the banks. For the low importance for hydromorphology River Trent, a no change magnitude of impact results in a **neutral effect** (**not significant**).

10.8.53 Directional drilling will also be used for crossing the other WFD watercourse channels. Therefore, as above it is considered there will be a no change magnitude of impact on their hydromorphology which on low importance water features (River Till and tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain) results in a temporary **neutral effect** (**not significant**).

10.8.54 For the intrusive open cut crossings on the Cable Route Corridor, there is likely to be unavoidable short term, temporary adverse impacts on the channel morphology, their riparian habitats, and the hydrological and sediment regimes during construction. With the proposed mitigation measures, it is considered there would be a direct, temporary and short term low adverse impact. A low adverse magnitude of impact, on a low importance receptor, will result in a **negligible effect** (**not significant**).

10.8.55 There is a requirement for the temporary crossing of watercourses during the Cable Route construction. As stated within the Embedded Mitigation, these will be temporary bailey bridges, with the deck length long enough to ensure no works within the channel or banks, and not within the buffer to the watercourse. Therefore, it is considered there would be a direct, temporary short term low adverse impact. A low adverse magnitude of impact, on a low importance receptor, will result in a **negligible effect** (**not significant**).

Groundwater

Risk of Pollution from Construction Works

10.8.56 As indicated in **Chapter 3: Scheme Description** of this ES **[EN010142/APP/6.1],** the low-voltage on-site cabling to connect the solar PV modules to the inverters may require trenches of around 1.2m deep. The higher voltage cables which are required to connect the transformers to the on-site substations may require trenches around 1.7m deep. However, this may vary at different points along the cable route, when required. Works that include open excavations potentially create new pathways to groundwater and thus potential impacts should be assessed.

10.8.57 There is limited groundwater level data across the Order limits including the Cable Route Corridor, however it is likely that groundwater within the Alluvium and River Terrace Deposits is shallow at <1m below the ground surface and for the bedrock to range from 15m to 20m bgl. Therefore, groundwater may be encountered during construction from the superficial deposits.

10.8.58 The potential impact of construction on groundwater quality during construction of the Cable Route Corridor, taking into account the measures secured within the **Framework CEMP [EN010142/APP/7.8]** (as discussed earlier in **Section 10.7**), is considered to be a temporary no change impact, which on the medium importance receptor results in a **neutral effect** (**not significant**).

Groundwater Flow Impacts

10.8.59 As there are no large, or deep, continuous foundations in the design, the cabling trenches are considered to have a negligible impact on groundwater flow. As such, no impediment to baseflow in the River Trent and connected tributaries are anticipated. As the receptors are classified as medium importance (Mercia Mudstone Group, Penarth Group – Mudstone, Scunthorpe Mudstone Formation and Charmouth Mudstone Formation, and alluvial deposits) and the magnitude of impact is considered to be no change, the resulting significance of effect is a **neutral effect** (**not significant**).

10.8.60 No impacts to groundwater abstractions on PWS are predicted as none are situated within the Cable Route Corridor.

10.8.61 The Cable Route Corridor is planned to cross a number of roads and rivers including the River Trent. The cable routes beneath watercourses are anticipated to be below the water table over part of their routes. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered to have a negligible impact on groundwater flow. As such, no impediments to baseflow in the River Trent or small watercourses across the Cable Route Corridor are anticipated. A direct, temporary, short term very low magnitude of adverse impact on medium importance receptors (Mercia Mudstone Group, Penarth Group – Mudstone, Scunthorpe Mudstone Formation and Charmouth Mudstone Formation and alluvial deposits) is assessed to result in a **negligible effect** (**not significant**).

Groundwater Dewatering Impacts

10.8.62 Construction works to install cables beneath the River Trent using drilling or boring techniques will involve a temporary pit either side of the watercourse (>10m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits along the length of the Cable Route Corridor. Maximum parameters for the pit dimensions have been assumed to be no greater than 4m by 3m by 2m deep.

10.8.63 As outlined above there may be shallow groundwater in parts of the Cable Route Corridor, and so there is potential for groundwater ingress to the pits. The potential risk identified from potentially contaminated land have been assessed as being very low to low **Appendix 17-3: Ground Conditions Principal Site PRA** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**. This will be managed using Embedded Mitigation measures as Stated in **Section 10.7**.

10.8.64 There is the likelihood of a short term, temporary very low adverse impact on groundwater flow. For the medium importance groundwater aquifers associated with Mercia Mudstone Group, Penarth Group – Mudstone, Scunthorpe Mudstone Formation and Charmouth Mudstone Formation and alluvial and sand and gravel superficial deposits, this is considered to have a very low to low adverse impact therefore resulting in a **negligible effect** (**not significant**).

Mobilisation of Existing Contamination

10.8.65 The 1km Study Area surrounding the Order limits for the Cable Route Corridor is not known to have a significant history of potentially contaminating land uses such as landfill, although there are areas of infilled land and made ground associated with historic quarries and pits. The potential risk identified from potentially contaminated land have been assessed as being very low to low **Appendix 17-3: Ground Conditions Principal Site PRA** and **Appendix 17-4: Ground Conditions Cable Route Corridor PRA** of this ES **[EN010142/APP/6.2]**. The excavation of the trench and installation of the cable are not considered at this stage to create a significant risk of mobilising contaminants, creating a contaminant pathway or risking infiltration to the water table.

10.8.66 Therefore, the potential for impact to groundwater from any existing contamination within the underlying medium importance receptors (Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe and Charmouth Mudstone Formation, and alluvial and sand deposits) is considered to be direct temporary short term very low adverse magnitude of impact, and a **negligible adverse effect** (**not significant**).

10.8.67 Consequently, water quality impacts to rivers receiving baseflow, and groundwater abstractions down gradient, considered to be of medium importance are considered to be direct temporary short term very low adverse magnitude of impact, and a **negligible adverse effect** (**not significant**).

Flood Risk

10.8.68 As the cable will be buried throughout the Cable Route Corridor there will be no long term impact on flood risk.

10.8.69 A summary of the pre- and construction phase Scheme scenario for construction flood risk levels for all sources within the Cable Route Corridor is provided in **Table 10-19** below, details of which have been taken from Table 5-1 of the **FRA**, which is included as **Appendix 10-3** of this ES [**EN010142/APP/6.2**].

Table 10-19: Flood Risk pre-Scheme to Construction Phase assessment

Flood Risk Source	Pre-Scheme Flood Risk Level	Construction Phase Flood Risk Level	Comments
Fluvial	High (Cable Route Corridor cross the River Till and Trent to where it connects to National Grid Cottam Substation.	High (Cable Route Corridor cross the River Till and Trent to where it connects to National Grid Cottam Substation.	**Source: (Figure 9.1 and 9.2 of WLDC SFRA) and online mapping (Gov.uk).** No change to flood risk level and no increase in flood risk. No permanent above ground infrastructure being located in the Cable Route Corridor. No long term flood risk and no mitigation required (i.e. no floodplain compensation or raising of ground levels/floor levels. No alternative Cable Route Corridor available that will avoid Flood Zones 2/3 completely.

Flood Risk Source	Pre-Scheme Flood Risk Level	Construction Phase Flood Risk Level	Comments
Tidal	Medium to High along majority of cable route in tidal Trent reaches.	Medium to High along majority of cable route in tidal Trent reaches.	**Source: (Figure 9.1 and 9.2 of WLDC SFRA).** No change to flood risk level and no increase in flood risk.
Pluvial (surface water)	Medium to High along cable route through interaction with fluvial Flood Zones	Medium to High along cable route through interaction with fluvial Flood Zones	**Source: (Online SW Mapping, Gov.uk).** No change to flood risk level and no increase in flood risk. No mitigation required for below ground cables. Any interaction with existing below ground drainage (land drains) will be managed and reinstated during construction and set out in the **Framework CEMP [EN010142/APP/7.8].**
Groundwater	Low to Medium	Low to Medium	**Source: British Geological Society (BGS) Online and Lincolnshire County Council (LCC) PFRA.** No historical groundwater flooding events are mentioned specifically within West Lindsey. However, where the Cable Route Corridor crosses the Rivers Trent and Till, groundwater may be elevated. There is no risk mapping for groundwater in this area, but as soils are largely impermeable the risk is considered medium, as the bedrock geology will not support large amounts of water storage, such as an aquifer.

Flood Risk Source	Pre-Scheme Flood Risk Level	Construction Phase Flood Risk Level	Comments
Sewers	Low	Low	**Source (WLDC SFRA and LCC PFRA):** No change to flood risk level. There are no confirmed sewers in the vicinity of the Cable Route Corridor. As there is no proposed connection to public sewers along the Cable Route Corridor, there will be no increase in sewer flood risk as a result of the Scheme. Construction risk of exposing or damaging sewers is included and managed within the **Framework CEMP [EN010142/APP/7.8]**.
Artificial sources	Medium to High (residual) – Flood risk from artificial sources are confined to small areas of the cable route corridor with a medium risk. However, the risk is increased when river levels are in high or flood conditions	Medium to High (residual)– Flood risk from artificial sources are confined to small areas of the cable route corridor with a medium risk. However, the risk is increased when river levels are in high or flood conditions	No change to flood risk level and no mitigation required.

10.8.70 The construction phase of Scheme, including the construction compounds, will not result in any changes to the risk of flooding potential from all sources of flooding from the Cable Route Corridor to surrounding land. Therefore, it is considered that the Scheme will result in a no change magnitude of impact. The receptors in the area are considered to be very high sensitivity, as in addition to residential receptors, there is the essential infrastructure of a sewage treatment works located within an area at risk of fluvial flooding close to the village of Willoughby. A no change magnitude of impact on a very high importance receptor is considered to result in a **neutral** (**not significant**) effect.

10.8.71 The Scheme in the Cable Route Corridor consists of below ground cabling. Therefore it is considered there would be a no change magnitude of impact for all potential sources of flooding in the study area on the Cable Route Corridor itself. On a very high importance receptor, this results in a **neutral effect** (**not significant)**.

10.8.72 The majority of the construction compounds are located within Flood Zone 1. Two compounds are located within the defended River Trent Flood Zone 3, with a low residual risk of flooding as a result. ~~The other~~Safe refuge will be provided for both of these construction compounds, at a level above 7.66m AOD in accordance with the **Framework CEMP [EN010142/APP/7.8]**. A third compound, east of Willingham by Stowe, is close to the Flood Zone 2/3 extent associated with Fillingham Beck. It is proposed to locate all staff and operational buildings within this temporary construction compound above 10.7m AOD. This would provide 300mm freeboard above the estimated current Flood Zone 3 extent. This will ensure the site remains operational and safe during a period of potential flooding during construction phase.

10.8.73 Therefore, it is considered there would be a no change magnitude of impact for all potential sources of flooding in the Study Area on the construction compounds. On a very high importance receptor, this results in a **neutral effect (not significant)**.

Summary of Construction Phase Impacts and Effects on the Water Environment for the Cable Route Corridor

10.8.74 Table ~~Table~~ **10-20** provides a summary of the potential impacts and effects on the water environment during construction of the Cable Route Corridor.

Table 10-20: Summary of Magnitude of Impact and Significance of Effect for the Construction Phase of the Cable Route

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
River Trent	Very High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling – associated works	Direct temporary and short term very low	**Minor Adverse** (**not significant**)
WFD monitored reaches*	High	Potential pollution of surface water during construction of cable route using non-intrusive	Direct temporary and short term very low	**Minor Adverse** (**not significant**)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
		directional drilling.		
Unnamed ditches	Low	Cable crossings using open cut techniques	Direct temporary and short term very low adverse	**Negligible** (**not significant**)
River Trent	Low hydromorphology	Potential impacts on hydromorphology of watercourses from directional drilling	No change	**Neutral** (**not significant**)
WFD monitored reaches*	Low (hydromorphology)	Potential impacts on hydromorphology of watercourses from non intrusive directional drilling	No change	**Neutral** (**not significant**)
Unnamed ditches	Low	Potential impacts on hydromorphology of watercourses from intrusive crossing	Direct, temporary and short term low adverse	**Negligible** (**not significant**)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and Alluvial and sand deposits	Medium	Potential impacts to quality of groundwater resources including any local water supplies (unlicenced abstractions)	No change	**Neutral** (**not significant**)
	Medium	Potential impact to groundwater flow from cabling trenches	Direct temporary short term very low adverse	**Negligible** (**not significant**)
	Medium	Potential impact to groundwater levels and flow from temporary dewatering	Direct temporary short term very low adverse	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
	Medium	Potential impact to groundwater quality from cable installation, leading to mobilisation of existing contamination, and water quality impacts to river baseflow.	Direct temporary short term very low	**Negligible** (**not significant**)
Wastewater Treatment Works/ Residential housing	Very High	Potential for changing of flooding potential to vulnerable land uses off site.	No change	**Neutral** (**not significant**)
Construction Compounds and Cable Corridor	Very High	Potential for changing of flooding potential to the essential infrastructure being constructed, and the temporary construction compounds.	No change	**Neutral** (**not significant**)

* Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, River Till and Fillingham Beck

Overall Effects: Cable Route Corridor and Principal Site

10.8.75 The location of the Principal Site and Cable Route Corridor are within the same watercourse catchment areas for the River Till and Fillingham Beck. Therefore, there is the potential for cumulative effects during construction. However, with the Embedded Mitigation in place, and considering there are no significant effects identified for the individual Principal Site and Cable Route Corridor elements, it is considered that there are no cumulative overall effects on the water environment receptors.

Operation: Principal Site

10.8.76 During the operational phase for the Principal Site, the following potential adverse impacts may occur:

a. Impacts on surface or groundwater quality from site run-off and the potential for accidental spillages during maintenance activities;

b. Impacts surface or groundwater quality as a result of the use of firewater in the event of a fire in the BESS;

c. Impacts on hydrology including subsequent impacts on aquatic habitats and water-dependent nature conservation sites;

d. Permanent hydromorphological impacts to watercourses;

e. Impact on local water supplies from water usage in a 'water stressed' area;

f. Impacts on groundwater resources (flows and level); and

g. Impacts on the rate and volumes of surface water run-off entering local watercourses and subsequent increase in flood risk.

10.8.77 These are summarised in **Table 10-21**~~Table 10-21~~ at the end of this section, with discussion presented below in the following paragraphs. The operational Cable Route Corridor has not been assessed as the whole cable will be installed beneath ground level with no impact on the water environment following completion of construction and reinstatement.

10.8.78 In addition to the above, there is the potential for indirect beneficial impacts to the water environment through a possible reduction of agricultural chemical inputs to watercourses / reduction in pesticide use on crops within the local area resulting in an increase in invertebrate abundance and diversity, though this is hard to quantify.

Surface Water Features

Impacts from Operational Site Runoff and Spillage Risk

10.8.79 The drainage arrangements propose to attenuate surface water runoff and contain any fire water runoff within lined swales within the Principal Site once operational, whilst minimising flood risk to the Scheme and surrounding areas (see **Section 10.7**). More detailed surface water drainage proposals are presented in the **Outline Drainage Strategy** included within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**.

10.8.80 The chemical pollutant risk from surface water runoff will mainly be low. In addition to permanent structures, there will be runoff from hardstanding areas such as the BESS, on-site substation, permanent plant storage buildings, office/warehouse buildings, access tracks and car park. The buildings will be investigated for the viability of rainwater harvesting during detailed design stage. The Pollution Hazard index and suitability of the proposed treatment trains is included within the **Outline Drainage Strategy** (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**). This concludes the treatment train provided is sufficient for the level of risk.

10.8.81 Within the area of solar PV panels, the impermeable area will remain largely consistent with its pre-development state as solar PV panels are elevated above ground and incident rainfall will run off them to ground as it does now.

10.8.82 In order to limit the potential for channelisation from rainfall dripping off the end of the solar PV panels, the areas between, under and surrounding the solar PV panels will be planted with native grassland and wildflower mix. This planting will intercept and absorb rainfall running off the panels, preventing it from concentrating and potentially forming channels in the ground.

10.8.83 The exact locations for each outfall will be agreed at detailed design stage in consultation with the Environment Agency/LLFA/IDBs. The decision of whether runoff will be allowed to infiltrate or be discharged to a watercourse will also be determined at detailed design stage. It is unlikely that infiltration will be suitable based on the geology, but the potential for infiltration will be investigated during the ground investigation to take place during detailed design. Where surface water runoff outfalls to a watercourse, it is proposed that the pipe would outfall into a green ditch outfall for the last 10m of the discharge pathway where this is possible. For the discharge into the Eau, this may not be possible due to the requirement to maintain access to the channel for IDB maintenance of the Eau.

10.8.84 The SuDS Manual's Simple Index Approach (Ref. 10-9) has been used to demonstrate the suitability of the proposed design SuDS treatment train. This assessment is presented in **Appendix 10-4: Outline Drainage Strategy** of this ES **[EN010142/APP/6.2]**.

10.8.85 The Solar PV panels are constructed in a robust manner and their components cannot be separated except with a considerable mechanical load. Therefore, the risk of any liquid leakage from the panels during operation is extremely low, especially in any large quantities.

10.8.86 The Principal Site will operate using good practice and comply with environmental legislation through the application of a **Framework OEMP [EN010142/APP/7.9**]. Details of appropriate maintenance of SuDS and other drainage infrastructure is included and secured within the **Framework OEMP [EN010142/APP/7.9]**.

10.8.87 The **Outline Drainage Strategy** (**Appendix 10-4** of this ES **[EN010142/APP/6.2]**) aims to mimic natural drainage conditions, and includes suitably sized SuDS swales within the drainage design. The CIRIA Simple Index Method assessment (Ref. 10-9) concludes the use of swales provides a mitigation potential greater than the pollution potential. Therefore, given the implementation of the **Outline Drainage Strategy**, which will be secured within the DCO, it is predicted at this stage that there will be a negligible impact to any receiving water feature from surface water runoff. Potential locations of the outfall locations have been included on the drainage strategy drawing included within **Appendix 10-4** of this ES **[EN010142/APP/6.2]**. There are BESS located close to unnamed ditches, of low importance, which are located within catchments of the River Eau, River Till, and Fillingham Beck. There are also BESS locations close to the River Eau (of high importance), and Yawthorpe Beck (of low importance). With the Embedded Mitigation in place it is considered to be an indirect permanent long term very low adverse magnitude of impact, result in a **negligible effect** (**not significant**). Within the Principal Site there are no very high water quality receptors, for a very low magnitude of impact even if the receptor value becomes higher (a very high or a high importance) at a later stage, using the criteria for determining the effect the effect would still be **not significant**.

Risk of surface water pollution from a fire affecting the BESS

10.8.88 The management of battery fire safety is provided in the **Framework Battery Safety Management Plan** submitted alongside the DCO application **[EN010142/APP/7.13]**. Compliance with this plan will be secured through Requirement 5 of Schedule 2 of the **Draft DCO [EN010142/APP/3.1]**.

10.8.89 With the Embedded Mitigation measures around management of fire risk, and the drainage strategy, and the lack of pathways from potential contaminated fire water to surface water features, it is considered there will be no change impact to surface water quality within the River Eau (high importance), Yawthorpe Beck (low importance) and the unnamed drains (low importance receptors), resulting in a **neutral effect** (**not significant**) regardless of water feature importance.

Potential impacts on hydrology

10.8.90 Once the Principal Site is operational, there is the potential for a change in surface water runoff or change in hydrology of the watercourses within the area. However, the **Outline Drainage Strategy** (**Appendix 13-4** of the ES **[EN010142/APP/6.2]**) is designed so as to mimic the natural drainage conditions within the Principal Site and ensure no impact on the flow in receiving surface water features. Therefore, it is considered there will be a no change impact on the surface water features in the area. The water features within the site are unnamed ditches of low importance within the catchments of Eau, Till and Fillingham Beck. For all receptors, a no change impact results in a **neutral effect** (**not significant**). For a no change magnitude of impact, even if the receptor value increases the effect would still be **not significant**.

Potential for hydromorphological impacts to watercourses

10.8.91 The potential for hydromorphological physical impacts to watercourses are covered below under ‘access’, with access track features, and ‘outfalls’ for where drainage from the site will enter the watercourse system.

Permanent Access

10.8.92 The location of the access track watercourse crossings is summarised in **Section 10.7**. Adopting a precautionary, reasonable worst-case approach, it is assumed these water features will be crossed using culverts. The need for and design of any permanent access across watercourses will be considered further as the design progresses. The access track crossings of watercourses are assumed to be culverts as a worst-case scenario for assessment purposes at this stage, with the least impacting design proposed (e.g. arch rather than box culverts, and box culverts in preference to pipes as stated above

10.8.93 Paragraph 10.7.38 lists the watercourse to be crossed for the permanent access tracks within the Principal Site. For the three new crossings there will be direct, localised and permanent impacts to the water feature’s channel, riparian and bank habitat for installation of the structures. However, it is assumed that there will be no interruption of flow or sediment conveyance.

10.8.94 It is worth noting that culverting that the channels to be crossed are small ephemeral unnamed ditches, with two crossings utilising and existing crossing, and five being new crossing locations.

10.8.95 There are seven watercourse crossings within the Principal Site (these are noted in paragraph 10.7.38, with four being over Yawthorpe Beck within the Eau catchment, and three being unnamed ditches within the River Till catchment. However, it is considered that, with mitigation, direct permanent long term low adverse magnitude of impact is possible. However, as the morphology receptors are assessed as being of low importance, this results in a potentially **negligible effect** (**not significant**).

Outfalls

10.8.96 The Scheme may require new surface water outfalls for operational drainage. Exact locations will be determined after the DCO at detailed design stage. Soft green ditch connections will be used where possible (access along the bankside is required for IDB watercourses), and the final location, position and orientation of any new outfall will be carefully determined and informed by a hydromorphological survey at detailed design stage to minimise any adverse local impacts on river processes. If headwalls are required, micro-siting of the outfalls will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. There are many locations of BESS within the Principal Site, the drainage strategy is for discharge into the closest watercourse within the Principal Site. There are BESS locations close to the River Eau (of low importance), Yawthorpe Beck (of low importance) and unnamed ditches, which are of low importance.

10.8.97 Overall, the presence of new engineered outfalls providing discharge of surface water runoff will result in a localised, direct permanent long term low adverse impact, which on the unnamed diches of low importance will result in a **negligible effect** (**not significant**). On the low importance River Eau, a low adverse impact result in a **minor adverse (not significant**) effect.

Potential impacts on groundwater resources

Groundwater – Water Quality Impacts

10.8.98 During routine operation and maintenance, there is the potential for impact so groundwater quality from any spillages of chemicals used onsite. However, the use of the **Framework OEMP [EN010142/APP/7.9]** will ensure any potential for impact is minimised. Therefore, no significant risks to the groundwater receptors in terms of groundwater quality are anticipated during operation of the Scheme, provided that the operation is conducted in accordance with the **Section 10.7** which will be secured in the DCO via the **Framework OEMP [EN010142/APP/7.9]**, including adoption of best industry practice to manage the risk of chfemical spillages. For the medium importance groundwater aquifers (Scunthorpe and Charmouth Mudstone Formation and alluvial deposits) this is considered to have an indirect permanent long term very low adverse magnitude of impact therefore resulting in a **negligible effect** (**not significant**).

Groundwater – Flow and Level Impacts

10.8.99 The outline drainage design for the Scheme includes swales around the solar PV panels. The swales will collect runoff which is expected to partly infiltrate to the underlying aquifer, whilst the portion that does not have opportunity to infiltrate may be conveyed towards watercourses.

10.8.100 Piling may be required up to 12m bgl for the foundations of infrastructure at the Principal Site. Whilst the groundwater within the Principal Site is anticipated to be not present within the shallower excavations, construction of piles to a depth of 12m may interact with groundwater. However, the cross sectional area of the piles is not considered sufficient to result in impediment to groundwater flow. Construction of building foundations and areas of new hardstanding will prevent recharge of rainfall directly under their footprint, with runoff again being managed appropriately using SuDS. These areas of hardstanding are very limited in size therefore the majority of the Principal Site which will remain permeable, therefore it is considered there will be no impact to infiltration of rainwater into the ground.

10.8.101 For the piling, it is considered that would result in a no change impact to the groundwater receptors. magnitude of impact on groundwater recharge of the medium importance groundwater aquifers (Mercia Mudstone Group, Penarth Group Mudstone, and alluvial deposits), resulting in a **neutral effect** (**not significant**).

10.8.102 As such, there may be very localised changes in the spatial distribution and quantity of recharge of groundwater across the Site. It is considered there will be an indirect permanent long term very low adverse magnitude of impact on groundwater recharge of the medium importance groundwater aquifers (Mercia Mudstone Group, Penarth Group Mudstone, and alluvial deposits), resulting in a **negligible effect** (**not significant**).

Pollution Risk from Fire Fighting at the BESS

10.8.103 There is potential for the use of firewater in the event of a fire. As stated in **Section 10.7**, the operational design will include both fire water tanks and associated fire water containment.

10.8.104 Therefore, due to the lack of pathway from potential fire water to ground or surface water features, it is considered there will be an indirect permanent long term very low impact to water quality. For the medium importance receptors, the WFD waterbodies, this results in a **negligible effect** (**not significant**).

Potential impacts on the rate and volumes of surface water discharge and flooding potential from the Principal Site

10.8.105 During the operational phase, there will be surface water runoff from the permanent structures, roofs, solar PV panels and access roads. This could impact surrounding watercourses and waterbodies. An **Outline Drainage Strategy** has been prepared, included as **Appendix 10-4** of this ES **[EN010142/APP/6.2]**, and includes a water quality risk assessment that illustrates adequate treatment of any runoff pollutants**.**

10.8.106 The **Outline Drainage Strategy** includes SuDS provision; therefore, it is predicted at this stage that there will be a negligible impact to any receiving water feature from the rate of surface water runoff. Thus, the Scheme will result in a no change magnitude of impact for all sources of flood risk. Based on the essential infrastructure within the Principal Site, the receptor is of very high importance, resulting in a **neutral effect** (**not significant**).

10.8.107 The change of land use within the Principal Site has the potential to result in a change in flood potential to off-site receptors during the operational phase, such as more vulnerable residential housing, high importance receptor. Taking into account the Scheme design and embedded mitigation, it is considered there will be a no change magnitude of impact on the high importance receptor. This results in a **neutral effect** (**not significant**).

Summary of Operational Impacts and Effects on the Water Environment for the Principal Site

10.8.108 Table 10-21~~Table 10-21~~ provides a summary of the potential impacts and effects on the water environment during operation from the Principal Site.

Table 10-21: Summary of Magnitude of Impact and Significance of Effect for the Operation of the Principal Site

Receptor	Importance (Value)	Description of Impact	Impact	Effect
River Eau	High	Impact on surface water quality from site run-off and spillage	Indirect permanent long term very low	**Minor adverse** (**not significant**)
Yawthorpe Beck	Low	Impact on surface water quality from site run-off and spillage	Indirect permanent long term very low	**Negligible** (**not significant**)
Unnamed Drains	Low	Impact on surface water quality from site run-off and spillage	Indirect permanent long term very low	**Negligible** (**not significant**)
River Eau	High	Potential for impact as a result of the use of firewater in the battery storage areas	No Change	**Neutral** (**not significant**)

Receptor	Importance (Value)	Description of Impact	Impact	Effect
Yawthorpe Beck	Low	Potential for impact as a result of the use of firewater in the battery storage areas	No Change	**Neutral** (**not significant**)
Unnamed drains	Low	Potential for impact as a result of the use of firewater in the battery storage areas	No Change	**Neutral** (**not significant**)
River Eau	High	Potential impacts on hydrology of the Scheme, this may also have an effect on aquatic habitats and water-dependent conservation sites	No Change	**Neutral** (**not significant**)
Yawthorpe Beck	Low	As above	No Change	**Neutral** (**not significant**)
Unnamed Drains	Low	As above	No Change	**Neutral** (**not significant**)
Yawthorpe Beck	Low	Potential for permanent physical impacts from permanent culverted crossings	Direct permanent long term very low	**Negligible** (**not significant**)
Unnamed Drains	Low	As above	Direct permanent long term very low	**Negligible** (**not significant**)

Receptor	Importance (Value)	Description of Impact	Impact	Effect
River Eau	Low (morphology)	Presence of new engineered outfalls discharges.	Direct permanent long term low adverse	**Negligible** (**not significant**)
Yawthorpe Beck	Low (morphology)	Presence of new engineered outfalls discharges.	Direct permanent long term low adverse	**Negligible** (**not significant**)
Unnamed Drains	Low (morphology)	Presence of new engineered outfalls discharges.	Direct permanent long term low adverse	**Negligible** (**not significant**)
Scunthorpe Mudstone Formation, Charmouth Mudstone Formation and Alluvial deposits	Medium	Potential impacts on groundwater quality resources	Indirect permanent long term very low	**Negligible** (**not significant**)
	Medium	Groundwater flow and level impacts	Indirect permanent long term very low	**Negligible** (**not significant**)
	Medium	Potential for impact as a result of the use of firewater in the battery storage areas.	Indirect permanent long term very low	**Negligible** (**not significant**)
Essential Infrastructure	Very High	Impact of flooding on essential infrastructure within the Principal Site	No change	**Neutral** (**not significant**)
Residential Housing	High	Potential impact for changing of flooding potential to vulnerable land uses off site, or on	No change	**Neutral** (**not significant**)

Receptor	Importance (Value)	Description of Impact	Impact	Effect
		offsite flooding potential.		

Decommissioning

10.8.109 Potential impacts from the decommissioning of the Scheme are similar in nature to those during construction, as some ground works will be required to remove infrastructure installed. The mode of cable decommissioning for the Cable Route Corridor and interconnecting cables will be dependent upon government policy and good practice at that time. Currently, the most environmentally acceptable option is leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the cables can be removed by opening the ground at regular intervals and pulling the cable through to the extraction point, avoiding the need to open up the entire length of the cable route. A **Framework DEMP [EN010142/APP/7.10]** has been prepared and is submitted with the DCO application, which sets out required measures to prevent pollution and flooding during this phase of the development.

10.8.110 As a result, it is considered the decommissioning impacts and effects will be no worse than those of the construction phase.

10.9 Additional Mitigation, Monitoring and Enhancements

10.9.1 This assessment considered the possible impacts of the Scheme on water environment in the area. No mitigation over and above that already set out in this assessment is proposed.

10.10 Residual Effects

10.10.1 No significant residual effects on surface water or groundwater resources or flood risk are anticipated by the Scheme.

10.10.2 **Table 10-22**~~**Table 10-22**~~ and **Table 10-23**~~**Table 10-23**~~ summarises what are considered to be the residual effects of the construction and operation of the Scheme with the mitigation and enhancements set out within **Sections 10.7** and **10.8** of this chapter. Decommissioning effects are considered to be no worse than those assessed for the construction phase.

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Table 10-22: Summary of Residual Effects (Construction and Decommissioning)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Principal Site				
Eau, Fillingham Beck and River Till	High	Pollution of surface water during construction	Measures contained within the **Framework CEMP [EN010142/APP/7.8]**	**Minor adverse** (**not significant**)
Yawthorpe Beck and Unnamed Ditches	Low	Pollution of surface water during construction	Measures contained within the **Framework CEMP [EN010142/APP/7.8]**	**Negligible** (**not significant**)
Yawthorpe Beck and Unnamed Ditches	Low	Impact on water quality from intrusive techniques for internal cabling	Measures contained within the **Framework CEMP [EN010142/APP/7.8]**	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Yawthorpe Beck and Unnamed Ditches	Low	Crossing of watercourses by access tracks, using culvert construction as worst case.	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
River Eau	High	Construction of any SuDS surface water drainage oufalls	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
Yawthorpe Beck and Unnamed Ditches	Low	Construction of any SuDS surface water drainage oufalls	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
Yawthorpe Beck and Unnamed ditches	Low	Temporary impacts on hydro-morphology from open cut internal cabling crossings	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and alluvial deposits	Medium	Potential impacts to quality of groundwater resources including any local water supplies (unlicenced abstractions)	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Neutral** (**not significant**)
		Potential impact to groundwater flow from foundations /construction of the PV bases	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Neutral** (**not significant**)
		Potential impact to groundwater flow from construction of internal cable routes.	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
		Potential impact to groundwater levels and flow from temporary dewatering	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Minor adverse** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
		Potential impact to groundwater quality from PV installation, leading to changes in quality of baseflow water input to rivers.	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
Cable Route Corridor				
River Trent, includes Cottam Ponds LWS	Very High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Minor adverse** (**not significant**)
WFD channel features (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, River Till and Fillingham Beck. Seymour Drain includes Cow Pasture Drain LSW and Mother Ings Drain LWS.	High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling.	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Minor Adverse** (**not significant**)
Unnamed ditches	Low	Cable crossings using open cut techniques	Measures contained within the **Framework CEMP**	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
			[EN010142/APP/ 7.8]	
River Trent	Low (hydromorphology)	Potential impacts on Hydromorphology of watercourses from non intrusive cable crossing	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Neutral** (**not significant**)
River Till and tributary, Skellingtongthorpe Main Dain, Marton Drain and Seymour Drain	Low	Potential impacts on Hydromorphology of watercourses from non intrusive cable crossing	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Neutral** (**not significant**)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and alluvial deposits	Medium	Potential impacts to quality of groundwater resources including any local water abstractions (unlicenced abstractions)	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**No change** (**neutral**)
		Potential impact to groundwater flow from cabling trenches	Measures contained within the **Framework CEMP**	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
			[EN010142/APP/ 7.8]	
		Potential impact to groundwater levels from temporary dewatering	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
		Potential impact to groundwater quality from cable installation, leading to quality of baseflow water input to rivers	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
Flood Risk : receptors in local area, WWTW, residential housing	Very High	Potential for changing of flooding potential to vulnerable land uses off site	Measures contained within the **Framework CEMP [EN010142/APP/ 7.8]**	**Negligible** (**not significant**)
Construction compounds and construction activity	Very High	Potential for changing of flooding potential to the essential infrastructure being constructed, and the temporary construction compounds.	Measures contained within the **Framework CEMP**	**Negligible** (**not significant**)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
			[EN010142/APP/ 7.8]	

Table 10-23 Summary of Residual Effects (Operation)

Receptor	Sensitivity (value)	Description of impact	Embedded and additional mitigation measure	Residual Effect after Mitigation
Principal Site				
River Eau, Yawthorpe Beck, nnamed Drains	Low	Impact on surface water quality from site run-off and spillage	Measures contained within **Framework OEMP [EN010142/APP/7.9]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Negligible** (**not significant**)
River Eau, Yawthorpe Beck, nnamed Drains	Low	Potential for impact as a result of the use of firewater in the battery storage areas	**Framework Battery Safety Management Plan [EN010142/APP/7.13]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Neutral** (**not significant**)
River Eau, Yawthorpe Beck, nnamed Drains	Low	Potential impacts on hydrology of the Scheme, this may also have an effect on aquatic habitats and water-dependent conservation sites.	Measures contained within **Framework OEMP [EN010142/APP/7.9]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Neutral** (**not significant**)

Receptor	Sensitivity (value)	Description of impact	Embedded and additional mitigation measure	Residual Effect after Mitigation
River Eau, Yawthorpe Beck, nnamed Drains	Low	Potential for permanent physical impacts from permanent culverted crossings	**Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Negligible** (**not significant**)
River Eau, Yawthorpe Beck, nnamed Drains	Low (morphology)	Presence of new engineered outfalls	Measures contained within **Framework OEMP [EN010142/APP/7.9]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Negligible** (**not significant**)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and Alluvial deposits	Medium	Potential impacts on groundwater quality resources	Measures contained within **Framework OEMP [EN010142/APP/7.9]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Negligible** (**not significant**)
		Groundwater flow and level impacts	Measures contained within **Framework OEMP [EN010142/APP/7.9]** and **Appendix 10-3: Outline Drainage**	**Negligible** (**not significant**)

Receptor	Sensitivity (value)	Description of impact	Embedded and additional mitigation measure	Residual Effect after Mitigation
			Strategy of the ES **[EN010142/APP/6.2]**	
		Potential for impact as a result of the use of firewater in the battery storage areas.	**Framework Battery Safety Management Plan [EN010142/APP/7.13]** and **Appendix 10-3: Outline Drainage Strategy** of the ES **[EN010142/APP/6.2]**	**Negligible** (**not significant**)

10.11 Cumulative Effects

10.11.1 An assessment of cumulative effects is presented in **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**.

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