Tillbridge Solar

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PEI Report Volume I Chapter 10: Flood Risk, Drainage and Surface Water

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10. Flood Risk, Drainage and Surface Water

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 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 **PEI Report Volume I Chapter 9: Ecology and Nature Conservation**, which includes details of relevant protected species and aquatic ecology surveys. Any effects of contaminated land on surface or groundwater within Preliminary Risk Assessments (PRAs) completed for the Principal Site (**PEI Report Volume II Appendix 16-2**) and the Cable Route Corridor (**PEI Report Volume II Appendix 16-3**). This is also covered in **PEI Report Volume I Chapter 16: Other Environmental Topics** under Section 16.4 Ground Conditions.

10.1.2 For more details about the Scheme, refer to **PEI Report Volume I Chapter 3: Scheme Description** of this PEI Report.

10.1.3 This assessment is supported by the following appendices in **PEI Report Volume II**:

- **Appendix 10-1: Water Framework Directive (WFD) Screening Assessment;**
- **Appendix 10-2: Preliminary Flood Risk Assessment; and**
- **Appendix 10-3: Preliminary Drainage Strategy.**

10.1.4 The chapter is supported by the following figures in **PEI Report Volume III**:

- **Figure 10-1: Surface water features and their attributes**.
- **Figure 10-2: Groundwater features and their attributes.**
- **Figure 10-3: Bedrock and superficial geology.**
- **Figure 10-4: Watercourses, Flood Zones and Internal Drainage Boards.**

10.2 Legislation, Planning Policy, and Guidance

10.2.1 Legislation, planning policy, and guidance relevant to this assessment and pertinent to the Scheme is outlined in this section. There are a number of Regulations that are concerned solely with the transfer of powers to the United Kingdom Government to ensure that European Union legislation remains functional as intended but otherwise do not change the requirements of the legislation. These specific pieces of legislation are not detailed as they are not material to the outcome of this assessment.

Legislation

10.2.2 Legislation to be considered includes, with a brief summary of relevance to the Scheme:

- Environment Act 2021 (Ref. 10-1): enables better environmental protection to be included into law, includes new binding targets for water, which when set will need to be considered by new development that may affect the water environment;
- Water Act 2014 (Ref. 10-2): mainly deals with regulating the impact of water supply on the water environment and the price of water;
- Flood and Water Management Act 2010 (Ref. 10-3): requires flood management authorities to manage risks in connection with flooding and prepare Strategic Flood Risk Assessments, for which new development must take into account;
- Environmental Protection Act 1990 (Ref. 10-4): brings together pollution prevention and disposal regulations, imposes duty of care on those involved with any waste stream;
- Land Drainage Act 1991 (as amended) (Ref. 10-5): sets out the functions of internal drainage boards and local authorities (as Lead Local Flood Authority) in relation to land drainage of ordinary watercourses. New development wanting to do works that may affect the flow in ordinary watercourse may require a consent from the relevant authority);
- Water Resources Act 1991 (as amended) (Ref. 10-6): regulates water resources, water quality and pollution and flood defences, for which new developments may need to take into account;
- Salmon and Freshwater Fisheries Act 1975 (as amended) (Ref. 10-7): sets out protection for migration routes of salmon and trout;
- Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations 2017 (Ref. 10-8): these regulations aim to improve and integrate the way water bodies are managed throughout the UK for which new development must be compliant or otherwise be carefully justified and include all necessary mitigation and compensation ;
- The Environmental Damage (Prevention and Remediation) Regulations 2017 (as amended) (Ref. 10-9): aims to prevent and remediate damage to the environment;
- Environmental Permitting (England and Wales) Regulations 2016 (as amended 2018) (Ref. 10-10): aims to streamline the legislative system for activities in England and Wales including those for construction activities which may pose an alteration of flood risk. New developments that may need to do works to a Main River or discharge unclean water, trade or process effluent into a controlled water may need to apply for a permit;
- Groundwater (England and Wales) Regulations 2009 (Ref. 10-11): aims to prevent the entry into groundwater of any hazardous substances as might be released by, among other things, new developments;

- Eels (England and Wales) Regulation 2009 (Ref. 10-12): gives powers to the regulators to implement recovery measures in all freshwater and estuarine waters in England and Wales and for which new developments that could impact eels should take into account;
- Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 10-13): sets out the requirements for the storage of oil for quantities over 200 litres, which is relevant to any development that may involve the storage of oil during construction or operation;
- The Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref. 10-14): regulates water resources, water quality and pollution and flood defence and should be taken into account where necessary by any new development;
- The Control of Substances Hazardous to Health (Amendment) Regulations 2004 (Ref. 10-15): requirements to control and manage risks from hazardous substances, such as may be used on construction sites or as part of the operation of new developments;
- The Anti-Pollution Works Regulations 1999 (Ref. 10-16): outlines the contents of any-pollution works notices served under the Water Resources Act 1991;
- The Water Framework Directive (WFD) (Standards and Classification) Directions 2015 (Ref. 10-17): includes directions for classification of surface water and groundwater bodies for which new developments must consider as part of any Water Framework Directive Assessment;
- The Building Regulations. Approved Document Part H: Drainage and Waste Disposal (2010) (Ref. 10-18); includes details of foul water drainage both above and below ground; and
- Marine and Coastal Access Act 2009: Includes requirements for new development to need a Marine Licence from the Marine Management Organisation for works below Mean High Water Spring Tide (Ref. 10-19)

National Planning Policy

10.2.3 National planning policy and guidance to be considered includes:

- Overarching National Policy Statement for Energy (EN-1) (2011) (Ref. 10-20): overarching policy statement setting out the requirements for consultation, and flood risk assessment;
- National Policy Statement EN-3 (2011) (Ref. 10-21): contains requirements for the assessment of flood risk, potential for effects on the water environment and their significance on renewable energy infrastructure;
- National Policy Statement EN-5 (2011) (Ref. 10-22): includes provision for the inclusion of possible climate change effects on the development of electricity networks infrastructure, specifically in relation to flooding;
- Draft Overarching National Policy Statement for Energy (EN-1) (Ref. 10-23) contains revisions relating to surface water and flood risk. Criteria for

site specific flood risk assessments is included and that mitigation for surface water runoff should include the use of Sustainable Drainage Systems(SuDS);

- Draft National Policy Statement for Renewable Energy (EN-3) (Ref. 10-24) includes a specific section on solar developments. Of particular note is the requirement that for access tracks permeable tracks should be used, and localised SuDS used to control runoff;
- Draft National Policy Statement for Electricity Networks (EN-5) (Ref. 10-25) includes reference to climate change adaptation in section 2.3;
- National Planning Policy Framework (NPPF) (2021) (Ref. 10-26): section 14 of the NPPF explains the national planning policy with regard to meeting the challenge of climate;
- National Planning Practice Guidance (NPPG) (2014, updated 2022) (Ref. 10-27): sets out the requirements for undertaking a flood risk assessment. Includes National Planning Practice Guidance: Flood Risk and Coastal Change (Ref. 10-28);
- A Green Future: Our 25 Year Plan to Improve the Environment (Ref. 10-29): sets out goals for cleaner air and water in the future;
- The UK Government's Future Water Strategy (2011) (Ref. 10-30): sets out a framework for water management in England;

Regional Policy

10.2.4 At a regional level, water management is coordinated through ten River Basin Management Plans (RBMPs). Each RBMP is prepared by the Environment Agency for six-year cycles and sets out how organisations, stakeholders and communities will work together to improve the water environment.

10.2.5 The waterbodies within the study area fall under both the Humber RBMP (Ref. 10-31) and the Anglian RBMP (Ref. 10-32). The most recent RBMPs for the Humber and Anglian river basin districts were updated in October 2022 and will remain in place until 2027. These set legally binding locally specific environmental objectives, and contain the current WFD status of the waterbodies in the area. More information on these is included in the baseline section of this chapter.

Local Planning Policy

10.2.6 Relevant local planning policy and guidance includes:

- Central Lincolnshire Local Plan 2023 (Ref. 10-33);
- Bassetlaw District Council Core Strategy and Development Management Policies Development Plan Documents (DPD), adopted 22 December 2011 (Ref. 10-34);
- Draft Bassetlaw Local Plan 2020-2037 (Ref. 10-35);
- Bassetlaw Local Plan Schedule of Suggested Changes to the Local Plan Publication Version and Policies Maps 2022 M1.111 (Ref. 10-36);

- Glentworth Local Policy 3 : NP3 design and character of the development ();
- Sturton by Stow & Stew Local Policy NP13 (Ref. 10-37);
- Hemswell &Harpswell Local Policy NP6 (Ref. 10-38);
- Lincolnshire County Council Sustainable Drainage Systems (SuDS) Guidance (Ref. 10-40);
- Lincolnshire County Council Preliminary Flood Risk Assessment. (2011) (Ref. 10-41).
- Second Cycle Preliminary Flood Risk Assessment for Lincolnshire. (2017) (Ref. 10-42); and
- West Lindsey District Council Strategic Flood Risk Assessment. (2009) (Ref. 10-43).

10.2.7 Information on where the local planning policies are relevant to the Scheme will be outlined at the Environmental Statement (ES) stage.

Guidance

10.2.8 Guidance documents which are relevant to the Scheme include:

- Non-statutory technical standards for Sustainable Drainage Systems (Ref. 10-44): includes information on volume and peak flow control in relation to mitigation of flood risk; and
- Water UK Sewerage Sector Guidance (2019) (Ref. 10-45): guidance in relation to the adoption of sewerage assets by sewerage companies in England.
- Construction Industry Research and Information Association (CIRIA) Report C753 The SuDS Manual 2nd Edition (2016) (Ref. 10-46): guidance covers the planning, design, construction, and maintenance of Sustainable Urban Drainage Systems, includes the Simple Index Method for mitigation calculations.
- National Highways (2020) Design Manual for Roads and Bridges (DMRB) CD532 Vegetated Drainage Systems for Highways Runoff (Ref. 10-47): guidance for the design of vegetated drainage systems, with information on their mitigation potential; and
- Planning Inspectorate Advice Note 18: The Water Framework Directive (Ref. 10-48). This outlines the WFD process and the information required to undertake screening, scoping and WFD impact assessment stage assessments.

10.3 Assessment Assumptions and Limitations

10.3.1 At this stage no site visits have been undertaken and the baseline and identification of water features is based on desk study and available online data. A walkover and hydrogeomorphology survey of the land within the Scheme Boundary are proposed and will inform the final impact assessment to be presented in the ES. An initial walkover took place subsequent to the

drafting of this report. The assessment submitted with the ES will be informed by the outcome of this initial walkover, and further more detailed hydromorphological walkovers due to take place before the DCO application. This will be when further details of the design and route are confirmed. When surveys are undertaken, these will seek to ground truth and identify all of the surface water features on the Site, including visiting watercourses where they may be crossed (where possible). However, there may be access and vegetation constraints that prevent full coverage of the Site. Seasonally dry and ephemeral watercourses, especially in locations close to the headwaters of a catchment are very difficult to identify in the field. For these small, minor water features, a best endeavours approach will be adopted.

10.3.2 This chapter forms a preliminary assessment which has been based on available information at the time of preparing the PEI Report for the Scheme. A final assessment is being undertaken as part of the EIA and will be reported in the ES that will be submitted with the Development Consent Order (DCO) application.

10.3.3 A request for water resources data (e.g. licensed abstractions, Water Activity Permit locations, pollution incident locations, groundwater levels etc.), WFD information, and water quality and flow data were requested from the Environment Agency to inform the desk study in September 2022. Only a partial response had been received at the time of writing the majority of the report in February 2023. However, it is considered that sufficient baseline information has been gathered from the desk study to enable an initial impact assessment to be undertaken presented in this PEI Report. It is expected that a full response will have been received from the Environment Agency by the time the impact assessment is complete.

10.3.4 At the time of writing, the full details regarding locations and methodologies of construction and installation of the cable within the Cable Route Corridor remain under development. The 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 10-15 m and subject to appropriate consents being obtained. Please note that the need for a Deemed Marine Licence to be included in the DCO is still being considered as there may be the possibility that the works are exempt subject to future consultation with the Marine Management Organisation.

10.3.5 The assessment assumes that the WFD reportable reaches of watercourses (but not necessarily including smaller tributaries with a WFD waterbodies catchment) will be crossed using underground techniques that would pass beneath the hard bed of the watercourse by a minimum of 1.5 m so as not to disturb the channel or risk being exposed by future bed scour.

10.3.6 Smaller watercourse crossings are currently assumed to be crossed using open cut installation techniques. This is considered a reasonable worst case assumption and follows a precautionary approach. Further detail on crossing methods will be confirmed at the ES stage, and the relevant statutory stakeholders consulted.

10.3.7 For intrusive crossings of small watercourses, it is assumed that water flow would be maintained by temporarily damming the watercourse and either over pumping or fluming the flow through the works. Several of the ditches within the Scheme Boundary are thought to be ephemeral and if works could be carried out in the drier months this would reduce the risk of needing to manage flows, and of water pollution (including propagating downstream of any impact), although this cannot be guaranteed and thus no weight has been attributed to this in the impact assessment. Further details on the final crossing proposals for watercourses will be provided at ES stage and the relevant statutory stakeholders consulted.

10.3.8 The exact location of any internal cabling routes within the Principal Site are not known at this stage. Assessment of these will take place at ES stage once further design information is available.

10.3.9 The exact locations of any internal access roads, and any crossings of water features, is not known at this stage. Assessment of these will take place at ES stage once further design information is available.

10.3.10 The solar PV panels will be set back from all water features by 10m to create a buffer zone. The point of measurement will be agreed with the Environment Agency through further consultation, but for the purposes of this assessment it is assumed for small channel watercourses/agricultural drainage channels that are approximately less than 3m in width (from bank top to bank top) this would be measured from the centre line of the watercourse as determined from standard Ordnance Survey mapping. For larger watercourses with channel widths typically greater than 3m (such as the River Trent), this would be measured from the water's edge / channel extents under normal flow conditions.

10.3.11 This buffer from water features will ensure all construction activities for the installation of solar PV panels would be offset from surface watercourses, other than where there is a need for crossing of a watercourse (such as for cabling installation or possible temporary access) or connection for surface water drainage (that may be for temporary works or from the operational Scheme). Any works to enhance watercourses would also require direct works to the channel and banks, although given the beneficial aim of these works, their small-scale and 'soft-engineering' nature, construction impacts would be minimal (e.g. bank scrapes or the creation of low flow berms). Overall, the inclusion of this buffer reduces the risk of any pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) where they are required.

10.3.12 The risk from surface water runoff to surface or groundwater features has been provisionally assessed qualitatively on the basis of design principles that will be presented in further detail in an outline drainage strategy at the ES stage, and delivery of this will be a Requirement under the DCO. As part of the final EIA to be presented within the ES and accompanying the DCO application, the risk from surface water runoff from new hard standing (i.e. surfaces where diffuse urban pollutants may accumulate) to surface or groundwater features will be assessed according to the Simple Index Approach presented in the C753 The SuDS Manual (Ref. 10-46). This will be presented in the Preliminary

Drainage Strategy included in **PEI Report Volume II Appendix 10-3**. It is expected on the basis of experience of other similar developments and professional judgement that the pollutant risk will not be very high from surface water runoff and so that only one or two layers of treatment would be required. It is also expected that there will be sufficient space within the Principal Site for a treatment solution following SuDS principles. However, there is also potential to use proprietary measures if there is a greater risk around certain infrastructure or there are localised constraints.

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. 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. They may be cleaned on occasion, but it is assumed at this stage that clean water will be delivered to the site for use in specially adapted tractors and this will not lead to any significant pollution risk.

10.3.14 Swales would be provided for draining the impermeable areas associated with the BESS and substation areas, and would, ultimately drain to a nearby watercourse. With regards to the BESS, any fire water runoff would be contained within the lined impermeable swale using a penstock to ensure no firewater is released to groundwater or to surface water without prior testing. The swale will be sized to store surface water and fire water.

10.3.15 There would also be some perimeter swales to collect any exceedance flows from the Principal Site which would discharge to watercourses.

10.3.16 Within the impact assessment, flood risk will be considered in terms of the potential for the Scheme to change existing flood risk (from all sources) and to impact on receptors that are determined based on the land uses present in the areas that a flood risk applies to and their associated vulnerability class as defined in the NPPF and NPPG.

10.3.17 There will be welfare facilities associated with the Scheme for up to 10-12 permanent (full time equivalent) members of staff during the operational phase. Given the low daily occupancy only small volumes of foul drainage will be generated. At this point in time, it is not known how any wastewater from permanent welfare facilities will be managed. However, this is anticipated to consist of a self-contained independent non-mains domestic storage and/or treatment system. An alternative, where this is not possible, would be for a self-contained foul drainage system such as a cess pit sealed tank, or portaloos with no discharge to ground. These tanks would be regularly emptied under contract with a registered recycling and waste management contractor. As there would be no discharge of foul water to a watercourse, and no discharge to the public foul sewer is anticipated, no further assessment of foul waste from the Scheme is proposed. This will be reviewed at the ES stage when further detail is available.

10.4 Assessment Methodology

Study Area

10.4.1 For the purposes of this assessment, a general study area of approximately 1km around Scheme Boundary has been considered in order to identify water features that are hydrologically connected to the Scheme and have the potential to be directly impacted by the activities associated with the Scheme. The study area around the Principal Site and the Cable Route Corridor is shown in **PEI Report Volume III Figure 10-1**. The Cable Route Corridor includes some local roads which may be impacted by the Scheme.

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 to as far downstream as a potential impact may influence the quality or quantity of the water body. 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.

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:

- Online Ordnance Survey (OS) maps viewed to identify any surface water features within 1 km of the Scheme (Ref. 10-49);
- Online aerial photography (Ref. 10-50);
- Part 1: Anglian and Humber River Basin District RBMPs (Ref. 10-31 and Ref. 10-32);
- The Met Office website (Ref. 10-51);
- National Rivers Flow Archive website (Ref. 10-52);
- Environment Agency's Catchment Data Explorer Tool (Ref. 10-53);
- Environment Agency's Water Quality Archive website (Ref. 10-54);
- Environment Agency's Fish & Ecology Data Viewer (Ref. 10-55);
- Multi-agency geographical information for the countryside (MAGIC) website (Ref. 10-56);
- British Geological Survey (BGS) Borehole and Geology Mapping (Ref. 10-57);
- The Cranfield University Soilscape website (Ref. 10-58);
- Natural England Designated Site website (Ref. 10-59); and
- Gov.uk Online Interactive Maps:
  - Flood map for planning (rivers and sea).
  - Risk of flooding from surface water.

- Risk of flooding from reservoirs.
- Flood warning areas and risk.

10.4.4 The Preliminary FRA presented within **PEI Report Volume II Appendix 10-2** provides further details of relevant catchment and flood risk data, and flood risk desktop survey information.

10.4.5 In addition, further information and data have been requested directly from the Environment Agency (water quality, resources, pollution incidents, abstraction licences, water activity permits, and biological data) and from West Lindsey District Council (October 2022) and Bassetlaw District Council (October 2022) regarding Private Water Supplies (PWS).

Field Survey

10.4.6 At this stage, the hydromorphological character has been assumed from desk study and professional judgement. The character of watercourses will be confirmed during field surveys undertaken at the ES stage. This will include site visits of all proposed watercourse crossings by the Cable Route Corridor, or by access track crossing locations, whether they be permanent or temporary.

10.4.7 No water quality monitoring will be carried out for the Scheme. The Environment Agency currently carries out monitoring of the more significant watercourses in the area. This data will be used as a proxy for watercourses within the area of the Scheme. Importance of water bodies will be determined from a holistic review of water body features. 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; i.e. essentially all water features that are not sewers and drains to sewers). Water quality impacts will be based on a risk assessment that does not require input of raw background water quality data.

Impact Assessment Methodology

Source-Pathway-Receptor Approach

10.4.8 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.

10.4.9 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:

- 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);

- A **receptor** that is sensitive to that impact (i.e. water features and the services they support); and
- A **pathway** by which the two are linked.

10.4.10 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.

10.4.11 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.

10.4.12 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).

10.4.13 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

10.4.14 At this stage, the hydromorphological character of the watercourses within the Principal Site and the Cable Route Corridor has been assumed from desk study and professional judgement. The character of watercourses will be confirmed during field surveys undertaken at the ES stage. This will include site visits of all proposed watercourse crossings along the Cable Route Corridor, and access track crossing locations, permanent or temporary.

10.4.15 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.

10.4.16 Consideration has been given to how the Scheme is likely to impact upon the WFD objectives for the relevant watercourses within **PEI Report Volume II Appendix 10-1**. Effects are described according to the method for determining effect significance set out in **PEI Report Volume I Chapter 5: EIA Methodology** (see below).

10.4.17 Information on the hydromorphology of the watercourses is included within the baseline and as part of the WFD Screening Assessment that is presented within **PEI Report Volume II Appendix 10-1**.

Flood Risk Assessment

10.4.18 A site-specific preliminary FRA has been prepared for the Scheme. This is presented within **PEI Report Volume II Appendix 10-2**. The preliminary FRA has been prepared in accordance with the requirements of the National Planning Policy Framework 2021 and the accompanying Planning Practice Guidance, NPS Draft EN-3, NPS EN-5, 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 identifies preventative measures to mitigate flood risk from all sources, if necessary and demonstrates how the Sequential Test and Exception Test have been met.

10.4.19 The FRA identifies two areas within the Principal Site Boundary where the extents of Flood Zone 2 and 3 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 two areas to ensure suitable freeboard above the predicted flood levels for the 1 in 100 year + Climate Change events is provided, resulting in no increased risk from fluvial flooding to the solar PV panel infrastructure within these areas.

Drainage Strategy

10.4.20 For this PEI Report stage, a preliminary surface water drainage strategy has been prepared and is presented within **PEI Report Volume II Appendix 10-3**. The drainage strategy details an outline drainage design for new impermeable area within the Principal Site such as the BESS areas and substation. The design includes above ground attenuation features, which will aim to mimic the natural drainage regime as far as practicable. The assessment includes the estimation of surface water attenuation requirements and potential locations within the Principal Site.

Assessment of Surface Water Runoff for the Operational Phase

10.4.21 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.

10.4.22 The appropriateness of design within the Preliminary Drainage Strategy has been assessed with reference to the Simple Index Assessment method described in the SuDS Manual (Ref. 10-46). This is included within the Preliminary Drainage Strategy within **PEI Report Volume II Appendix 10-3** and will be revisited at ES stage. The Simple Index Approach follows three steps:

- Step 1 – Determine suitable pollution hazard indices for the land use(s);
- 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
- Step 3 – If the discharge is to a water body protected for drinking water, consider a more precautionary approach.

10.4.23 The SuDS Manual (Ref. 10-46) 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.

Water Framework Directive Assessment

10.4.24 Development proposals having the potential to impact on current or predicted WFD status are required to assess their compliance against the objectives defined for potentially affected water features. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

- Cause a deterioration of a water body from its current status or potential; and/or
- Prevent future attainment of Good status (or potential where not already achieved) taking into account the conservation objectives of any relevant Protected Areas.

10.4.25 The following guidance on how to undertake WFD assessments will be used to inform this assessment:

- Environment Agency Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity' (Ref. 10-60); and
- The Planning Inspectorate Advice Note 18: The Water Framework Directive' (Ref. 10-48).

10.4.26 The assessment will be undertaken in three stages. The first stage is 'screening', the aim of which is to identify the Scheme components that could affect WFD status and 'screen out' aspects of the Scheme that do not require any further consideration. The second stage is 'scoping', whereby WFD receptors that are potentially at risk are identified and it is determined how the risk will be assessed. Finally, and if required, the third stage involves a full impact assessment and, potentially, consideration of the criteria for derogation of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, if required. The WFD regulations set out the conditions that must be met to justify derogation of compliance with WFD objectives.

10.4.27 Watercourses that do not have individual WFD classifications take the classification of the receiving water body. **PEI Report Volume II Appendix 10-1** presents the screening (Stage 1) assessment. The scoping (Stage 2) phase of the WFD assessment will be undertaken alongside the ES. The full impact assessment (Stage 3) will be undertaken (if necessary) alongside the ES, as will be agreed during consultation with the Environment Agency.

Matters Scoped out of the Assessment

10.4.28 Within the Planning Inspectorate's Scoping Opinion, as tabulated in Table 10-4, the following are agreed to be scoped out from this assessment:

- 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.

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

Determining the Significance of Effects

10.4.29 The significance of effects will be 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. 10-61) 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 will be used to determine receptors importance is presented in Table 10-1. Further information on the general assessment methodology is included within **PEI Report Volume I Chapter 5: EIA Methodology.**

10.4.30 Whilst other disciplines may consider 'receptor sensitivity', instead 'receptor importance' is considered 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.

10.4.31 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 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.
- The magnitude of potential and residual impact (classed as negligible, 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.
- 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.

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

- Negligible: An imperceptible effect or no effect to a water resource receptor;
- Beneficial: A beneficial / positive effect on the quality of a water resource receptor; or
- Adverse: A detrimental / negative effect on the quality of a water resources receptor.

10.4.33 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).

10.4.34 At a spatial level, 'local' effects are those affecting the Scheme within the Site 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.

10.4.35 The importance of the receptor (Table 10-1) and the magnitude of impact (Table 10-2) are determined independently from each other and are then used to determine the overall significance of effects (Table 10-3). Options for mitigation will be 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 will then be reported. Effects of moderate or greater are considered significant.

Table 10-1: Criteria to Determine Receptor Importance (Adapted from LA113) (Ref. 10-61)

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 River Basin Management Plan (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 EC and UK legislation; Groundwater locally supports 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.	Flood Zone 3a and/or 3b; 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 River Basin Management Plan (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, navigation or mineral extraction.	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.	Flood Zone 2; More vulnerable development.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some	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	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water	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.	Flood Zone 2; Less vulnerable development.

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
	environmental value or is of regional importance.	species. Limited social or economic uses.	abstraction: 50-499m^3/day.		
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 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	Floodplain with limited constraints and low probability of flooding of residential and industrial properties; Flood Zone 1; Water compatible development.
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. 10-61)

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 >100 mm.
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. 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.

Magnitude of Impact	Description	Examples
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.
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: Negligible change to peak flood level (≤ +/- 10mm).
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).
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).

Magnitude of Impact	Description	Examples
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).
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. 10-61)

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 was sought from the Secretary of State through the Planning Inspectorate in 2022 as part of the EIA Scoping Process. Consultation responses in relation to Flood Risk, Drainage and Surface Water, to date, are presented in Table 10-4 below.

10.5.2 Consultation has been undertaken with key stakeholders including the Planning Inspectorate, who have contacted the Environment Agency, Upper Witham, Witham Third and Ancholme Internal Drainage Boards, Scunthorpe and Gainsborough Water Management Board, and the relevant local authorities.

Table 10-4: Engagement undertaken

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.	Justification of the scoping out is included within paragraph 10.4.28 of this chapter. The inspector agrees.	Scoping out justification included in paragraph 10.4.28 of this chapter.
Scoping out of Highfield Lane Drinking Water Safeguarding Zone (groundwater). The inspector agrees.	Justification of the scoping out is included within paragraph 10.4.28 of this chapter. The inspector agrees.	Scoping out justification included in paragraph 10.4.28 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.	The ES will include description of the temporary works which have been assessed, which are considered to be part of the Construction Impacts. Their potential for likely significant effects has been assessed.	Section 10.8.
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 assess the potential for sediment mobilisation from drilling to impact on water quality and the potential for	The potential for drilling fluid breakout, or 'frac out' has been assessed a potential impact on watercourses during the construction of the Cable connections in the Cable Route Corridor. A 'frac out' event could result drilling fluids such as bentonite pushing through the bed of the watercourse from the directional drilling beneath. The Framework CEMP includes measures outlining how pollution will be prevented during the	Section 10.8.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
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.	construction phase, including from fine sediment in runoff. The Framework CEMP will include a Silt Management Plan at the ES stage.	
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 that would not result in a significant effect). 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 not require input of raw background water quality data. This is consistent with the approach we have adopted on numerous other solar Nationally Significant Infrastructure Projects (NSIPs), and which has been accepted by PINS each time. Examples include the Sunnica Energy Farm and Longfield Solar Farm, which both utilised Environment Agency monitoring data for watercourses in the area of their respective Schemes. Water	Paragraph 10.4.7 sets out the reasons why no water quality monitoring is required.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	quality monitoring is also only effective when there is a clear purpose for it, and may require monitoring over a long period of time to ensure reliable and robust results as it is not constant. To carry out general baseline monitoring is not standard and it is our view that it is not required at this stage. 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 Preliminary Drainage Strategy in **PEI Report Volume II Appendix 10-3**, provides details of the proposed attenuation features, alongside their potential locations, which will be incorporated within the surface water drainage strategy.	The Preliminary Drainage Strategy is included in **PEI Report Volume II Appendix 10-3**.
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 Preliminary FRA is included within **PEI Report Volume II Appendix 10-2** and an update will be appended to the ES, and its findings will form part of the overall assessment process. A summary of the FRA findings will not report the significance of effects of any changes in flood risk on the Scheme as that is not appropriate and the Scheme does not form part of the baseline. The suitability of the development in terms of flood risk will be determined in the site-specific FRA prepared in accordance with the NPPF, regional and local policy, and taking into account predicted future climate change. The FRA document will be used to inform the assessment of likely significant effects both to the Scheme, and the potential for likely significant	The Preliminary FRA is included in **PEI Report Volume II Appendix 10-2**.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
	effects to flood risk elsewhere within the ES.	
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 will include an estimate of the likely water usage for the Scheme within the operational phases based on the number of proposed full time employees and industry standards on demand per person, and the likely requirement for panel cleaning. Estimates of demand requirements during construction are considered to be temporary, and considered to not result in a long term effect. Industry standards for industrial use are 90 litres per person per employee. The Anglian Water development proposals for dwellings are for 110 litres per person per day.	The ES will contain an estimate of likely water usage once details of the Scheme are finalised.
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 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	These comments are noted. The Preliminary Drainage Strategy confirms the proposed discharge rates to ordinary watercourses.	The Preliminary Drainage Strategy is included in **PEI Report Volume II Appendix 10-3**.

Summary of main matter raised	How has the matter been addressed?	Location of response in the chapter
watercourses are permitted without consent from the IDB.		

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. 10-49 and Ref. 10-50). The land levels are decreasing 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. 10-51) the nearest weather station is located at Scampton (SK 95080 79300), approximately 11km southeast 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 falling in May on average (See Plate 10-1).

The same weather station 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.

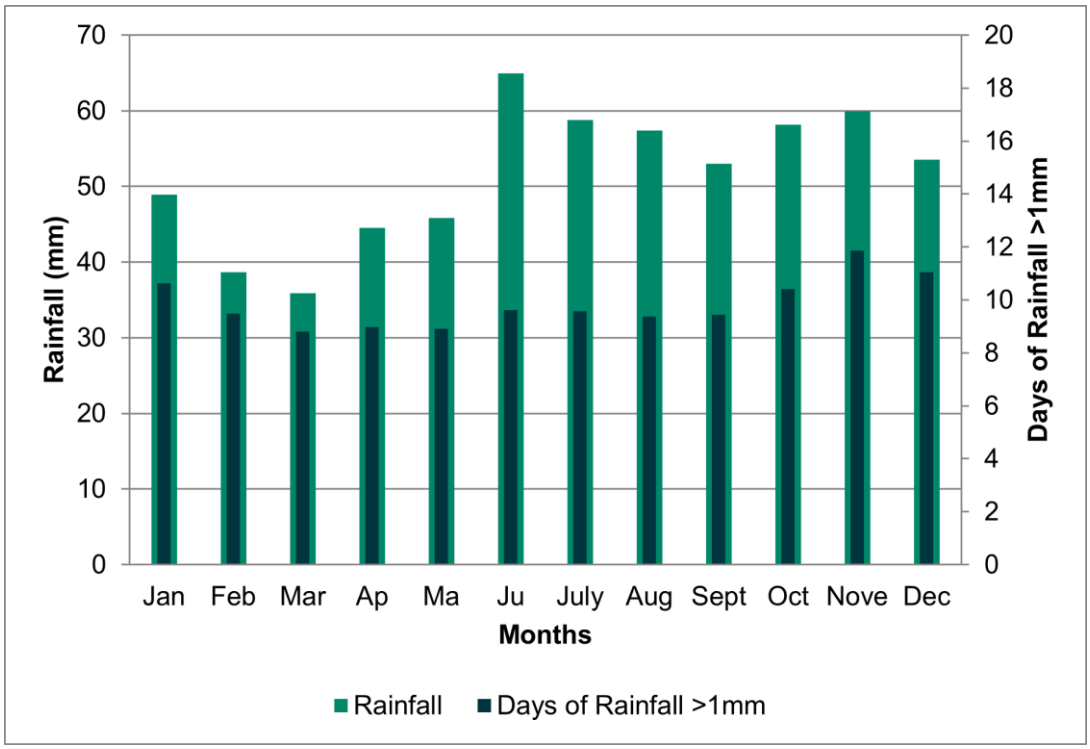


Plate 10-1: Scampton weather station: monthly rainfall and days of rainfall >1mm.

Geology, Groundwater and Soils

10.6.1 The Principal Site is primarily underlain by two bedrock geologies comprising mudstone formations (BGS GeoIndex). **PEI Report Volume III Figure 10-3** displays the Bedrock and superficial geology. These include:

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

10.6.2 These units overly the Marlstone Rock Formation, the Whitby Mudstone Formation, Grantham Formation and the Lincolnshire Limestone Formation, which are situated to the eastern side of the Principal Site.

10.6.3 The bedrock on the Principal Site is largely overlain by Mid-Pleistocene Till deposits, comprising diamicton, with pockets of glaciofluvial deposits, comprising sand and gravel. Alluvium is situated along ditches and streams in the northeast of the site (NGR 490884, 389670 and 491922, 390437), comprising clay, silt, sand and gravel.

10.6.4 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.

10.6.5 There is a strip of Secondary (undifferentiated) aquifer, which is associated with the Charmouth Mudstone Formation located to the eastern section of the Principal Site (**PEI Report Volume III Figure 10-3**). 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.

10.6.6 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. **PEI Report Volume III Figure 10-3** includes the groundwater features and their attributes.

10.6.7 There are three borehole scans available online on the BGS Geoindex website across the study area, which supply groundwater level information. The list of boreholes follows as:

- Upton Gainsborough 2 (reference SK88NE13, NGR 486422, 386705) – groundwater level 1m below ground level (bgl) (described as 'seepage') – west of study area
- AIsby (reference SK89SE117, NGR 486409, 392693) – groundwater level 27m bgl – north of study area
- Dog Kennel Farm Glentworth (reference SK98NE3) – groundwater level 9m bgl – east of study area

10.6.8 Although there is limited groundwater level data available in the vicinity of the Principal Site, it is considered likely that groundwater is shallow (~2m below ground level) within the Alluvium and River Terrace Deposits.

10.6.9 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.

10.6.10 The study area falls within two WFD groundwater bodies (Environment Agency). 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 site falls within the Lower Trent Erewash (GB40402G990300) within the Humber RBMP.

10.6.11 The Witham Lias groundwater body (WFD ID: GB40502G401400) covers a total area of 683.57km^2 and under the WFD Cycle 2 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 1924.4km^2 and during 2019 Cycle 2, was given Good Status, overall, quantitatively and chemically (Ref. 10-53).

10.6.12 There are no source protection zones (SPZ) situated within the study area. A SPZ I is situated approximately 5.5km east of the Scheme with the associated SPZ II situated just east of the Scheme.

10.6.13 The Soilscape map viewer 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 is most at risk from pollution from floodwater scouring.

Surface Water features

10.6.14 The area of the Principal Site contains the following surface water features:

- The River Eau (Ordinary Watercourse) flowing west along the northern boundary, and its tributary flowing to the north within the Principal Site. From the site this flows northwards;
- A tributary to Fillingham Beck, an Ordinary Watercourse, flowing westwards from the Glentworth area across the south-eastern part of the Principal Site;
- A tributary to the Till (Witham) flowing southwards in the extreme west of the Principal Site. This is a Main River.
- A square water holding reservoir located within the Principal Site within the north, south of Harpswell Grange. Other water reservoirs are located just outside the area of the Principal Site.

WFD Classifications

10.6.15 The Principal Site is located within the WFD management catchments off Lower Trent and Erewash (within Humber RBMP), and Witham (within Anglian RBMP). The Cable Route Corridor is not finalised at this stage, and so it is assumed that construction works may cross the following watercourses:

- Eau from Source to Northorpe Beck (GB104028057970) - WFD designated water body; and
- Complex network of unnamed ditches, and tributaries flowing into the larger watercourses associated with the agricultural nature of this location.

10.6.16 Further details for the Eau from Source to Northorpe Beck WFD designated waterbody is given in Table 10-5.

Table 10-5: WFD Surface Waterbodies in the Principal Site

Waterbody: Eau from Source to Northorpe Beck (GB 104028957970)

Ecological Status / Potential	Moderate Ecological Potential (note that Physico-chemical Status is Moderate due to a Poor classification for phosphate).
Chemical Status	Fail.
Overall Target Objective	Good 2027.
Hydromorphological Designation	Not designated artificial or heavily modified.

Waterbody: Eau from Source to Northorpe Beck (GB 104028957970)

Designated Reach	The water course is designated from Harpswell and flows north to Northorpe Beck and the Eau from Manton Sewer to Trent. The water course is c.17km length and drains an area around 49.5 km^2.
Reasons for Not Achieving Good Status	Poor nutrient management and point source continuous sewage discharge.

Surface Water Quality and Flow

10.6.17 The Environment Agency's Water Quality Archive website (Ref. 10-54) 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.

10.6.18 There are no National River Flow Archive (Ref. 10-52) monitoring sites for flow on any of the watercourses in the 1 km study area of the Principal Site. The closest monitoring site for flow is located over 20 km south, and upstream, of the Cottam area on the River Trent. This shows a Q95 flow of 28.9 m^3/sec. The flow of the River Trent in the area of the Scheme will therefore be higher. The flows within the watercourse in the 1 km study area of the Principal Site will be estimated using desk study information at ES stage.

Hydromorphology

10.6.19 The Scheme interacts with one watercourse within the Principal Site that is located in the WFD management catchments off Lower Trent and Erewash, and Anglian. This is the Eau from Source to Northorpe Beck (GB104028057970).

10.6.20 The watercourse flows through the Principal Site for 2.25 km. This section is characterised by being artificially straightened through arable farmland with any changes in direction being sharply defined. Historic mapping shows very little change in the river locally since the early 1900s, meaning it is likely that much of the modification to the river occurred prior to this date. From aerial imagery, it appears to be potentially culverted in two points as it flows under farm tracks. These could alter flow and sediment transport and sever the longitudinal continuity of the watercourse. The watercourse is approximately 1m in width and has steep incised banks that limit lateral connectivity. Arable agriculture extends to the channel margins on both banks, with no riparian buffer, and so the watercourse would be expected to suffer from ingress of agricultural pollution.

10.6.21 A number of smaller unnamed watercourses / ditches are present within the study area, and whilst they do not have individual WFD classifications they will be considered at further phases of the assessment through the WFD water body catchment that they fall within. The watercourses are likely to be largely artificial in nature and would have been developed, or modified, to aid land drainage. As a result, they are likely to be relatively low energy and uniform in nature, with little floodplain connectivity. 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.

Aquatic Ecology

10.6.22 An Aquatic Ecology baseline report has been completed and is included in **PEI Report Volume II Appendix 9-3**. This section provides a brief summary of that report, which is compiled from desk-based data as well as observations from walkover surveys, aquatic macroinvertebrate surveys, and aquatic macrophyte surveys.

10.6.23 Aquatic macroinvertebrate surveys revealed that watercourses within the WFD catchments sampled within the Principal Site are all subject to 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 survey sites.

10.6.24 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.

Nature Conservation Sites

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

10.6.26 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. 10-56) (refer also to **PEI Report Volume I Chapter 9: Ecology and Nature Conservation**). There are no international sites designated for nature conservation within the study area. There are also no Sites of Special Scientific Interest (SSSI) within the 1km study area.

Water Resources

10.6.27 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. 10-56).

10.6.28 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. 10-56). The designations are made in accordance with the Nitrate Pollution Prevention Regulations 2015. 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).

10.6.29 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. The abstraction is for agricultural spray irrigation / storage, and the water is abstracted from an un-named watercourse at Glentworth. This is shown on **PEI Report Volume III Figure 10-1**.

10.6.30 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). For the category 1 – 3 incidents 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

10.6.31 Information on consented discharges was obtained from the Environment Agency. There are five consented discharges within the study area for the Principal Site. Four are located outside of the site boundary, with one located on the road adjacent to the site boundary. The discharge consents are summarised below, and shown on **PEI Report Volume III Figure 10-1**:

- 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;
- AW3NF112: located east of the site in Glentworth for Glentworth Waste Water Treatment Works (WWTW);
- AW3NF690: located east of the site in Glentworth for Glentworth Waste WWTW;
- AW3NF100: located 1km west of the site, for Corringham WWTW; and
- PR3LF253: located approximately 250m west of the Site, for a single domestic property discharge.

Flood Risk

10.6.32 The existing flood risk levels for the Principal Site is summarised in Table 10-6, details of which have been taken from Table 3-2 of the Preliminary FRA (**PEI Report Volume II Appendix 10-2**).

Table 10-6: Flood Risk for the Principal Site

Flood Risk Source	Flood Risk Level	Comments
Fluvial	Low - High	

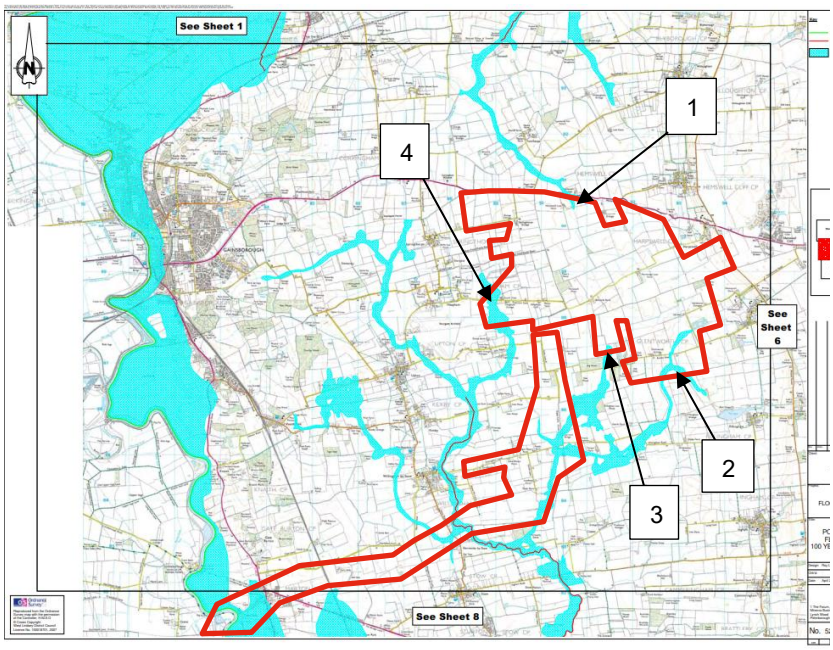
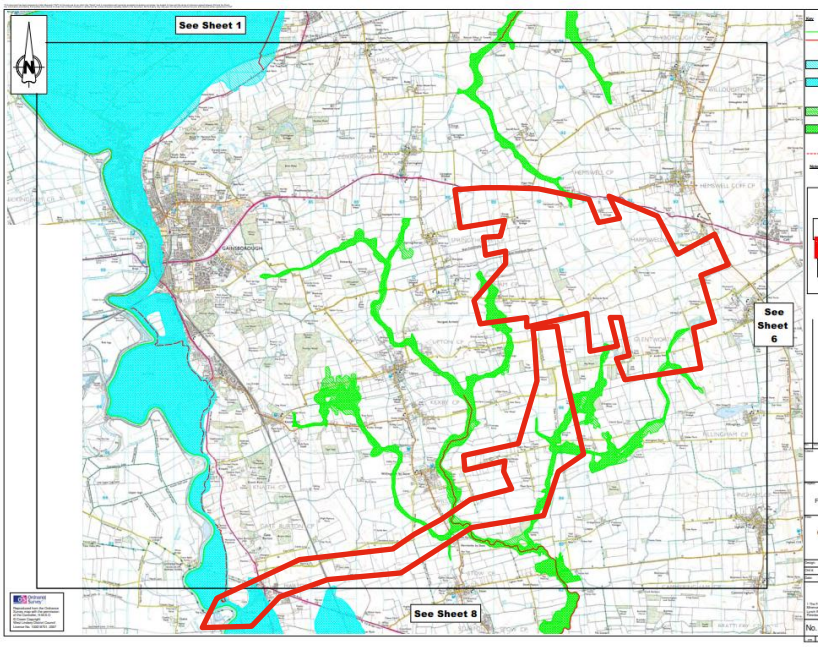
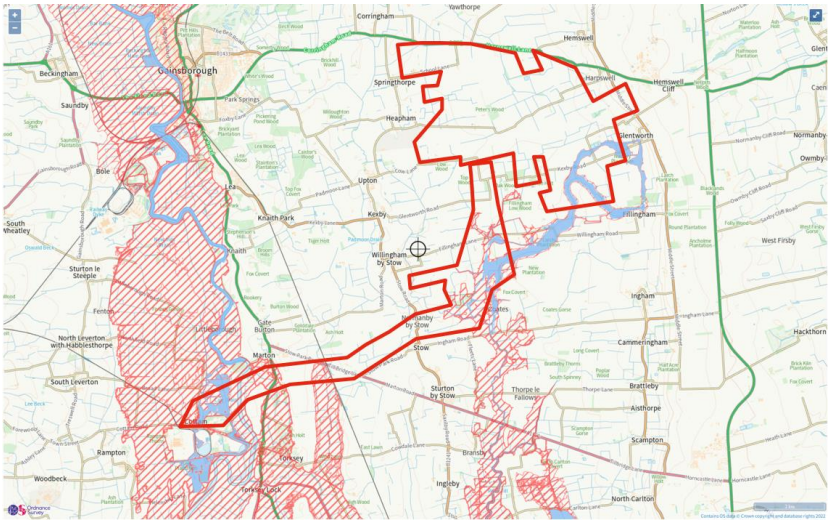


Plate 10-2 – WLDC SFRA – Fluvial Flood Risk Map

WLDC's Strategic Flood Risk Mapping indicates majority of the Principal Site is located within Flood Zone 1, with 4 small areas of Flood Zone 2 and 3 extents located near the Principal Site Boundary (Labelled 1 – 4 on Figure 3-1). There are two areas where Flood Zone 2 and 3 extend into the Principal Site where PV panel infrastructure is proposed (area 1 and 2 on Figure 3-1) both have an approximate area of 4 ha each.

Flood Risk Source	Flood Risk Level	Comments
Tidal	Low	 **Plate 10-3 – WLDC SFRA – Tidal Flood Risk Map (blue hatch)** 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.
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 indicate the majority of the Scheme Boundary lies in areas of Very Low risk from surface water

Flood Risk Source	Flood Risk Level	Comments
		flooding. There are small areas ranging from low to high risk associated with watercourses.
Ground water	Low	Majority of boreholes are restricted for access across the Principal Site. LCC PFRA notes groundwater flooding in the region of Louth, far east of the Scheme Boundary (~20km); this area is not impacted by the Scheme. No other groundwater flooding identified within the Principal Site. The Principal Site lies atop mudstones and clays, with little ability to store water. Given the Principals Site's high elevation and 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.
Artificial sources	Low	 **Plate 10-5 – Gov.uk – Reservoir Flood Risk Mapping (accessed January 2023)** 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

10.6.33 The area of the Cable Route Corridor is from the eastern edge of the River Trent floodplain to the River Trent and to the west of the River Trent. 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 and Marton.

10.6.34 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

10.6.35 The Cable Route Corridor is primarily underlain by four bedrock geologies which are all mudstone formations (Ref. 10-57). These include:

- Mercia Mudstone Group – Mudstone to the western side of the Cable Route Corridor;
- Penarth Group – Mudstone, a thin band between the Mercia Mudstone and the Scunthorpe Mudstone Formation;
- Scunthorpe Mudstone Formation - mudstone and limestone interbedded which covers the majority of the Cable Route Corridor; and
- Charmouth Mudstone Formation to the eastern side of the Cable Route Corridor.

10.6.36 The superficial deposits are generally patchy across the Cable Route Corridor. The north-eastern side deposits of Till and Alluvium underlie the Cable Route Corridor. 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.

10.6.37 There are small patches of peat present between Marton and Torksey (beneath 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. As these deposits are not spatially extensive, it is anticipated that the Cable Route Corridor will avoid peat deposits where possible. Should this not be feasible, assessment of impacts to peat deposits will be considered further within the ES.

10.6.38 The Scunthorpe Mudstone Formation and the Mercia Mudstone beneath the Cable Route Corridor 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.

10.6.39 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.

10.6.40 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.

10.6.41 There are six borehole scans available online on the BGS Geoindex (Ref. 10-57) website across the study area which supply groundwater level information. The list of boreholes follows as:

- Upton Gainsborough 2 (reference SK88NE13, NGR 486422, 386705) – groundwater level 1mbgl (described as 'seepage') – northwest of study area;
- Dog Kennel Farm Glentworth (reference SK98NE3) – groundwater 9mbgl – northeast of study area;
- Hill Top Farm Kexby (reference SK88NE10) – groundwater level 3mbgl – northeast of study area;
- Tidal Trent (reference SK87NW150, NGR 483704, 378117) – groundwater level 6.5mbgl – south of the study area;
- Torksey (SK87NW48, NGR 483920, 378440) – groundwater level 3.7mbgl – south of study area; and
- C.E.G.B Cottam Station C3 (reference SK87/22A, NGR 481370, 379400) – groundwater level 23.64mbgl – south of the study area.

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

10.6.43 According to data obtained from Bassetlaw District Council and West Lindsey District Council, there are no private water supplies (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 borehole is available.

10.6.44 The study area falls within two WFD groundwater bodies (Ref. 10-53). The majority of the Cable Route Corridor falls within the Witham Lias groundwater body (GB40502G401400) within the Anglian RBMP. To the west of the Cable Route Corridor, the Scheme falls within the Lower Trent Erewash (GB40402G990300) within the Humber RBMP.

10.6.45 The Witham Lias groundwater body (WFD ID: GB40502G401400) covers a total area of 683.57km^2 and under the WFD Cycle 2 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. 10-53). The objective is stated as Good by 2015, therefore it has met this objective.

10.6.46 There are no Source Protection Zones (SPZ) situated within the study area.

10.6.47 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

10.6.48 The Cable Route Corridor, from east to west, contains the following surface water features:

- Tributary to the Till (Witham) is a heavily modified water feature flowing north to south northeast of Upton, and its tributary which rises in the Principal Site, this is a Main River.
- 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 flowing southwards.
- Till (Witham) is a heavily modified water feature, an Ordinary Watercourse, flowing to the south close to Kexby and Willingham by Stow. This watercourse rises south of Gainsborough to the north-west of the Site and flows southwards. 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.
- Tributary of Till water feature, an Ordinary Watercourse, is 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 heavily modified.
- Tributary to Skellingthorpe Main Drain, an Ordinary Watercourse flowing southwards west of Stow Park. This is a heavily modified water feature.
- Marton Drain is an Ordinary Watercourse, and heavily modified water feature, 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.

- River Trent (Main River and WFD waterbody 'Trent from Carlton-on-Trent to Laughton Drain'). This is a major watercourse, which has an artificial channel, flowing northwards.
- Seymour Drain and tributaries in the area are Ordinary Watercourses, heavily modified, and drain the area of Cottam Power Station. The watercourses in the catchment, and the main channel, flow northwards to confluence with the River Trent west of Marton area.
- Rectangular surface water reservoir approximately 1km west of Willingham by Stow.
- Surface water pond located northeast of Brampton within the Marton Drain catchment.
- Four ponds to south of Brampton, south of the old railway line feature.
- One surface water pond to south of Brampton and north of the old railway line feature.
- One surface water pond to south of Torksey Lock, and two to the east of Torksey Lock.
- 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.

10.6.49 The Upper Witham IDB catchment contains the Till (Witham) and Tributary of the Till watercourses. Marton Drain River Trent and Seymour Drain catchments are part of Trent Valley IDB area. The Eau is part of the Scunthorpe and Gainsborough Water Management Board IDB. **PEI Report Volume III Figure 10-4** shows includes the areas of the IDBs, fluvial flood sones and watercourses.

WFD Classifications

10.6.50 The Cable Route Corridor is located within the WFD management catchments off Lower Trent and Erewash, and Anglian. The full details regarding locations and methodologies of construction are not yet known. However, it is assumed that construction may cross the following watercourses:

- Fillingham Beck (GB105030062490) – WFD designated water body;
- Marton Drain Catchment (Tributary of Trent) (GB104028057840) - WFD designated water body;
- Till (Witham) (GB105030062500) - WFD designated water body;
- Trent from Carlton-on-Trent to Laughton Drain (GB104028058480) - WFD designated water body;
- Tributary of Till (GB105030062480) - WFD designated water body;
- Seymour Drain Catchment (Tributary of Trent) (GB104028058340) - WFD designated water body;
- Carr Drain (SK 82726 80440);
- Skellingthorpe Main Drain (GB105030062390); and

- Complex network of unnamed drains, ditches, and tributaries flowing into the larger watercourses associated with the agricultural nature of this location.

10.6.51 Further details for these waterbodies are given in Table 10-7.

Table 10-7: WFD Surface Waterbodies in the Cable Route Corridor

Waterbody	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
Fillingham Beck (GB105030 062490)	Moderate Ecological Status (on the basis of invertebrates which is at Bad status)	Fail	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 2.46 km length and drains an area around 24.3 km^2.	Physical modifications, sewage discharge pollution, and poor soil and nutrient management.
Marton Drain Catchment (tributary of Trent) waterbody (GB104028 057840)	Moderate Ecological Status (on the basis of dissolved oxygen which is at Moderate status)	Fail	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 3.14 km in length and drains a total area of 5.04 km^2.	Physical modifications, sewage discharge pollution and poor livestock management.
Till (Witham) waterbody (GB105030 062500)	Moderate Ecological Potential (on the basis of Moderate physico-chemical quality elements, notably phosphates which are at Poor status)	Fail	Moderate (2015)	Heavily Modified	The watercourse designation extends from where it rises to the south of Gainsborough east of Warren Wood and continues east and south past Upton, Kexby and Willingham-on-Stow, to its confluence with the 'Lower Till' waterbody between Stow and Coates-on-Stow. The watercourse is 14.1 km length and drains an area of around 35.2 km^2.	Trade/industry discharges, sewage discharge (continuous) and poor nutrient management from agriculture.
Trent from Carlton-on-Trent to Laughton waterbody	Moderate Ecological Potential (note that Biological Status is Bad due to a Bad classification for invertebrates)	Fail	Good (2027)	Artificial	The designation extends from the town of Carlton-on-Trent (approximately 18 km south of Gate Burton as the crow flies) from where it flows predominantly north-northeast for 58.6 km to Laughton where the waterbody is then designated as the	Physical modifications relating to navigation and agriculture, continuous sewage discharges, diffuse agricultural pollution,

Waterbody	Ecological Status / Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
(GB104028 058480)					'Humber Upper' WFD waterbody. The catchment has an area of 153 km^2.	poor soil management in the catchment and transport drainage.
Tributary of the Till waterbody (GB105030 062480)	Poor Ecological Status (on the basis of Poor macrophytes and phytobenthos combined)	Fail	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 4.9 km length and drains an area of around 17.1 km^2.	Diffuse pollution from poor soil management and physical modification relating to land drainage.
Skellingthorpe Main Drain waterbody (GB105030 062390)	Moderate Ecological Potential	Fail		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.
Seymour Drain Catchment (tributary of Trent) (GB104028 058340)	Moderate Ecological Potential	Fail	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 6.5 km before reaching the confluence with Trent from Carlton-on-Trent to Laughton waterbody (River Trent). It is 6.5 km in length and drains a catchment of 19.6 km^2.	Physical modifications, sewage discharge pollution, poor soil management and transport drainage.

10.6.52 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 before it discharges into Seymour Drain. It has as a total length of approximately 2km.

River Trent – Hydrology and Tidal Cycle

10.6.53 The Non Tidal Limit (NTL) for the River Trent is approximately 21km south, and upstream of the Principal Site (Ref. 10-49) at Cromwell Weir, shortly north of, and downstream, of Newark-on-Trent.

10.6.54 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 90.709 m^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. 10-52). Plate 10-2 shows the mean daily flow at North Muskham for the period 2018 to 2020 inclusive.

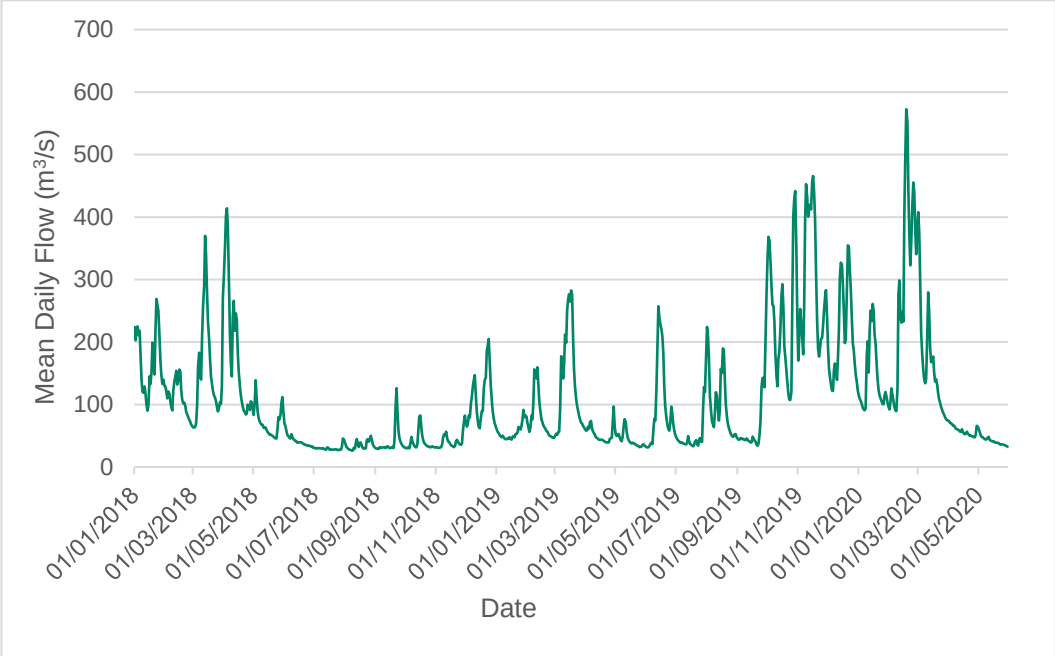


Plate 10-6: Mean daily flow for the River Trent at North Muskham Gauging Station, 2018-2020 (Source: National River Flow Archive Ref. 10-52).

10.6.55 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.

10.6.56 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).

10.6.57 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.

10.6.58 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. 10-62).

10.6.59 At Gainsborough, the usual range of the River Trent taking account of tidal variability is between 1.29 m and 5.00 m (Ref. 10-62).

10.6.60 There are two Trent Valley IDB 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 **PEI Report Volume III Figure 10-1**). 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

10.6.61 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. 10-54) and is summarised in Table 10-8 and 10-9 for the period 2017-2021. Monitoring locations are shown on **PEI Report Volume III Figure 10-1**.

10.6.62 Table 10-8 indicates that the River Trent is slightly alkaline with an average pH of 8.09. 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 waterbody. Nitrates and orthophosphate concentrations are elevated, which is not surprising given the agricultural landscape surrounding the River Trent in this stretch of the river.

10.6.63 Table 10-8 indicates the water quality at Seymour Drain at Cottam is circum-neutral with a mean pH of 7.68 and this falls within the WFD High classification, based on the 44 samples considered here (2017-2021). A 10th percentile dissolved oxygen saturation of 50.24% falls within the Poor WFD

classification (with a 10th percentile of 54% being Moderate). 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 1.42 mg/l, suggesting low levels of organic pollution. Ammonia levels fall within the WFD classification for High at a 90th percentile value of 0.17 mg/l (90th percentile lower than 0.3 mg/l is High), which similarly suggests pollution from organics is limited. Nitrate values are elevated (mean of 8.01 mg/l N), as are orthophosphate concentrations (mean 0.68 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.

10.6.64 Table 10-9 indicates that Marton Drain at Brampton Grange is circum-neutral with a mean pH of 7.62 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 (with a 10th percentile of 70% being High under the WFD EQS) which suggests the waterbody is well oxygenated. BOD falls within the Moderate WFD classification with a 90th percentile value of 6.68 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 Good at a 90th percentile value of 0.6 mg/l. Nitrate values are high (mean of 10.33 mg/l N) and indicate probable pressure from the surrounding agricultural land uses. Orthophosphate values have a mean of 0.1 mg/l.

10.6.65 Table 10-9 indicates that the tributary of the River Till at Kexby Lane is circum-neutral with a mean pH of 7.75 (within the WFD EQS), based on the 15 samples considered here. Dissolved oxygen saturation is within the WFD High classification range, BOD and ammonia meet the High EQS indicating low organic pollution. Nitrate values are elevated (mean of 7.31 mg/l N) similarly to the other monitoring sites relating to the study area and indicate agricultural pressure. However, orthophosphate values are lower than at the other nearby monitoring sites with a mean of 0.04 mg/l.

Table 10-8: Summary Environment Agency water quality monitoring data (2017-2021)

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	7.68	8.05	7.17	7.9	7.4	8.09	9.01	7.67	8.16	7.91
Temperature of Water	°C	10.9	16.7	4.1	16.04	5.92	10.6	21.6	4.6	19.0	5.1
Conductivity at 25°C	µs/cm	1692	1807	1542	1779	1600	812	1035	505	976	612
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	1.2	1.5	1.0	1.4	1.0	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.09	0.85	0.03	0.18	0.03	0.12	0.44	0.03	0.23	0.03
Nitrogen, Total Oxidised as N	mg/l	8.61	15.5	4.20	11.0	6.52	9.2	12.3	5.5	10.98	7.19
Nitrate as N	mg/l	8.01	10.9	4.42	9.434	6.39	8.37	11.4	4.35	10.32	6.47
Nitrite as N	mg/l	0.049	0.110	0.019	0.082	0.021	0.32	7.92	0.01	0.09	0.02
Ammonia un-ionised as N	mg/l	0.0007	0.0026	0.0002	0.0013	0.0003	0.002	0.015	0.001	0.003	0.001
Alkalinity to pH 4.5 as CaCO3	mg/l	236.2381	280	200	260	210	164	178	136	178	144
Orthophosphate, reactive as P	mg/l	0.678	1.77	0.256	1.188	0.289	0.269	0.44	0.12	0.39	0.16
Oxygen, Dissolved, % Saturation	%	78.52	132.8	20	98.09	50.24	96.32	118.40	83.3	100.47	88.66
Oxygen, Dissolved as O2	mg/l	8.67	14.7	3.74	11.6	4.61	10.85	13.00	7.69	12.66	8.71

Table 10-9: Summary of Environment Agency water quality monitoring data (2017-2021)

Determinant	Units	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	7.62	8.31	7.32	7.85	7.41	7.75	8.34	7.34	8.16	7.38
Temperature of Water	°C	10.74	19.80	3.50	19.12	4.38	9.29	15.8	2.5	14.38	4.04
Conductivity at 25°C	µs/cm	1032	1044	1020	1041	1022	731	1010	504	914	598
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	3.41	19.0	1.00	6.68	1.18	2.1	5.6	1	2.8	1
Ammoniacal Nitrogen as N	mg/l	0.37	3.70	0.03	0.60	0.05	0.13	0.73	0.035	0.129	0.039
Nitrogen, Total Oxidised as N	mg/l	10.45	33.00	5.57	15.00	5.76	7.35	17.0	2.20	10.49	3.32
Nitrate as N	mg/l	10.33	32.90	5.49	15.40	5.65	7.31	16.80	2.18	10.48	3.28
Nitrite as N	mg/l	0.095	0.34	0.025	0.158	0.035	0.04	0.19	0.015	0.052	0.017
Ammonia un-ionised as N	mg/l	0.002	0.018	0.000	0.003	0.0004	0.001	0.003	0.0001	0.0025	0.0001
Alkalinity to pH 4.5 as CaCO3	mg/l	207	250	130	233	190	205	258	110	238	187
Orthophosphate, reactive as P	mg/l	0.106	0.29	0.01	0.20	0.027	0.038	0.074	0.019	0.056	0.021

Determinant	Units	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*
Oxygen, Dissolved, % Saturation	%	89.97	148.50	52.40	138.28	65.88	87.91	126	48.3	120.28	60.78
Oxygen, Dissolved as O2	mg/l	9.95	15.50	6.30	13.63	7.43	10.14	14.8	5.01	13.4	7.09

Table10-10: Summary of WFD physio-chemical standards for watercourses in the study area (not relevant to River Trent which is a transitional waterbody)

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; Mod-Poor 10%ile	>6 &<9	>6 &<9	4.7	4.2	<4.2
Temperature	Degrees Celsius (ºC)	98%ile (not in salmonid waterbodies and canals)	25	28	30	32	>32

Hydromorphology

10.6.66 The Scheme interacts with six watercourses within the Cable Route Corridor that is in the WFD management catchments off Lower Trent and Erewash, and Anglian. The baseline information on each watercourse is provided in Table 10-11.

Table 10-11: Hydromorphology of watercourses

Waterbody	Baseline Description
Fillingham Beck (GB105030062490)	The Fillingham Beck flow within the Cable Route Corridor for approximately 525m. It has a straightened channel that is 1m in width. Historic mapping 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. Through this section it has no riparian vegetation but a 5m buffer between arable farmland is present, which will help to limit pollution from the surrounding agriculture.
Marton Drain Catchment (tributary of Trent) waterbody (GB104028057840)	The Marton Drain has a straightened, trapezoidal channel and is c. 5m wide. It has steep incised banks rising approximately 5m from the bed on the left bank, and 3m on the right bank. Historic mapping shows no change in the local river since the early 1900s, meaning it is likely that much of the modification to the river and occurred prior to this date. The margins demonstrate extensive fine sediment deposition. There is approximately 5m buffer zone to help mitigate the ingress of fines and nutrients from surrounding arable fields.
Till (Witham) waterbody (GB105030062500)	The Till east of Stow Road demonstrates a small degree of sinuosity as it flows through agricultural fields. This section is approximately 3.5m in width. There is rough grassland on the left bank for approximately 5m and deciduous hedgerow on the right bank, both will provide a buffer from the adjacent arable field. North of this section, the Till becomes straightened before it passes under Glenworth Road. This section also has c. 5m of grassland that will help to limit the ingress of fines and nutrients from the surrounding arable land. The watercourse has steep incised banks which limit

Waterbody	Baseline Description
	lateral connectivity. The whole section of the Till that flows through the Cable Route Corridor demonstrates limited change since the early 1900s, meaning it is likely that much of the modification to the river occurred prior to this date.
Trent from Carlton-on-Trent to Laughton waterbody (GB104028058480)	The watercourse flows from south to north and is approximately 90m 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. Flow within the channel is suggested to be uniform and laminar, owing to the over-deep form maintained by artificial confinement; with no apparent hydraulic variance 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.
Tributary of the Till waterbody (GB105030062480)	This watercourse is highly modified, with extensive straightened sections with signs of recent dredging. It shows minimal change in the lateral extent or position locally since the early 1900s, meaning it is likely that much of the modification to the river occurred prior to this date. The channel is trapezoidal with steep incised banks. It is flows under Marton Road through a box culvert of approximately 1.5m width. Flow is impounded upstream of the culvert and a pool is evident. Arable agriculture extends to the channel margins on both banks, with no riparian buffer, and so would be expected to suffer from ingress of agricultural pollution.
Seymour Drain Catchment (tributary of Trent) (GB104028058340)	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. Along the left bank there is some riparian vegetation which will provide some buffer from the ingress of fines and nutrients from surrounding arable farmland. The left bank lacks any riparian vegetation between the channel and the adjacent field. The bed is dominated by fine sediment. The watercourse flows along Torksey Ferry Road, under which it is then culverted before entering another culvert beneath the Cottam Power Station. The watercourse demonstrates sharply defined sinuosity in a section close to Headstead Bank, and here the channel width is c. 3m, with banks rising c. 3m from the bed. Minimal riparian vegetation is present to limit ingress of fines and nutrients from adjacent arable farmland. Historic mapping shows minimal change in the local river since the early 1900s apart from through Cottom Power Station where it has been straightened.

10.6.67 A number of smaller unnamed watercourses / ditches are present within the study area, and whilst they do not have individual WFD classifications, watercourses that do not have individual WFD classifications take the

classification of the receiving water body. The watercourses are likely to be largely artificial in nature and would have been developed, or modified, to aid land drainage. As a result, they are likely to be relatively low energy and uniform in nature, with little floodplain connectivity. 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.

Aquatic Ecology

10.6.68 At the time of writing, information on protected aquatic species, including Water Vole, Otter, Great Crested Newt was not available. The importance of water feature receptors will be reassessed at ES stage when this information is available.

Nature Conservation Sites

10.6.69 There are no statutory sites designated for nature conservation identified within 1km of the Cable Route Corridor. 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 **PEI Report Volume III Figure 10-1** and summarised in Table 10-12.

Table 10-12: Non-statutory Designated sites within 1km of the Site

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.	Within the Cable Route Corridor	This water dependent LWS is located close to the Cable Route Corridor. 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	These are located upstream of the Cable Route Corridor. As such it is considered there would be no hydrological pathway, and is therefore scoped out of further assessment.
Cow Pasture Lane	Ditch with notable aquatic and bankside vegetation located	Within the Cable Route Corridor	This LWS is located to the north, and into the area of the Cable Route Corridor. The Cable Route Corridor

Site Name	Description (from site designation)	Distance and direction from closest point of the Site	Relevance to this assessment
Drains LWS	within the Cable Route Corridor.		crosses this LWS. Thus, there is the potential for effects 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	These are located upstream of the Cable Route Corridor. As such it is considered there would 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.	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.
Mother Drain Upper Ings LWS	A drain notable for supporting many species of water beetle and water bug	Located 800 m north of the Cable Route Corridor.	This LWS is located 100m to the west of the River Trent and is hydrologically connected to the Cable Route Corridor via the connection between Seymour Drain and Mother Drain.

Water Resources

10.6.70 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 **PEI Report Volume III Figure 10-1**.

10.6.71 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. 10-56) This drinking water protected area is designated as ‘currently not at risk’.

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

10.6.73 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 **PEI Report Volume III Figure 10-1**.

10.6.74 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. 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.

10.6.75 Incident number 1324290 was a category 3, minor incident, which occurred at Fillingham Lane within the Cable Route Corridor. The cause was listed as sewage water. Incident number 1370631 was a category 3, minor incident, which approximately 800 m 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. 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. These are shown on **PEI Report Volume III Figure 10-1**.

Consented Discharges

10.6.76 Information on consented discharges 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 **PEI Report Volume III Figure 10-1**. Two are for WWTW, with two for a domestic property.

Flood Risk

10.6.77 The existing flood risk levels for the Cable Route Corridor is summarised in Table 10-13, details of which have been taken from Table 3-2 of the FRA.

Table 10-13: 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.
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

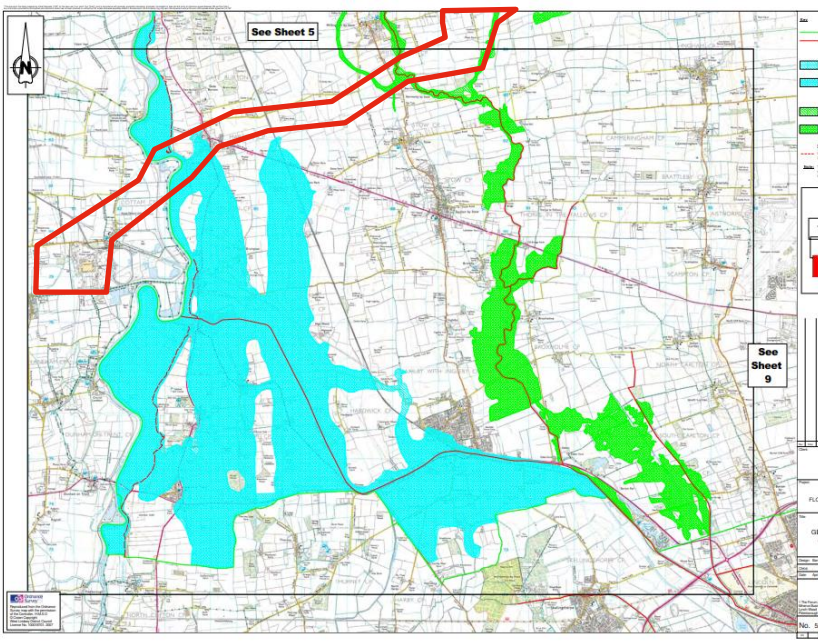


Plate 10-7 – WLDC SFRA – Tidal Flood Risk Map (Blue Hatch)

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)	

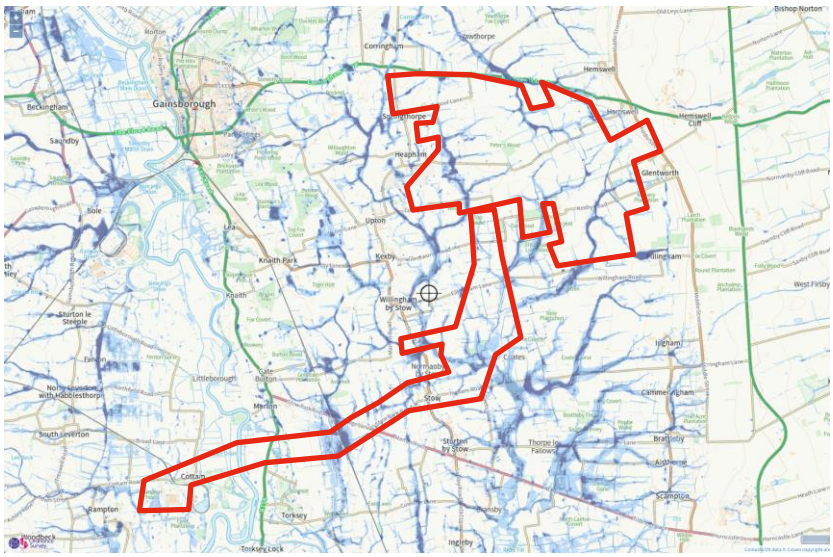
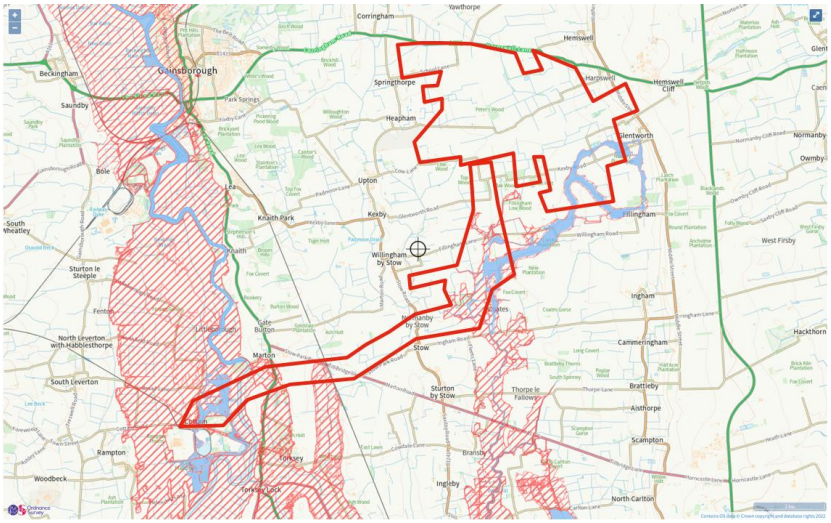


Plate 10-8 – Gov.uk – Flood Map for Surface Water (accessed January 2023)

Gov.uk Online Flood Maps indicate the majority of the Scheme Boundary lies 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

Flood Risk Source	Flood Risk Level	Comments
		Corridor crossing the River Trent is shown to be generally low risk.
Ground water	Low	**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 would not support large amounts of water storage, such as an aquifer. There may be a risk of groundwater flooding during and laying of cables. Further investigation will be carried out to inform the construction methods for the Cable Route Corridor and where they cross watercourses and ensure no increase in risk to the Scheme or elsewhere.
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 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.
Artificial sources	Low	 **Plate 10-9 – Gov.uk – Reservoir Flood Risk Mapping (accessed January 2023)** 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.

Future Baseline

10.6.78 The future baseline scenarios are set out in **PEI Report Volume I Chapter 5: EIA Methodology** and described below.

Future Baseline – 2025 – 2027 Construction, 2027 onwards Operation

10.6.79 The Till (Witham) WFD waterbody and Skellingthorpe Main Drain WFD waterbody are currently at their target WFD objective for 2015 (Moderate Ecological Status). The remaining WFD waterbodies have a target of Good by 2027 (Fillingham Beck, Marton Drain, Trent, and Seymour Drain) and Moderate by 2027 (Tributary of the Till).

10.6.80 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 and the proposed Levelling-Up and Regeneration Bill 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.

10.6.81 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

10.6.82 The WFD groundwater bodies (Lower Trent Erewash – Secondary Combined and Witham Lias) are at their target WFD objective of Good Status. However, these WFD classifications are subject to change during RBMP Cycle 3 (due to be published as originally due in 2021).

10.6.83 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

10.6.84 Climate change is predicted to alter the future fluvial flood risk and thus it is important that it is taken into account by the Preliminary FRA (**PEI Report Volume II Appendix 10-2**). Climate change resilience will be accounted for within the surface water drainage strategy for the Scheme, accommodating current government climate change projections.

10.6.85 The Scheme will not alter the current flood risk baseline described above. The drainage strategy will seek to ensure no detrimental impact relating to the surface water runoff from the Scheme following its construction. Therefore, no significant adverse changes to current baseline conditions are predicted for the future baseline, and so the impact assessment is undertaken against existing baseline conditions.

Future Baseline (Decommissioning)

10.6.86 It is considered that continued environmental improvements, tighter regulation at both national, regional and local scales, and environmental enhancements would lead to a gradual improvement over current baseline conditions in terms of water quality.

10.6.87 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. However, the design of the Scheme will incorporate the climate change projections required by the Environment Agency to ensure that potentially increased surface water flows are accounted for and managed across the lifetime of the Scheme. Therefore, it is assumed that there would be no significant adverse changes to current baseline conditions within the next 40-60 years (assumed decommissioning date of 2067 but could be longer, as the Applicant are not seeking a time limited consent), and so the impact assessment within this chapter is undertaken against existing baseline conditions.

Importance of Receptors

10.6.88 Table 10-14 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 provisional importance of the water feature as used in this preliminary 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 waterbody 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 **PEI Report Volume III Figure 10-1** for surface water features.

Table 10-14: Provisional Importance of Receptors

Water feature	Provisional importance
Seymour Drain (Trent Valley 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 and there may be surface water abstractions from the watercourse in the study area for agriculture, although this will be confirmed at the ES stage. It also receives treated sewage from Cottam Sewage Treatment Works (STW) and is therefore of importance

Water feature	Provisional importance
	for dispersal of this effluent. This catchment contains Cow Pasture Lane LWS. Seymour Drain is linked to Mother Drain Upper Ings LWS. 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 Ponds LWS, Torksey Ferry Road Ditch LWS, Cottam Wetlands LWS and Coates Wetland LWS. Low importance for morphology due to the heavily modified nature of the channel, particularly along the banks.
Marton Drain (Trent Valley 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. It also receives treated sewage from Marton STW and is therefore of importance for dispersal of this effluent. 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 (partly (Trent Valley IDB and LLFA 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 as well as urban and transport. Low importance for morphology due to the heavily modified nature of the channel, particularly along the banks.
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 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.
Till (Witham) (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 in 2013 and 2014.

Water feature	Provisional 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.
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. 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 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.
Other unnamed drains (Ordinary Watercourses)	As artificial, generally ephemeral agricultural drains and ditches, these are considered Low Importance water features for water quality and morphology.
Cottam Wetland and Ponds LWS	As these water features all support LWS they are considered to be of medium importance for water quality. Low Importance for morphology given they are largely artificial water features related to past activity on the floodplain of the River Trent. There is potential for presence of natural or recovering.
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.

Water feature	Provisional importance
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.
Floodplain Sensitivity **Fluvial flooding: River Till, River Trent Fillingham Beck**	River Trent: Medium to High Importance; River Till and Fillingham Beck: Low Importance. Within the Principal site, the land is mainly Fluvial Flood Zone 1, but small areas of Fluvial Flood Zone 2 and 3 encroach into the north, southern and west boundaries of the site. The areas at risk of flooding are agricultural land. The Cable Route Corridor crosses areas of the River Trent.
Tidal Flooding	Low Importance: Areas at risk of tidal flooding along the River Trent where flood defences are in place, where cable route corridor crosses site. No Tidal flood risk to Principal Site. Land use mainly agricultural.
Pluvial / Surface Water Flooding	Low Importance: Most of the Principal Site is at very low risk of surface water flooding, with some small areas of low to high risk associated with surface watercourses with agricultural land use adjacent.
Groundwater flooding	Low Importance.
Sewers	Low Importance: Risk of sewer surcharging within urbanised areas, with a low risk of flooding at the Principal Site or along Cable Route Corridor.
Artificial sources	Principal Site: Low Importance. A small area in the southeast at risk of reservoir flooding in agricultural area. Cable Route Corridor: Medium to High Importance. As the route enters the River Trent floodplain the area is at potential risk of flooding from a reservoir breach.

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, as described in **PEI Report Volume I Chapter 3: Scheme Description**. It forms part of the Framework Construction Environmental Management Plan (CEMP) (**PEI Report Volume II Appendix 3-1**).

10.7.2 A Framework CEMP will accompany the ES and will be secured through the DCO. The Framework CEMP details the measures that would be undertaken during construction to mitigate temporary effects on the water environment. The Framework CEMP will set out the structure and content for the detailed CEMP, which will be completed once a contractor is appointed, following submission of the DCO application. The detailed CEMP will be required to be developed in accordance with the Framework CEMP which will accompany the DCO application.

10.7.3 The Framework CEMP will comprise good practice methods that are established and effective measures to which the Scheme will be committed through the development consent. The measures within the CEMP will focus on managing the risk of pollution to surface waters and the groundwater environment. It will also consider 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 Framework CEMP will be reviewed, revised and updated as the Scheme progresses 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 will be implemented. 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 Framework CEMP will set out the 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 The high voltage cables associated with the Cable Route Corridor will be below ground, requiring trenching typically at a depth of around 2 m. Underground techniques (such as HDD) may be used to install cables beneath the River Trent, and would be at a suitable depth to avoid impacting the channel or the bed, subject to design and ground conditions. Where underground techniques are not feasible, and it can be agreed with regulators, crossings will be installed using open-cut techniques. In such cases, water flow would be maintained (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 design and location of the crossings will be provided before the DCO application. These details will be included within the ES, and be used to inform the assessment process within the ES.

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

Good Practice Guidance

10.7.8 The following relevant GPPs have been released to date on the NetRegs website (Ref. 10-63) and are listed below. While these are not regulatory guidance in England where the UK government website outlines regulatory requirements, they remain a useful resource for best practice. They will be documented in the Framework CEMP:

- GPP 1: Understanding your environmental responsibilities – good environmental practices;
- GPP 2: Above ground oil storage;
- GPP 3: Use and design of oil separators in surface water drainage systems;
- GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer;
- GPP 5: Works and maintenance in or near water;
- GPP 8: Safe storage and disposal of used oils;
- GPP 13: Vehicle washing and cleaning;
- GPP 19: Vehicles: Service and Repair;
- GPP 20: Dewatering underground ducts and chambers;
- GPP 21: Pollution Incident Response Plans;
- GPP 22: Dealing with spills; and
- GPP 26: Safe storage – drums and intermediate bulk containers.

10.7.9 Where new GPPs are yet to be published, previous Pollution Prevention Guidance (PPGs) still provide useful advice on the management of construction to avoid, minimise and reduce environmental impacts, although they should not be relied upon to provide accurate details of the current legal and regulatory requirements and processes. Construction phase operations would be carried out in accordance with guidance contained within the following PPGs:

- PPG6: Working at construction and demolition sites (Ref. 10-64);
- PPG7: Safe storage – the safe operation of refuelling facilities (Ref. 10-65); and
- PPG18: Managing fire water and major spillages (Ref. 10-66).

10.7.10 Additional good practice guidance for mitigation to protect the water environment can be found in the following key Construction Industry Research Information Association (CIRIA) documents and British Standards Institute documents:

- British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works (Ref. 10-67);
- British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites (Ref. 10-68);
- C753 (2015) The SuDS Manual (second edition) (Ref. 10-46);
- C741 (2015) Environmental good practice on site guide (fourth edition) (Ref. 10-69);
- C648 (2006) Control of water pollution from linear construction projects, technical guidance (Ref. 10-70);
- C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref. 10-71);
- C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors (Ref. 10-72); and
- C736F Containment systems for prevention of pollution (Ref. 10-73).

Management of construction runoff

10.7.11 The measures outlined below will be required for the management of fine particulates in surface water runoff that may occur as a result of the construction activities:

- 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 CIRIA report 'C532: Control of water pollution from construction sites' (Ref. 10-72) and CIRIA report 'C648 Control of water pollution from linear construction sites' (Ref. 10-70). Measures may include use and maintenance of temporary lagoons, tanks, bunds and fabric silt fences etc., or silt screens as well as consideration of the type of plant used.
- 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, geotextile silt fences, straw bales etc., or proprietary treatment (e.g. lamella clarifiers).
- Where practical, earthworks will be undertaken during the drier months of the year and earth moving works will avoid periods of very wet weather, 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.

- To protect watercourses from fine sediment runoff, topsoil/subsoil will be stored a minimum of 20 m from watercourses on flat lying land. Where this is not practicable measures to prevent runoff draining to the watercourse without prior treatment as necessary will be provided. Furthermore, if 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.
- Appropriately sized runoff storage areas for the settlement of excessive fine particulates in runoff will be provided.
- 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) 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.
- Equipment and plant are to be washed out and cleaned in designated areas within the Scheme compound only, where runoff can be isolated for treatment before disposal as outlined above.
- 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.
- 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.
- 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

10.7.12 The measures outlined below will be implemented to manage the risk of accidental spillages within the Site and potential conveyance to nearby water features via surface runoff or land drains. These measures will be included in the Framework CEMP and adopted during the construction works:

- Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002, and the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 10-13). Particular care will be taken with the delivery and use of concrete and cement as it is highly corrosive and alkaline.
- 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).

- 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 compound. 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.
- All washing down of vehicles and equipment will take place in designated areas and wash water will be prevented from passing untreated into watercourses.
- 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.
- As far as reasonably practicable, only biodegradable hydraulic oils will be used in equipment working in or over watercourses.
- All fixed plant used on the Site will be self-bunded.
- 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.
- 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 Site and regularly topped up. All construction workers will receive spill response training and tool box talks.
- The Site will be secure to prevent any vandalism that could lead to a pollution incident.
- Construction waste/debris are to be prevented from entering any surface water drainage or water body.
- Surface water drains on public roads trafficked by plant or within the construction compound 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.
- 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.
- 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.

10.7.13 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.

Management of flood risk

10.7.14 The Framework CEMP will incorporate 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.

10.7.15 Construction works undertaken adjacent to, beneath and within watercourses will comply with relevant guidance, including Environment Agency and Defra guidance documents.

10.7.16 The CEMP will incorporate measures aimed at preventing an increase in flood risk during the construction works. Examples of measures that could be implemented include:

- 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 would be done in accordance with the applicable flood risk activity regulations, if required.
- Connectivity will be maintained between the floodplain and the adjacent watercourses, with no changes in ground levels within the floodplain as far as practicable.
- 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.
- The construction laydown area site office and supervisor will be notified of any potential flood occurring by use of the Floodline Warnings Direct or equivalent service.
- All temporary construction compounds will be located outside of areas of fluvial flood zones 2 and 3 including allowances for climate change.

10.7.17 The Contractor will be required to produce an Emergency Response Plan following grant of DCO and prior to construction, which will provide details of the response to an impending flood and include:

- A 24-hour availability and ability to mobilise staff in the event of a flood warning.
- 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.
- Details of the evacuation and site close down procedures.
- Arrangements for removing any potentially hazardous material and anything capable of becoming entrained in floodwaters, from the temporary works areas.
- 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.

- 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. 10-14) and the Environmental Permitting Regulations (2016) (Ref. 10-10).
- 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.

Cable Route Corridor: Management of risk to morphology of watercourses

10.7.18 At the time of writing, the River Trent is expected to be, and WFD monitored reaches of watercourses will be crossed using underground techniques, as stated in Section 10.4. Other smaller watercourse crossings are likely to be crossed using open cut installation techniques, and this is the worst case scenario assessed in this PEI Report. However, final decisions on the watercourse crossing schedule will not be made until a later stage, at which point further consultation will be carried out with relevant statutory stakeholders.

10.7.19 In total, there are expected to be in the order of approximately 25 watercourse crossings including the River Trent. These will include the WFD watercourses Seymour Drain, River Trent, Marton Drain, Skellingthorpe Main Drain, River Till, and its tributary, Fillingham Beck and the Eau tributary. At the time of writing the Cable Route Corridor has not been finalised as the design is being developed.

10.7.20 More detail on the location of watercourse crossings, and the methodology for crossing will be available and assessed at the ES stage, when a final route for the Cable Route Corridor will be defined.

10.7.21 A pre-works morphology survey of the channel of each watercourse to be crossed 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.

10.7.22 At this stage it is assumed that where open-cut crossings are required that water flow would be maintained by damming and over pumping or fluming. Works should be carried out in the drier months where possible as this would reduce the risk of pollution propagating downstream, particularly in the case of ephemeral watercourses. Once the watercourses are reinstated, silt fences, geotextile matting or straw bales should be used initially to capture mobilised sediments until the watercourse has returned to a settled state. 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 the construction activity. Regular observations of the watercourses will also be required post-works during vegetation re-establishment of the banks, especially following wet weather, to ensure that no adverse impacts have occurred. These requirements will be described in the WMP.

Access Track Crossings of Watercourses

10.7.23 Access tracks will be constructed across the Principal Site. These will typically be 3.5m to 6m wide compacted stone tracks with 1:2 gradient slopes on either side. The internal road layout will be designed to avoid drainage ditch and watercourse crossings wherever possible.

10.7.24 Any existing watercourse crossing locations should be utilised to avoid the need for new crossing locations. As a design principle, culverts will be avoided wherever possible. However, as a worst-case basis and adopting a precautionary approach at the time of writing, since the need for and design of future access watercourse crossings are not known, the use of culverts has been assessed in this PEI Report. However, it would be expected that where culverts are necessary the least impacting design that is reasonably practicable is proposed (e.g. arch rather than box cuverts, and culverts in preference to pipes etc.).

10.7.25 Depending on the design of any watercourse crossings, floodplain compensation may be required on a ‘like for like’ and ‘level for level’ basis. Alterations to surface water flow pathways will also need to be considered and, if necessary, mitigated. This will include consideration of the span and soffit height of any works to existing crossings to ensure no increase in flood risk.

10.7.26 More detail on the watercourse crossings by access tracks will be known, and assessed fully, at the ES stage. The access track crossings of watercourses are assumed to be culverts as a worst-case scenario for assessment purposes at this stage.

Design

10.7.27 Detailed information on Scheme design and infrastructure is provided in **PEI Report Volume I Chapter 3: Scheme Description**.

10.7.28 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. Where flood depths exceed this, the panel height may be raised further, or area avoided. Mounting poles will generally be driven or screwed into the ground to a maximum depth of 4m. Location of the BESS, on site substations, and other infrastructure will be located based on flood risk and other environmental factors.

10.7.29 The solar PV panels will be offset from watercourses by 10m. The point of measurement will be agreed with the Environment Agency through further consultation, but for the purposes of the assessment, as stated in Section 3, for smaller channels less than 3m in width this would be measured from the

centre line of the watercourse as on Ordnance Survey mapping. For channels greater than 3m, this would be measured from the water's edge / channel extents under normal flow conditions.

10.7.30 Indicative foundation depths associated with the development include 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 30m for low voltage distribution cables installed using open trench techniques. There will be a maximum depth of 3m for the BESS Compound foundations.

Drainage Strategy

10.7.31 A Preliminary Drainage Strategy has been prepared within **PEI Report Volume II Appendix 10-3** and will be submitted with the DCO application. This Drainage Strategy will provide attenuation of surface water runoff from the Scheme, whilst minimising flood risk to the Site and surrounding areas. In accordance with planning policy guidance (as outlined in Section 10.2), 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 will be secured through the inclusion of a detailed Drainage Strategy as a Requirement of the DCO.

10.7.32 Individual solar PV panels will be held above the ground surface on mounting structures (see **PEI Report Volume I Chapter 3: Scheme Description**). This prevents sealing the ground with an impermeable surface beneath the solar panels, allowing rainfall/runoff to infiltrate to ground throughout the Principal Site. 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.

10.7.33 For new impermeable areas associated with the BESS areas and substations, additional attenuation in the form of swales will be incorporated to control any increase in the rate of flow towards receiving watercourses, and to provide treatment for any contaminants collected on areas of hardstanding. The rate of runoff from each development location within the Scheme would ensure nil detriment in terms of no increase in runoff rate from the Site to receiving watercourses.

Drainage Outfalls

10.7.34 Where possible, surface water will drain from the Scheme's swale based drainage system to local receiving watercourses via a new ditch, as this avoids 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. 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 would occur following grant of the DCO and subject to a Requirement.

Foul Drainage

10.7.35 At this point in time, it is not confirmed how any wastewater will be managed but it is expected that the low volumes of foul drainage generated (related to 10-12 operational staff) will be self-contained non-mains domestic storage and / or a treatment system. These would be regularly emptied under contract with a registered recycling and waste management contractor.

10.7.36 Should a connection to a foul sewer be required as an alternative option, Anglian Water would be consulted at the appropriate time.

10.7.37 As there would be no discharge of foul water to a watercourse, and only small volumes would either be discharged to a foul sewer indirectly via a suitable waste management contractor, or directly with Anglian Water consent, no further assessment of foul waste from the Scheme is proposed. This will be reviewed as the EIA progresses.

Operational cleaning

10.7.38 It is assumed that the solar PV panels will be cleaned around once per year, using clean water with no added chemicals.

10.7.39 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. Alternatively, where water is sourced from a local natural source, this would need to be in accordance with any abstraction licence from the Environment Agency (if the volumes to be abstracted are sufficiently high).

Solar PV Panel Maintenance

10.7.40 The operation of the Site will be covered by procedures to be contained within a Framework Operation Environmental Management Plan (OEMP). This document will be provided with the ES.

10.7.41 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 Scheme, and to ensure any maintenance activities take place in a way to avoid and minimise any potential environmental impacts. This would include measures to manage the risk of pollution from proposed infrastructure spillages and maintenance activities, such are correct storage in appropriately bunded areas of any hazardous materials, and appropriate, regular inspection and maintenance of all equipment on site.

10.7.42 The OEMP for the Scheme is to be finalised prior to operation and would include a regular schedule for visual inspection and cleaning of the panels.

The solar PV panels do not contain any liquid (hazardous or not). The panels are constructed in a robust manner and their components cannot be separated except with a considerable mechanical load. Therefore, no specific mitigation measures (in terms of the management of leaks) are required for the solar PV panel structures themselves during operation.

Management of fire risk

10.7.43 The BESS areas require fire water tanks to supress a fire, should one break out.

10.7.44 Fire water runoff may contain particles from a fire. 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.

10.7.45 It is proposed to contain the 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.

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

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

10.7.48 Consultation with the emergency services will be undertaken as part of the Applicant's pre-application work. Further details regarding management of fire water will be outlined in the Drainage Strategy to be submitted with the DCO application.

Permits and Consents

10.7.49 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:

- Land drainage consent(s) under section 23 of the Land Drainage Act 1991 (Ref. 10-5) for works affecting the flow in ordinary watercourses;
- Flood risk activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 10-10) in connection with drainage outfall installation;
- Water activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 10-10) for temporary construction and permanent operational discharges;
- Trade effluent consent under the Water Industry Act 1991 (Ref. 10-74) for the purposes of discharging trade effluent from welfare facilities during construction;
- Full or temporary water abstraction licence(s) under section 24 of the Water Resources Act 1991 (Ref. 10-14) (if more than 20m^3/d is to be

dewatered / over-pumped and exemptions do not apply) – see further detail below;

- Temporary water impoundment licence under section 25 of the Water Resources Act 1991 (Ref. 10-14) in connection with the laying of cables; and
- Marine licence from the Marine Management Organisation under the Marine and Coastal Access Act 2009 (Ref. 10-75).

10.7.50 There is the potential for the need for either full or temporary water abstraction licence(s) from the Environment Agency for the abstraction of water from the send and receive pits associated with the underground watercourse crossings or other excavations where groundwater may be encountered, 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 more 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 obtain a water activity permit(s) from the Environment Agency to discharge the water to ground or a watercourse if the water is considered to be 'unclean'.

10.8 Assessment of Likely Impacts and Effects

10.8.1 The Scheme as outlined in **PEI Report Volume I Chapter 3: Scheme Description** 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 EIA methodology is included in **PEI Report Volume I Chapter 5: EIA Methodology.**

Construction (2025 to 2027): Principal Site

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

- 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;
- Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required;
- Potential impacts on groundwater resources, including licenced and unlicenced (private) water supplies.
- Potential impact on baseflow to watercourses from temporary dewatering of excavations or changes in hydrology; and
- 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 in flood risk due to the construction of PV panels, which may alter runoff from the site.

10.8.3 Residual effects are summarised in Table 10-16 at the end of this section, with discussion presented below in the following paragraphs. All of these potential impacts and effects will be re-assessed once further design information is available at the ES stage. In some cases, the assumptions as described earlier have been taken into account. However, in others there simply is not enough information to undertake a water feature specific assessment at this stage.

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 non-intrusive method, with it assumed at this stage that other smaller watercourses may be crossed using open cut techniques. This is a precautionary, worst-case approach and all crossing methods will be reviewed as the Scheme is developed.

10.8.9 At the time of writing, it is not known exactly where access track crossings or crossings for cables within the Principal Site are located. Therefore, only a generic assessment can be provided at this stage. A water features specific assessment will be undertaken when the actual locations and proposed

crossing design is known with the results presented in the ES. In addition, at this stage the locations, and potential need for, drainage outfalls is not known and so any water feature specific impacts related to outfalls will also be assessed within the ES with only a generic assessment provided in this chapter.

10.8.10 Within the Principal Site there is the River Eau, and its tributary from the south, Tributary to Fillingham Beck, and Tributary to Till (Witham). It is likely there are more minor surface water channels within the catchment contained within the Principal Site which feed into these watercourses. These are all considered to be of **high** importance for water quality.

10.8.11 There is a potential for 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 receptors, being the River Eau and its tributary from the south, Tributary to Fillingham Beck, and Tributary to Till (Witham), it is considered that with the proposed embedded mitigation measures this would result in a **very low adverse** impact on the water features. This would result in a **minor adverse effect** (**not significant**).

Internal Cabling

10.8.12 There may also be a requirement to cross water features for internal cabling connections. For monitored reaches of WFD watercourses, **high** importance receptors, this would result in a **no change** impact to the receptor, as non-intrusive directional drilling would be used. This would result in a **neutral effect** (**not significant**).

10.8.13 For small agricultural ditches, **low** importance receptors, it is assumed at this stage that intrusive techniques would be used with the flow over-pumped or flumed through the working area. With the proposed embedded mitigation, on **low** importance receptors it is considered this would result in a short term, temporary **low adverse** impact, resulting in a **negligible effect** (**not significant**).

Access

10.8.14 Given that, at the current stage of the design, information on crossing methodology and access track crossing locations are not fully developed, it is considered appropriate to assume a worst-case for the potential for magnitude of impact on the watercourses in the Principal Site.

10.8.15 For receptors of **high** importance, if culverts are proposed as a worst case assessment, this would result in temporary construction impacts within the channel (as they would need to be constructed online) of **low adverse** magnitude of impact. The water pollution risk would result in a **moderate adverse effect** (**significant**). However, in practice alternative options to culverts should be considered (or the least impacting culvert option with all possible embedded mitigation applied) and this will be investigated as the design of the Scheme is progressed. The same magnitude of impact on agricultural ditches of **low** importance is considered to result in a **negligible adverse effect** (**not significant**).

Outfalls

10.8.16 It is not known where future surface water outfalls will be located, and there remains an opportunity for any SuDS or surface water drainage systems to connect to the existing waterways using ditches to avoid engineered outfalls entirely. However, as this is not confirmed, and adopting a precautionary approach, it has been assumed that engineered outfalls will be provided.

10.8.17 Although it is assumed that construction of any outfalls would be within a dry working area, their construction would 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. For receptors of **high** importance, this would result in a localised, short term and temporary **very low adverse** magnitude of impact, which would result in a **minor adverse effect** (**not significant**). The same magnitude of impact on the low importance agricultural ditches is considered to result in a **negligible adverse effect** (**not significant**).

Temporary Impacts on the Hydromorphology of Watercourses

10.8.18 The crossing of watercourses using open cut techniques, and the construction of temporary access track crossings of watercourses utilising culverting has the potential to result in **medium adverse** magnitude of impact. This is due to the impact on the WFD hydromorphological quality elements, which include the character of the bed, longitudinal and lateral continuity, connection to groundwater, and riparian habitat of the watercourse, a **low** importance receptor. This would result in a **minor adverse effect** (**not significant**).

10.8.19 There may also be a requirement to cross water features for internal cabling connections. For WFD watercourses, **low** importance (morphology) receptors, this would result in a **no change** magnitude of impact to the receptor, as non-intrusive directional drilling would be used. This would result in a **neutral effect** (**not significant**).

10.8.20 For small agricultural ditches, of **low** importance, it is assumed at this stage that intrusive techniques would be used. With the proposed embedded mitigation it is considered this would result in a short term, temporary **medium adverse** magnitude of impact, resulting in a **minor adverse effect (not significant)**.

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

Groundwater

Risk of Pollution from Construction Works

10.8.22 As indicated in **PEI Report Volume I Chapter 3: Scheme Description**, the low-voltage on-site cabling to connect the solar PV modules to the inverters may require trenches of around 1.2 m deep. The higher voltage cables required to connect the transformers to the on-site substations may require trenches around 1.7 m deep. However, this may vary at different points along

the cable route when required. Other structures to be 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 below ground level as a worst case.

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

10.8.24 Taking into account the scale of the construction works that may encounter groundwater across the whole Principal Site, the potential magnitude of impact on groundwater quality is **low** adverse. However, the potential impact of construction on groundwater quality, taking into account the measures to be secured within the Framework CEMP, are considered to be a **no change** magnitude of impact, which on **medium** importance groundwater features (Scunthorpe Mudstone Formation and Charmouth Mudstone Formation) results in a **neutral effect** (**not significant**) from the PV modules.

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

Groundwater Flow Impacts

10.8.26 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 high permeability of the sand and gravel aquifers. Significant groundwater flows are not anticipated in the Till and Alluvium superficial geology being largely clayey and low permeability. On the basis of the above, as the importance of the receptor is classified as **medium** and the magnitude of impact from the cabling trenches is considered to be **no change**, this is assessed to result in a **neutral effect** (**not significant**).

10.8.27 Cable routes beneath watercourses are anticipated to be below the water table over part of their 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 **very low** 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**).

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

Groundwater Dewatering Impacts

10.8.29 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. Maximum parameters for the pit dimensions will be outlined at the ES stage.

10.8.30 As outlined above, there may be shallow groundwater in parts of the Principal Site, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques potentially including pumping, damming or shoring up the pits with sheet piling. Significant groundwater ingress is not anticipated due to the largely clayey low permeability Till and Alluvium superficial geology, and the low hydraulic gradients in the high permeability sand and gravel aquifers.

10.8.31 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. This document states that uncontaminated, clean water, is water that is wholly or mainly clear rainwater or infiltrated groundwater that has collected in the bottom of temporary excavations on an uncontaminated site (Ref. 10-76).

10.8.32 The pits would be backfilled with the original excavated material upon completion and would not affect groundwater base flow in the longer term. Given the potential to encounter groundwater temporarily during construction, but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the Framework CEMP, there is the likelihood of a 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 negligible impact therefore resulting in a **minor adverse effect** (**not significant**).

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

Mobilisation of Existing Contamination

10.8.34 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 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.

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

10.8.36 Consequently, water quality impacts to rivers receiving baseflow, and groundwater abstractions down gradient are considered to be **very low** magnitude of impact, on groundwater receptors of **medium** importance, and

a resulting **negligible effect (not significant)**. This will be reviewed at the ES stage.

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

Flood Risk

10.8.38 Long term flood risk resulting from the Scheme 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 Boundary.

10.8.39 The increase in surface water runoff rates as a result of the with-Scheme scenario will be managed via sustainable drainage techniques proposed to mimic the pre-Scheme conditions detailed within the Preliminary Drainage Strategy (**PEI Report Volume II Appendix 10-3**), resulting in no impact to flooding from surface water sources within or surrounding the Scheme Boundary.

10.8.40 A summary of the pre- and post- Scheme scenario flood risk levels for all sources within the Principal Site is provided in Table 10-15 below, details of which have been taken from Table 5-1 of the FRA (**PEI Report Volume II Appendix 10-2**).

Table 10-15: Flood Risk pre-Scheme to post-Scheme assessment

Flood Risk Source	Pre-Scheme Flood Risk Level	Post-Scheme Flood Risk Level	Comments
Fluvial	Low (Principal Site)	Low (Principal Site)	Discharge from impermeable areas detailed in the Preliminary Drainage Strategy (**PEI Report Volume II Appendix 10-3**) are to be restricted to Greenfield rates, mitigating increases to peak river flow rates. Solar PV Panel infrastructure within Flood Zones 2/3 “interaction zones” are not envisaged to alter the existing flood extents’ topography and are proposed to be installed to enable sufficient freeboard during the worst case flooding scenarios.
Tidal	Low (majority of Scheme Boundary) – High (areas associated with watercourses)	Low (majority of Scheme Boundary) – 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

Flood Risk Source	Pre-Scheme Flood Risk Level	Post-Scheme Flood Risk Level	Comments
			including the 1 in 100 + 40% CC event. No change in flood risk level.
Groundwater	Low	Low	The Preliminary Drainage Strategy (**PEI Report Volume II Appendix 10-3**) 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.

10.8.41 As noted in the Table 10-15 above, solar PV Panel infrastructure within Flood Zones 2/3 “interaction zones” are not envisaged to alter the existing flood extents’ topography and are proposed to be installed to enable sufficient freeboard during the worst case flooding scenarios (i.e. the Credible Maximum Scenario). The greenfield runoff rates will mimic the natural drainage conditions from the current undeveloped site conditions. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a worst case **High** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.42 The Scheme would not result in any changes to the risk of tidal flooding in the area. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.43 The Scheme would not result in any changes to the risk of surface water flooding in the area based on the proposed drainage strategy and mitigation to greenfield runoff rates. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.44 The Scheme would not result in any changes to the risk of groundwater flooding in the area based on the low risk of groundwater flooding in the area, and the Scheme itself. Therefore, it is considered that the Scheme would result

in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.45 The Scheme would not result in any changes to the risk of sewer flooding in the area. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.46 The Scheme would not result in any changes to the risk of flooding from artificial sources in the area. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

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

10.8.47 Table 10-16 provides a summary of the potential impacts and effects on the water environment during construction of the Principal Site.

Table 10-16: Summary of Magnitude of Impact and Significance of Effect for the Construction Phase of the Principal Site

Receptor	Importance	Description of Impact	Impact	Effect
Watercourses: Eau, Fllingham Beck and River Till	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)
Agricultural ditches	Low	As above	Low adverse	Neutral (not significant)
Watercourses: Eau, Fllingham Beck and River Till	High	Crossing of water features by non-intrusive directional drilling	No change	Neutral (not significant)
Agricultural ditches	Low	Crossing of ditches by intrusive techniques	Low adverse	Negligible (not significant)
Watercourses: Eau, Fllingham Beck and River Till	High	Crossing of watercourses by access tracks, using culvert construction.	Low adverse	Moderate Adverse (significant)
Agricultural ditches	Low	Crossing of watercourses by	Low adverse	Negligible (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
		access tracks, using culvert construction.		
Watercourses: Eau, Fllingham Beck and River Till	High	Construction of any SuDS or surface water drainage system outfalls .	Very Low	Minor adverse (not significant)
Agricultural ditches	Low	Construction of any SuDS or surface water drainage system outfalls .	Very Low	Negligible (not significant)
Watercourses: Eau, Fllingham Beck and River Till	Low (morphology)	Temporary impacts on hydro-morphology from the use of open cut techniques and construction of temporary access track crossings.	Medium adverse	Minor adverse (not significant)
Watercourses: Eau, Fllingham Beck and River Till	Low (morphology)	Crossing of water features for internal cabling connections	No change	Neutral (not significant)
Agricultural ditches	Low	Temporary impacts on hydro-morphology	Medium adverse	Minor adverse (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)
	Medium	Potential impact to groundwater flow from construction of internal cable routes.	Very Low	Negligible (not significant)
	Medium	Potential impact to groundwater levels and flow from	Very Low	Negligible (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
		temporary dewatering		
	Medium	Potential impact to groundwater quality from any mobilisation of existing contamination, and water quality impacts to river baseflow.	Very Low	Negligible (not significant)
Fluvial Flood Risk	High	Impact on fluvial flood risk during construction	No change	Neutral (not significant)
Tidal Flood Risk	High	Impact on tidal flood risk during construction of Cable Route Corridor	No change	Neutral (not significant)
Surface Water Flood Risk	Low	Impact on pluvial flood risk during construction	No change	Neutral (not significant)
Groundwater Flood Risk	Low	Impact on pluvial flood risk during construction of drainage features and	No change	Neutral (not significant)
Sewer Flood Risk	Low	Impact on sewer flood risk during construction of Cable Route Corridor	No change	Neutral (not significant)
Artificial sources Flood Risk	Low	Impact on fluvial flood risk during construction	No change	Neutral (not significant)

Construction (2025 to 2027): Cable Route Corridor

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

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

- 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
- 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.

10.8.49 These are summarised in Table 10-18 at the end of this section, with discussion presented below in the following paragraphs. All of these potential impacts and effects will be re-assessed once further design information is available at the ES stage.

Surface Water Features

10.8.50 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. 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.

10.8.51 During construction, with the embedded mitigation in place, it is considered there would be potential for a **very low** magnitude of impact on surface water quality. For the **high** importance receptors (WFD monitored watercourse channels), this would result in a **minor adverse (not significant) effect**. For **low** importance receptors, his would result in a **negligible (not significant) effect**.

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

10.8.53 There is a small risk of 'frac-out' events (i.e. 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 would be included within the Framework CEMP at ES stage and will minimised the risk of a 'frac-out' event. 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. This requirement would be included within the Framework CEMP at ES stage. These mitigation requirements will be outlined in a WMP. Given the large size of the River Trent, and therefore its large dilution and dispersal capacity, as well as the non-intrusive nature of the works, the risk to the water quality during cable installation is considered to be very low magnitude of impact. For a **very**

high importance receptor, a **very low** magnitude of impact is assessed as a **minor adverse effect** (**not significant**).

10.8.54 At the time of writing, it is not known exactly where access track crossings or crossings for cables for the Cable Route Corridor will be located. The locations will be reviewed, and assessment undertaken at the ES stage. As stated in the assumptions, some watercourses will be crossed by non-intrusive methods such as HDD, with it assumed that other smaller watercourses would be crossed by open cut techniques (i.e. a precautionary approach has been adopted).

Cable Crossings

10.8.55 With regard to the River Trent, there is considered to be negligible potential for impact from works to install a cable beneath it given the mitigation measures in place, the distance of the launch/receiving pits from the banks and the size of the watercourse which would dilute and disperse any pollutants. For the **very high** importance River Trent, a **very low** magnitude of impact results in a temporary **minor adverse effect** (**not significant**).

10.8.56 Directional drilling will also be used for crossing the other WFD watercourse channels. Therefore, as above it is considered there would be a **very low** magnitude impact from the risk of water pollution including 'frac out' events, which on **high** importance water features (River Till and tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain) results in a temporary **minor adverse effect** (**not significant**).

10.8.57 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 best practice measures, which will be outlined in the Framework CEMP and WMP, these impacts would be a temporary and localised **low adverse** magnitude of impact in terms of water quality. Intrusive open cut methods would only be used for lower importance receptors, for example agricultural ditches. A **low adverse** magnitude of impact on a **low** importance receptor would result in a **negligible adverse effect** (**not significant**).

Access

10.8.58 There is potential for adverse impacts on surface water quality of water features during construction of temporary crossings (e.g. using culverts) for access. It is considered that the installation and removal of temporary culverts for site access would result in short term, temporary **low adverse** magnitude of impact. At this stage, locations are not known so site specific assessment is not possible. For any crossings of **high** importance water features (River Till and tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain), this would result in a **moderate adverse effect** (**significant**). For the **low** importance agricultural ditches, a **low adverse** magnitude of impact results in a **negligible effect** (**not significant**).

10.8.59 Given that no other watercourses or water features will be directly affected by the construction works, and that the Scheme has buffer zones around watercourses and ponds, a **no change** magnitude of impact is predicted for all other surface water receptors in the study area from site runoff and chemical spillages (as they may receive runoff indirectly from permitted site discharges of treated runoff). For the **high** importance River Till, Tributary of the Till, and Fillingham Beck this gives a **neutral effect** (**not significant**). For the **low** importance agricultural drainage ditches (those that are not directly crossed) and small ponds, this results in a **neutral effect** (**not significant**).

Temporary Impacts on the Hydromorphology of Watercourses

10.8.60 The crossing of watercourses using open cut techniques, and the construction of temporary access track crossings of watercourses utilising culverting has the potential to result in moderate adverse impacts to the channel and riparian habitat of the watercourse.

10.8.61 At the time of writing, it is not known exactly where access track crossings or crossings for cables for the Cable Route Corridor will be located. The locations will be reviewed, and assessment undertaken at the ES stage. As stated in the assumptions, some watercourses will be crossed by non-intrusive methods such as HDD, with it assumed that other smaller watercourses would be crossed by open cut techniques (i.e. a precautionary approach has been adopted).

10.8.62 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, the distance of the launch/receiving pits from the banks. For the **very high** importance River Trent, a **no change** magnitude of impact results in a **neutral effect** (**not significant**).

10.8.63 Directional drilling will also be used for crossing the other WFD watercourse channels. Therefore, as above it is considered there would 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 adverse effect** (**not significant**).

10.8.64 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, their riparian habitats, and the hydrological and sediment regimes during construction. With the proposed mitigation measures, including reinstatement of the channel as found this would be a temporary and localised **medium adverse** impact. Intrusive open cut methods would only be used for lower importance receptors, for example agricultural ditches. A **medium adverse** magnitude of impact, on a **low** importance receptor, would result in a **minor adverse effect** (**not significant**).

Groundwater

Risk of Pollution from Construction Works

10.8.65 As indicated in **PEI Report Volume I Chapter 3: Scheme Description** 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 open excavations potentially create new pathways to groundwater and thus potential impacts should be assessed

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

10.8.67 The potential impact of construction on groundwater quality during construction of the Cable Route Corridor, taking into account the measures to be secured within the CEMP (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

10.8.68 As no continuous foundations are in the design and that groundwater is likely to be within the shallow superficial units across the majority of the Cable Route Corridor, 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 **negligible effect** (**not significant**).

10.8.69 No impacts to groundwater abstractions or PWS as none are situated within the Cable Route Corridor.

10.8.70 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 on the Site are anticipated. A **very low** magnitude of 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

10.8.71 Construction works to install cables beneath the River Trent using drilling or boring techniques would 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 will be outlined in the ES.

10.8.72 As outlined above there may be shallow groundwater in parts of the Site, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques, potentially including pumping, damming or shoring up the pits with sheet piling. A temporary abstraction licence may be required from the Environment Agency when abstracting more than $20m^3$ of water per day lasting less than 28 days. 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 (Ref. 10-76).

10.8.73 The pits would be backfilled with the original excavated material upon completion and would not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction, but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the Framework CEMP, there is the likelihood of a short term, temporary **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 negligible impact therefore resulting in a **minor adverse effect** (**not significant**).

Mobilisation of Existing Contamination

10.8.74 The 1km study area surrounding 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 installation of the module structures to a maximum depth of 2m 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.

10.8.75 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 **very low** magnitude of impact, and a **negligible effect** (**not significant**).

10.8.76 Consequently, water quality impacts to rivers receiving baseflow, and groundwater abstractions down gradient, considered to be of **medium** importance are considered to be **very low** magnitude of impact, and a **negligible effect** (**not significant**). This will be reviewed at the ES stage.

Flood Risk

10.8.77 Long term flood risk resulting from the Scheme to and from the Cable Route Corridor is considered to be as existing, as the infrastructure will be buried throughout the Cable Route Corridor with no permanent above ground built development.

10.8.78 A summary of the pre- and post- Scheme scenario flood risk levels for all sources within the Cable Route Corridor is provided in Table 10-17 below, details of which have been taken from Table 5-1 of the Preliminary FRA.

Table 10-17: Flood Risk pre-Scheme to Post-Scheme assessment

Flood Risk Source	Pre-Scheme Flood Risk Level	Post-Scheme Flood Risk Level	Comments
Fluvial	High (Cable Route Corridor cross the River Till and Trent to where it connects to the substation at Cottam.	High (Cable Route Corridor cross the River Till and Trent to where it connects to the substation at Cottam.	**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 would avoid Flood Zones 2/3 completely.
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 CEMP.
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 would not support large amounts of water storage, such as an aquifer. There may be a risk of groundwater flooding during and laying of cables.

Flood Risk Source	Pre-Scheme Flood Risk Level	Post-Scheme Flood Risk Level	Comments
			Further investigation will be carried out to inform the construction methods for the Cable Route Corridor and where they cross watercourses and ensure no increase in risk to the Scheme or elsewhere.
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 Corridors. 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 will be included and managed within the CEMP.
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.

10.8.1 The Scheme would not result in any changes to the risk of surface water flooding in the area based on the proposed drainage strategy and mitigation to greenfield runoff rates. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.2 The Scheme would not result in any changes to the risk of groundwater flooding in the area based on the low risk of groundwater flooding in the area, and the Scheme itself. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.3 The Scheme would not result in any changes to the risk of sewer flooding in the area. Therefore, it is considered that the Scheme would result in a **No**

Change Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

10.8.4 The Scheme would not result in any changes to the risk of flooding from artificial sources in the area. Therefore, it is considered that the Scheme would result in a **No Change** Magnitude of Impact on a **low** importance receptor, resulting in a **Neutral** (not significant) effect.

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

10.8.5 Table 10-18 provides a summary of the potential impacts and effects on the water environment during construction of the Cable Route Corridor.

Table 10-18: Summary of Magnitude of Impact and Significance of Effect for the Constrciton 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	Very Low	Minor Adverse (not significant)
River Trent	Very High	Cable crossing using non-intrusive directional drilling	Very Low	Minor Adverse (not significant)
WFD monitored reaches (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, Till (Witham) and Fillingham Beck	High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling.	Very Low	Minor Adverse (not significant)
WFD channel features (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, Till (Witham) and Fillingham Beck	High	Internal Cabling crossings of water features using HDD	No change	Neutral (not significant)
Agricultural ditches	Low	Cable crossings using open cut techniques	Low adverse	Negligible (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
WFD monitoring reaches	High	Access: crossing of watercourses by access tracks, using culvert construction.	Low adverse	Moderate Adverse (significant)
Agricultural ditches	Low	Crossing of water features by access tracks using culvert construction	Low adverse	Negligible (not significant)
WFD channel features	High	Outfalls impact of water resources	Low adverse	Minor adverse (not significant)
Agricultural ditches	Low	Outfalls impact on water resources	Low adverse	Negligible (not significant)
WFD water features: River Trent	Low	Potential impacts on hydromorphology of watercourses from directional drilling	No change	Neutral (not significant)
River Till, and tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain	Low (hydromorphology)	Potential impacts on hydromorphology of watercourses from directional drilling	Medium Adverse	Minor adverse (not significant)
Agricultural ditches	Low	Potential impacts on hydromorphology of watercourses from intrusive crossing	Medium Adverse	Minor adverse (not significant)
River Till, and tributary, Skellingthorpe Main Drain, Marton Drain and Seymour Drain	Low (hydromorphology)	Potential impacts from internal cabling connections using HDD under WFD monitored reaches	No change	Neutral effect (not significant)
Agricultural ditches	Low (hydromorphology)	Potential impacts from internal cabling connections using intrusive techniques	Medium Adverse	Minor adverse effect (not significant)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone	Medium	Potential impacts to quality of groundwater resources including any local water supplies (unlicenced abstractions)	No change	Neutral (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and Alluvial and sand deposits	Medium	Potential impact to groundwater flow from cabling trenches	Very Low	Negligible (not significant)
	Medium	Potential impact to groundwater levels and flow from temporary dewatering	Low Adverse	Minor adverse (not significant)
	Medium	Potential impact to groundwater quality from cable installation, leading to mobilisation of existing contamination, and water quality impacts to river baseflow.	Very Low	Negligible (not significant)
Fluvial Flood Risk	High	Impact on fluvial flood risk during construction	No change	Neutral (not significant)
Tidal Flood Risk	High	Impact on tidal flood risk during construction of Cable Route Corridor	No change	Neutral (not significant)
Surface Water Flood Risk	Low	Impact on pluvial flood risk during construction	No change	Neutral (not significant)
Groundwater Flood Risk	Low	Impact on pluvial flood risk during construction of drainage features and	No change	Neutral (not significant)
Sewer Flood Risk	Low	Impact on sewer flood risk during construction of Cable Route Corridor	No change	Neutral (not significant)
Artificial sources Flood Risk	Low	Impact on fluvial flood risk during construction	No change	Neutral (not significant)

Operation: Principal Site

10.8.6 As stated in Section 10.4, the assessment of effects which may occur during operation is based on a source-pathway-receptor approach. During the operational phase for the Principal Site, the following adverse impacts may occur:

- Impacts on water quality in surface water features from diffuse pollution: run-off and the potential for accidental spillages from new permanent hardstanding and maintenance activities, assuming surface water run-off does ultimately drain to a surface watercourse rather than simply to ground;
- Potential for impact on groundwater or surface water as a result of the use of firewater in the event of a fire in the battery storage areas (BESS);
- Potential impacts on hydrology as a result of the Scheme. This may also have a subsequent effect on aquatic habitats and water-dependent nature conservation sites;
- Potential for permanent morphological physical impacts to watercourses if crossings are required for access and depending on the design of the structure used;
- Potential for impact on 'water stress' status of the area from water usage;
- Potential impacts on groundwater resources: quality, flow and level and potential risk from firefighting at the BESS areas;
- Potential impacts on the rate and volumes of surface water run-off entering local watercourses and increasing the risk of flooding; and
- Potential for impact of foul drainage / water supply in the area due to the offices / maintenance facilities required as part of the Scheme.

10.8.7 These are summarised in Table 10-19 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.

Surface Water Features

Impacts from Diffuse Pollution

10.8.8 The provisional drainage arrangements propose to attenuate surface water runoff and contain chemical spillages from the Site once operational, whilst minimising flood risk to the Site and surrounding areas (see Section 10.7). More detailed surface water drainage proposals will be presented in an update to the Preliminary Drainage Strategy that will be completed at the ES stage and submitted alongside the DCO application.

10.8.9 Surface water runoff would mainly be low risk roof or panel runoff as this will consist mainly of rainfall. In addition to permanent structures, there would be runoff from hardstanding areas such as the BESS, onsite substation, permanent plant storage buildings, office/warehouse buildings, access tracks and car park.

10.8.10 Within the area of solar PV panels, the impermeable area would 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.

10.8.11 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.

10.8.12 Additional SuDS attenuation such as swales will be incorporated to control any increase in the rate of flow from new impermeable areas towards the receiving watercourses, and to provide treatment for any contaminants collected on areas of hardstanding that may also be positively drained.

10.8.13 At this stage outfall locations have not been determined, nor has it been decided whether runoff will be allowed to infiltrate or be discharged to a watercourse. If to a watercourse, it is yet to be determined whether this could be achieved via a new ditch course or if an engineered outfall is required. These design matters are being considered and will be confirmed at the ES stage.

10.8.14 The SuDS Manual's Simple Index Approach (Ref. 10-46) will be revisited at the ES stage assessment. This will be used to demonstrate the suitability of the SuDS treatment trains within the design. This approach would take into account different land uses, including offices and access roads. It is likely that one or two treatment trains would be considered to provide significant mitigation.

10.8.15 The Principal Site would operate using best practice and comply with environmental legislation through the application of an Outline Landscape and Ecological Management Plan (Outline LEMP) (refer to **PEI Report Volume II Appendix 3-2**), including appropriate maintenance of SuDS and other drainage infrastructure included within the Operational Environmental Management Plan. Overall, it is anticipated that with the embedded mitigation of an appropriate drainage strategy mimicking natural flow status there would be no material impact on existing surface water flow pathways from runoff from the Scheme. The inclusion of SuDS treatment train components would result in no impact to surface water quality from any site runoff.

10.8.16 Overall, given the implementation of a Drainage Strategy including SuDS provision, it is predicted at this stage that there would be a negligible impact to any receiving water feature from surface water runoff. Final outfall locations have not yet been determined, and so water feature specific assessment is not possible at this stage, but the following receptors are likely: the Tributary of the Till (Witham), River Eau and Fillingham Beck (all of **high** importance) or the **low** importance drainage ditches that are ubiquitous across the area. For the **high** importance Till (Witham) and River Eau this would result in a **minor adverse effect** (**not significant**). For the **low** importance ditches this would be a **negligible effect** (**not significant**).

Pollution for impact on water resources from fire-fighting water at the BESS

10.8.17 Should there be a fire within the BESS there is a risk that contaminated water may pollute nearby watercourses if it is not contained. As stated in Section 10.7, the operational Scheme design will include both fire water tanks and associated fire water containment. Any fire water will be stored on Site in tanks. In the event of a fire, any fire water runoff will be stored in lined swales

surrounding the BESS areas. These swales will have an impermeable liner and the outfall from the swale will be controlled via a penstock to allow the containment of all stored fire water should it become necessary to be used. This means there would be no pathway whereby firewater could access surface water runoff and enter surface water features. Any fire water that collects in the lined swales would be tested and if found to be contaminated, it would be pumped out by a suitable contractor for off-site disposed at a licenced waste facility. If not contaminated, this would be released with agreement of the Environment Agency if a permit was required.

10.8.18 Overall, due to the lack of pathway from potential contaminated fire water to surface water features, it is considered there would be **no change** impact to surface water quality of the Eau, Till, Fillingham Beck (**high** importance receptors) and agricultural ditches (**low** importance receptors), resulting in a **neutral effect** (**not significant**) regardless of water feature importance.

Potential impacts on hydrology

10.8.19 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 drainage strategy will be designed so as to mimic the natural drainage conditions within the Site and ensure no impact on the flow in receiving surface water features. Therefore, it is considered there would be a **no change** impact on the surface water features in the area. These are of both **high** and **low** importance. For all receptors, a no change impact results in a **neutral effect** (**not significant**).

Potential for morphological impacts to watercourses

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

Access

10.8.21 At this stage in the design, the need for and location of permanent access tracks is not known. Adopting a precautionary, reasonable worst-case approach, it is assumed these water features would be crossed using culverts. The need for and design of any permanent access across watercourses will be considered further as the design progresses and details provided in the ES.

10.8.22 For any watercourses within the Principal Site that are to be crossed using culverts, there would be localised and permanent moderate impacts to the water feature’s riparian and bank habitat for installation of the structures, and localised shading effects to the watercourse bed habitat. This reduces light intensity, photosynthesis, metabolic activity, and biochemical cycling within the watercourse, thereby impacting on the aquatic ecosystem, albeit for a short length for each crossing. However, it is assumed that there would be no interruption of flow or sediment conveyance, and providing arch culverts are proposed, interaction with groundwater can be maintained.

10.8.23 It is worth noting that culverting is most likely where only small watercourses need to be crossed, and which may be ephemeral/intermittently flowing channels without functional flows. For larger watercourses, clear span

structures would be more appropriate. It is also expected that where culverts are proposed the unaffected adjacent channel, mitigation may need to be implemented to neutralise the impact on a 'length for length' basis.

10.8.24 Overall, as need and location are not known at this stage, a water features specific assessment is not possible. However, it is considered that, with mitigation, **medium adverse** magnitude of impacts are likely. However, as the morphology receptors are assessed as being of **low** importance, this results in a potentially **minor adverse effect** (**not significant**).

Outfalls

10.8.25 The Scheme may require new surface water outfalls for operational drainage. Locations will be determined at the ES stage following further development of the drainage strategy. Soft green ditch connections will be used where possible, and the final location, position and orientation of any new outfall will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. If headwalls are required, appropriate 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. It is anticipated that agricultural drainage ditches would be impacted by outfalls from the Scheme.

10.8.26 Overall, the construction of new engineered outfalls would result in a localised, permanent **low adverse** impact, which on a receptor of **low** importance would result in a **negligible effect** (**not significant**).

10.8.27 Water feature specific impact assessment of these features will be considered at the ES stage when full details of the drainage strategy are available.

Potential impact on 'water stress' status

10.8.28 The Scheme is contained within an area of water stress, as designated by the Environment Agency, which covers the Anglian Water Area where the Scheme is located. Within the Anglian Water Resource Management Plan, there is an aim of achieving 110 litres per day per head by 2050. Industry standards for industrial use by employees is 90 litres per head per day.

10.8.29 At this stage there are no details relating to water supply and demand requirements for the operational site are known. At the ES stage more details will be obtained, and assessment made of the potential for impact on water resources in the area.

Potential impacts on groundwater resources

Groundwater – Water Quality Impacts

10.8.30 During operation, there is the potential for impact so groundwater quality from any spillages of chemicals used onsite. However, the use of an Operational Environment Management Plan (OEMP) 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, including adoption of best industry practice to manage the risk of chemical spillages. For the

medium importance groundwater aquifers (Scunthorpe and Charmouth Mudstone Formation and alluvial deposits) this is considered to have a **very low** magnitude of impact therefore resulting in a **negligible effect** (**not significant**).

Groundwater – Flow and Level Impacts

10.8.31 The drainage design for the Scheme is not yet fully developed but it is anticipated that swales around the solar PV panels 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.

10.8.32 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 Site which will remain permeable, therefore it is considered there would be no impact to infiltration of rainwater into the ground.

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

Pollution Risk from Fire Fighting at the BESS

10.8.34 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. Fire water will be stored on-site at each BESS area. Associated with these will be bunded areas to allow the containment of all stored fire water should it become necessary to the used. In this way there would be no pathway whereby firewater can infiltrate to ground.

10.8.35 Therefore, due to the lack of pathway from potential fire water to ground or surface water features, it is considered there would be a **very low** impact to surface 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 and flooding potential from the Operational site

10.8.36 During the operational phase, there would be surface water runoff from the permanent structures, roofs, solar PV panels and access roads. This could impact surrounding watercourses and waterbodies. A preliminary surface water drainage strategy has been prepared, included as **PEI Report Volume II Appendix 10-3**, and includes a water quality risk assessment following the Simple Index Approach described in C753 The SuDS Manual (Ref. 10-46). This is a method to assess water quality risk from different land uses so that sufficient treatment can be provided, preferably using SuDS. According to this

risk assessment the proposed SuDS treatment train will provide adequate treatment of diffuse urban pollutants.

10.8.37 The drainage strategy includes SuDS provision; therefore, it is predicted at this stage that there would be a negligible impact to any receiving water feature from surface water runoff.

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

10.8.38 Table 10-19 provides a summary of the potential impacts and effects on the water environment during operation from the Principal Site.

Table 10-19: Summary of Magnitude of Impact and Significance of Effect for the Operation of the Principal Site

Receptor	Importance (Value)	Description of Impact	Impact	Effect
Eau, Till and Fillingham Beck	High	Impact on surface water quality from site run-off and spillage	Very Low	Minor Adverse (not significant)
Agricultural Ditches	Low	As above	Very Low	Negligible (not significant)
Eau, Till and Fillingham Beck, and Agricultural Ditches	High Low	Potential for impact as a result of the use of firewater in the battery storage areas	No Change	Neutral (not significant)
Agricultural Ditches	Low	As above	No Change	Neutral (not significant)
Eau, Till and Fillingham Beck	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)
Agricultural Ditches	Low	As above	No Change	Neutral (not significant)
Eau, Till and Fillingham Beck	Low (morphology)	Potential for permanent physical impacts from permanent culverted crossings	Medium	Minor adverse (not significant)
Agricultural Ditches	Low	Potential for permanent physical impacts from permanent culverted crossings	Medium	Minor adverse (not significant)

Receptor	Importance (Value)	Description of Impact	Impact	Effect
Eau, Till and Fillingham Beck	Low (morphology)	Construction of new engineered outfalls.	Low Adverse	Negligible (not significant)
Scunthorpe Mudstone Formation, Charmouth Mudstone Formation and Alluvial deposits	Medium	Potential impacts on groundwater quality resources	Very Low	Negligible (not significant)
	Medium	Groundwater flow and level impacts	Very Low	Negligible (not significant)
	Medium	Potential for impact as a result of the use of firewater in the battery storage areas.	Very Low	Negligible (not significant)
Fluvial Flood Risk	High	Impact on fluvial flood risk during operation	No change	Neutral (not significant)
Tidal Flood Risk	High	Impact on tidal flood risk during operation	No change	Neutral (not significant)
Surface Water Flood Risk	Low	Impact on pluvial flood risk during operation	No change	Neutral (not significant)
Groundwater Flood Risk	Low	Impact on pluvial flood risk during operation	No change	Neutral (not significant)
Sewer Flood Risk	Low	Impact on sewer flood risk during operation	No change	Neutral (not significant)
Artificial sources Flood Risk	Low	Impact on fluvial flood risk during operation	No change	Neutral (not significant)

Decommissioning

10.8.39 Potential impacts from the decommissioning of the Scheme are similar in nature to those during construction, as some ground works would be required to remove infrastructure installed. Whether cables remain in situ or are removed would be confirmed prior to the ES assessment**.** A Framework Decommissioning Environmental Management Plan (DEMP) will be prepared at the ES stage and a final DEMP will be prepared prior to decommissioning to identify required measures to prevent pollution and flooding during this phase of the development.

10.8.40 As a result, it is considered the decommissioning impacts and effects would mirror those of the construction phase. This will be reviewed at the ES stage.

10.9 Additional Mitigation and Enhancements

Additional Mitigation: Monitoring

10.9.1 The WMP will set out details of water quality monitoring to be undertaken during construction. Due to the low level of risk posed by the construction works, this monitoring will consist of visual and olfactory observations plus in-situ testing using hand-held water quality meters only.

10.9.2 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. 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 in as sustainable a way as possible. This requirement would be included within the OEMP.

Enhancements

10.9.3 The possibility of enhancements to be provided as a result of the Scheme would be provided at ES stage enhancement.

10.10 Residual Effects

10.10.1 This section summarises the residual significant effects of the Scheme on surface water, groundwater and flood risk following the implementation of embedded and additional mitigation. At this stage there are potentially two significant effects (crossing of watercourses by access tracks using culvert construction for the Principal Site and Cable Route Corridor Construction). The assessments have been based on conservative worst case scenario at this stage. At the ES stage, it is considered there would be further detail available regarding construction and design to determine appropriate measures to ensure mitigation of these effects. No additional mitigation has been outlined at this stage other than monitoring, but requirements will be reassessed at ES stage.

10.10.2 Effects for decommissioning are considered to be the same as those identified for construction. However, decommissioning activities will be reviewed at the ES stage, and more detailed assessment provided if necessary.

10.10.3 Table 10-20 and Table 10-21 summarises what are considered to be the residual effects of the construction, operation and decommissioning of the Scheme at this stage in the assessment process.

Table 10-20: Summary of Significant 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 Framework CEMP	Minor adverse (not significant)
Agricultural Ditches	Low	Pollution of surface water during construction	Measures contained within Framework CEMP	Neutral (not significant)
Eau, Fillingham Beck and River Till	High	Crossing of water features by non-intrusive directional drilling	Measures contained within Framework CEMP	Neutral (not significant)
Agricultural Ditches	Low	Crossing of ditches by intrusive techniques	Measures contained within Framework CEMP	Negligible (not significant)
Eau, Fillingham Beck and River Till	High	Crossing of watercourses by access tracks, using culvert construction.	Measures contained within Framework CEMP	Moderate adverse (significant)
Agricultural Ditches	Low	Crossing of watercourses by access tracks, using culvert construction.	Measures contained within Framework CEMP	Negligible (not significant)
Eau, Fillingham Beck and River Till	High	Construction of any SuDS surface water drainage oufalls	Measures contained within Framework CEMP	Minor Adverse (not significant)
Agricultural Ditches	Low	Construction of any SuDS surface water drainage oufalls	Measures contained within Framework CEMP	Negligible (not significant)
Eau, Fillingham Beck and River Till	Low	Temporary impacts on hydro-morphology	Measures contained within Framework CEMP	Minor Adverse (not significant)
Agricultural Ditches	Low	Temporary impacts on hydro-morphology	Measures contained within Framework CEMP	Neutral (not significant)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone	Medium	Potential impacts to quality of groundwater resources including any local water supplies (unlicenced abstractions)	Measures contained within Framework CEMP	Neutral (not significant)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Principal Site				
Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and alluvial deposits		Potential impact to groundwater flow from foundations /construction of the PV bases	Measures contained within Framework CEMP	Neutral (not significant)
		Potential impact to groundwater flow from construction of internal cable routes.	Measures contained within Framework CEMP	Negligible (not significant)
		Potential impact to groundwater levels and flow from temporary dewatering	Measures contained within Framework CEMP	Negligible (not significant)
		Potential impact to groundwater quality from PV installation, leading to changes in quality of baseflow water input to rivers.	Measures contained within Framework CEMP	Negligible (not significant)
Flood Risk	High	Temporary changes in Flood Risk to fluvial and pluvial sources during construction and decommissioning of cable routes and PV Panels.	Measures contained within Framework CEMP	Negligible (not significant)
Cable Route Corridor				
River Trent	Very High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling	Measures contained within Framework CEMP	Minor adverse (not significant)
WFD channel features (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, Till (Witham) and Fillingham Beck	High	Potential pollution of surface water during construction of cable route using non-intrusive directional drilling.	Measures contained within Framework CEMP	Minor Adverse (not significant)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Principal Site				
Agricultural ditches	Low	Cable crossings using open cut techniques	Measures contained within Framework CEMP	Negligible (not significant)
WFD channel features (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, Till (Witham) and Fillingham Beck	High	Crossing of watercourses by access tracks, using culvert construction.	Measures contained within Framework CEMP	Moderate adverse (Significant)
Agricultural ditches	Low	As above	Measures contained within Framework CEMP	Neutral (not significant)
WFD channel features (Seymoor Drain, Marton Drain, Skellingthorpe Main Drain, Trib of Till, Till (Witham) and Fillingham Beck	High	Potential pollution of surface water during construction of PV areas, fine sediments, any spillages of polluting substances.	Measures contained within Framework CEMP	Neutral (not significant)
Agricultural ditches	Low	As above	Measures contained within Framework CEMP	Neutral (not significant)
River Till and tributary, Skellingtongthorpe Main Dain, Marton Drain and Seymour Drain	Low	Potential impacts on Hydromorphology of watercourses from direction drilling	Measures contained within Framework CEMP	Neutral (not significant)
Agricultural Ditches	Low	Potential impacts on Hydromorphology of watercourses from direction drilling	Measures contained within Framework CEMP	Minor adverse (not significant)
Mercia Mudstone Group, Penarth Mudstone Group, Scunthorpe Mudstone	Medium	Potential impacts to quality of groundwater resources including any local water abstractions (unlicenced abstractions)	Measures contained within Framework CEMP	No change (neutral)

Receptor	Importance	Description of Impact	Embedded and Additional Mitigation Measure	Residual Effect after Mitigation
Principal Site				
Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and alluvial deposits		Potential impact to groundwater flow from cabling trenches	Measures contained within Framework CEMP	Negligible (not significant)
		Potential impact to groundwater levels from temporary dewatering	Measures contained within Framework CEMP	Minor adverse (not significant)
		Potential impact to groundwater quality from cable installation, leading to quality of baseflow water input to rivers	Measures contained within Framework CEMP	Negligible (not significant)
Flood Risk	High	Temporary changes in Flood Risk to fluvial and pluvial sources during construction and decommissioning of cable routes and PV Panels.	Measures contained within Framework CEMP	Negligible (not significant)

Table 10-21 Summary of Significant Residual Effects (Operation)

Receptor	Sensitivity (value)	Description of impact	Embedded and additional mitigation measure	Residual Effect after Mitigation
Principal Site				
Eau, Till and Fillingham Beck	High	Impact on surface water quality from site run-off and spillage	Measures to be contained within FOEMP	Minor adverse (not significant)
Agricultural Ditches	Low	As above	Measures to be contained within FOEMP	Negligible (not significant)
Eau, Till and Fillingham Beck	High	Impact on water quality from reduction in use of nitrate fertilisers within NVZ area	Measures to be contained within FOEMP	Minor beneficial (not significant)
Eau, Till and Fillingham Beck	High	Potential for impact as a result of the use of firewater in the battery storage areas	Measures to be contained within FOEMP	Neutral(not significant)
Agricultural Ditches	Low	As above	Measures to be contained within FOEMP	Neutral(not significant)
Eau, Till and Fillingham Beck	High	Potential impacts on hydrology of the Scheme, this may also have an effect on aquatic habitats and water-dependent conservation sites.	Design	Neutral(not significant)
Agricultural Ditches	Low	As above	Design	Neutral(not significant)
Eau, Till and Fillingham Beck	Low (morphology)	Potential for permanent physical impacts from permanent culverted crossings	Design	Minor adverse (not significant)
Agricultural Ditches	Low	Potential for permanent physical impacts from permanent culverted crossings	Design	Minor adverse (not significant)
Eau, Till and Fillingham Beck	Low (morphology)	Construction of new engineered outfalls	Measures to be contained within FOEMP	Negligible (not significant)
Mercia Mudstone Group, Penarth Mudstone Group,	Medium	Potential impacts on groundwater quality resources	Measures to be contained within FOEMP	Negligible (not significant)

Receptor	Sensitivity (value)	Description of impact	Embedded and additional mitigation measure	Residual Effect after Mitigation
Principal Site				
Scunthorpe Mudstone Formation, Charmouth Mudstone Formation Secondary undifferentiated aquifers, and Alluvial deposits		Groundwater flow and level impacts	Design, and measures to be contained within FOEMP	Negligible (not significant)
		Potential for impact as a result of the use of firewater in the battery storage areas.	Design, and measures to be contained within FOEMP	Negligible (not significant)

10.11 Cumulative Effects

10.11.1 An assessment of cumulative effects is presented in **PEI Report Volume I Chapter 17: Cumulative Effects**.

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