Fosse Green Energy

Fosse Green Energy

Preliminary Environmental Information Report

VOLUME

1

Chapter 9: Water Environment

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9.1 Introduction

9.1.1 This chapter of the Preliminary Environmental Information Report (PEI Report) provides the preliminary assessment of the likely significant effects of Fosse Green Energy Park (hereafter referred to as the 'Proposed Development') on surface water bodies (rivers, streams, ditches, canals and lakes) including water quality and hydromorphology, flood risk and drainage. This chapter also considers potential effects on hydrogeology, with ground condition issues discussed in **PEI Report Volume 1, Chapter 14: Other Environmental Topics**.

9.1.2 This chapter identifies and proposes measures to address the potential impacts and likely significant effects of the Proposed Development on the Water Environment during the construction, operation, and decommissioning phases of the Proposed Development.

9.1.3 This chapter should be read in conjunction with the Proposed Development description provided in **PEI Report Volume 1, Chapter 3: The Proposed Development**. Additionally, water environment interfaces with other aspects and as such, should be considered alongside **PEI Report Volume 1, Chapter 8: Ecology and Nature Conservation**, where appropriate. **PEI Report Volume 1, Chapter 8: Ecology and Nature Conservation** also includes details of aquatic ecology surveys and assessments.

9.1.4 This chapter is supported by the following figures in **PEI Report Volume 2**:

a. **Figure 9-1: Surface Water Features and Their Attributes**;
b. **Figure 9-2: Groundwater Water Features and their Attributes**;
c. **Figure 9-3: Fluvial Flood Risk**; and
d. **Figure 9-4: Surface Water Flood Risk**.

9.1.5 This chapter is supported by the following appendices in **PEI Report Volume 3**:

a. **Appendix 9-A: Water Environment Policy and Legislation**;
b. **Appendix 9-B: Water Framework Directive Screening Assessment**;
c. **Appendix 9-C: Preliminary Flood Risk Assessment**; and
d. **Appendix 9-D: Preliminary Surface Water Drainage Strategy**.

9.2 Legislation and Planning Policy

9.2.1 **PEI Report Volume 3, Appendix 9-A: Water Environment Policy and Legislation**, identifies the legislation, policy, and guidance of relevance to the assessment of significant effects of the Proposed Development on the

water environment. A brief summary is provided below, however, **PEI Report Volume 3, Appendix 9-A** should be referred to for further detail.

Legislation

9.2.2 Legislation to be considered includes:

a. Environment Act 2021 (Ref 9-1) - 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;

b. Water Act 2014 (as amended) (Ref 9-2) - mainly deals with regulating the impact of water supply on the water environment and the price of water;

c. Flood and Water Management Act 2010 (as amended) (Ref 9-3) - 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;

d. Land Drainage Act 1991 (as amended) (Ref 9-5Ref 9-5) - 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);

e. Water Resources Act 1991 (as amended) (Ref 9-6) - regulates water resources, water quality and pollution and flood defences, for which new developments may need to take into account;

f. Environmental Protection Act 1990 (as amended) (Ref 9-4) - brings together pollution prevention and disposal regulations, imposes duty of care on those involved with any waste stream;

g. Salmon and Freshwater Fisheries Act 1975 (as amended) (Ref 9-7) - sets out protection for migration routes of salmon and trout;

h. Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 9-8) - 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;

i. The Environmental Damage (Prevention and Remediation) Regulations 2017 (as amended) (Ref 9-9) - aims to prevent and remediate damage to the environment;

j. Environmental Permitting (England and Wales) Regulations 2016 (as amended 2018) (Ref 9-10) - 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;

k. Eels (England and Wales) Regulation 2009 (as amended) (Ref 9-11) - 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;

l. Control of Pollution (Oil Storage) (England) Regulations 2001 (as amended) (Ref 9-12) - 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.

m. The Control of Substances Hazardous to Health (Amendment) Regulations 2004 (Ref 9-13) - 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;

n. The Anti-Pollution Works Regulations 1999 (Ref 9-14) - outlines the contents of any-pollution works notices served under the Water Resources Act 1991; and

o. The Water Framework Directive (Standards and Classification) Directions 2015 (Ref 9-15) - includes directions for classification of surface water and groundwater bodies for which new developments must consider as part of any Water Framework Directive (WFD) Assessment.

National Planning Policy and Guidance

9.2.3 National planning policy and guidance to be considered includes:

a. Overarching National Policy Statement for Energy (NPS EN-1) (2023) (Ref 9-16));

b. National Policy Statement for Renewable Energy (NPS EN-3) (2023) (Ref 9-17);

c. National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (2023) (Ref 9-18);

d. National Planning Policy Framework (NPPF) (2023) (Ref 9-19);

e. National Planning Practice Guidance (NPPG) (2023) (Ref 9-20);

f. National Planning Practice Guidance: Flood Risk and Coastal Change (2022) (Ref 9-21);

g. The UK Government's Environmental Improvement Plan 2023 (Ref 9-22);

h. A Green Future: Our 25 Year Plan to Improve the Environment (Ref 9-23);

i. The UK Government's Plan for Water: Our Integrated Approach to Delivering Clean and Plentiful Water (2023) (Ref 9-24);

j. The UK Government's Future Water Strategy (2011) (Ref 9-25);

k. The Non-statutory technical standards for Sustainable Drainage Systems (SuDS) (Ref 9-26);

l. Construction Industry Research and Information Association (CIRIA) Report C753 The SuDS Manual 2nd Edition (2016) (Ref 9-27);

m. The Building Regulations 2010 Approved Document H Drainage and Waste Disposal (Ref 9-28);

n. The BRE Digest 365: Soakaway Design and Sewerage Sector Guidance 2022, Appendix C Design and Construction Guidance (Ref 9-29); and

o. Water UK (2022) Sewerage Sector Guidance (Ref 9-30).

Regional Guidance

9.2.4 At a regional level, water management is coordinated through ten River Basin Management Plans (RBMPs). The most recent updates to the plans were published in 2022 and will remain in place until 2027, after which the monitoring and protection regime is uncertain until new Government targets and guidance is released. Until then the RBMPs set legally binding, locally specific, environmental objectives, and contain the current Water Framework Directive (WFD) status of the water bodies in the area. More information on these is included in the baseline section of this chapter. The Study Area falls under the Witham Management Catchment within the Anglian RBMP (Ref 9-31) and the Trent Lower and Erewash Management Catchment within the Humber RBMP (Ref 9-32).

Local Planning Policy and Guidance

9.2.5 The Proposed Development is located within the North Kesteven District Council area. The Central Lincolnshire Joint Strategic Planning Committee (CLJSPC), which includes North Kesteven District Council, adopted the Central Lincolnshire Local Plan in 2023 (Ref 9-33). Further details are given in **PEI Report Volume 3, Appendix 9-A: Water EnvironmentPolicy and Legislation.**

9.2.6 In 2018, Lincolnshire County Council produced the ‘Sustainable Drainage Design and Evaluation Guide’ (Ref 9-34). This guide links the design of SuDS with the evaluation requirements of planning to facilitate consultation in order to achieve the best possible SuDS design. It is primarily intended for use by developers, designers and consultants who are seeking guidance on the Lead Local Flood Authority (LLFA) standards for the design of sustainable surface water drainage in Lincolnshire.

9.3 Consultation

9.3.1 A request for an Environmental Impact Assessment (EIA) Scoping Opinion was sought from the Secretary of State through the Planning Inspectorate in June 2023 as part of the EIA Scoping Process. A Scoping Opinion was received from the Planning Inspectorate on 25 July 2023 (**PEI Report Volume 3, Appendix 1-B**).

9.3.2 Responses to comments received in the EIA Scoping Opinion relating to the Water Environment are presented in **PEI Report Volume 3, Appendix 1-C: Scoping Opinion Responses**.

9.3.3 A freedom of information request was issued to the Environment Agency on 18 April 2023 to receive baseline information and data relating to water resources, water quality, flood risk and WFD classification and investigations. A response was received on 17 May 2023 (Reference RFI/2022/275414). This data has been used to inform the baseline conditions presented in Section 9.5.

9.3.4 North Kesteven District Council were contacted to provide details of Private Water Supplies (PWS) within the Study Area. A response was received on 20 August 2024 and has been used to inform the baseline in Section 9.5.

9.3.5 The LLFA (Lincolnshire County Council), Environment Agency, Upper Witham Internal Drainage Board, and Trent Valley Internal Drainage Board will be consulted during the statutory consultation, and the assessments within the PEI Report reviewed, taking into account any comments made prior to the Development Consent Order (DCO) application submission.

9.4 Assessment Methodology

9.4.1 This section sets out the scope and methodology for the preliminary assessment of the impacts of the Proposed Development on the Water Environment.

Study Area

9.4.2 For the purposes of this assessment, a general Study Area of 1km around the Site has been considered in order to identify water bodies that are hydrologically connected to the Proposed Development and have the potential to be directly impacted by the activities associated with the Proposed Development. This Study Area is shown in **PEI Report Volume 2, Figure 9-1: Surface Water Features and their Attributes**.

9.4.3 Watercourses flow and so water quality and flood risk impacts may propagate downstream. As such, water environment impact assessments will sometimes consider a wider Study Area extending to as far downstream as a potential impact may influence the quality or quantity of the water body or water dependent designated nature conservation site. In this case, watercourses across the Study Area drain towards the River Witham, and so this is considered the final receiving water body that could conceivably be affected (and which is within 1km of the Site boundary). As such, a 1km buffer around the Site Boundary is considered appropriate for the Study Area.

Methodology

9.4.4 This section describes the methodology used for the assessment of effects of the Proposed Development on the water environment, including the criteria for the determination of the importance of the receptor and the magnitude of change from the baseline conditions. Potential impacts of the Proposed Development on the water environment will be assessed by:

a. Considering the existing (baseline) status of the water environment within the Proposed Development and relevant surrounds with respect to flood risk, surface water, groundwater and drainage, following the source-pathway-receptor approach;

b. Identifying potential impacts of the Proposed Development on the water environment during the construction and operational phases including maintenance, as well as cumulative effects. Potential impacts from the decommissioning of the Proposed Development are considered to be similar in nature to those during construction, as some groundwork would be required to remove infrastructure installed (potentially including cables, although the option of cables remaining in-situ is also a possibility). As such, decommissioning impacts are considered the same as construction as a worst case given implementation of a detailed Decommissioning Environmental Management Plan (DEMP). A Framework DEMP will be prepared as part of the EIA and will be submitted with the Environmental Statement (ES);

c. Proposing suitable mitigation measures to be incorporated into the development design, construction, operation and decommissioning to avoid, prevent, minimise or offset any adverse impacts (i.e. embedded and additional mitigation); and

d. Reviewing any residual impacts.

Sources of Information

9.4.5 The following sources of information have been used to inform the baseline and preliminary assessment presented within this chapter:

a. Online Ordnance Survey (OS) maps viewed to identify any surface water bodies within 1km of the Site Boundary (Ref 9-35);

b. Online aerial photography (Ref 9-36);

c. Anglian River Basin District RBMP (Ref 9-31);

d. Environment Agency Catchment Data Explorer website (Ref 9-37);

e. Environment Agency Public Registers website – Environmental Permitting Regulations – Discharges to Water and Groundwater (Ref 9-38);

f. National Soil Resources Institute Soilscapes website (Ref 9-39);

g. Defra's Multi Agency Geographical Information for the Countryside (MAGIC) map website; (Ref 9-40);

h. National River Flow Archive (NRFA) website (Ref 9-41);

i. Natural England website for designated sites (Ref 9-42);

j. British Geological Survey (BGS) Geoindex website (Ref 9-44);

k. Met Office website (Ref 9-45);

l. BGS Borehole and Geology Mapping (Ref 9-46); and

m. Environment Agency Online Interactive Maps (Ref 9-47):

i. Flood map for planning (rivers and sea);
ii. Risk of flooding from surface water;
iii. Risk of flooding from reservoirs; and
iv. Flood warning areas and risk.

n. Environment Agency information on water resources (e.g. water activity permits, abstraction licenses and pollution incidents).
o. Local Authority information on private water supplies.

9.4.6 The **PEI Report Volume 3, Appendix 9-C: Preliminary Flood Risk Assessment** provides further details of relevant catchment and flood risk data, and flood risk desktop survey information.

Scope of the Assessment

9.4.7 The following potential impacts have been agreed to be considered as part of the EIA for the Proposed Development for which a preliminary assessment is provided Section 9.8 of this chapter.

9.4.8 During the construction phase the following impacts may occur and will be assessed:

a. Pollution of surface water or groundwater (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 or piling;
b. Temporary impacts on the hydromorphology of watercourses (e.g. from open-cut watercourse crossings and temporary vehicle access crossings as may be required). Temporary access from vehicles has been assessed as part of the overall construction activities taking place;
c. Potential impacts on groundwater resources and local water supplies (licenced and unlicenced (private) abstractions);
d. Potential impact to baseflow to watercourses from temporary dewatering of excavations or changes in hydrology; and
e. Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works), and exacerbation of localised flooding, due to deposition of silt, sediment in drains, ditches; and construction of the Solar PV Panels, BESS and associated infrastructure.

9.4.9 During decommissioning activities, potential impacts from the decommissioning of the Principal Site are similar in nature to those during construction, as some ground works would be required to remove infrastructure installed. Buried cables would either be removed by pulling the cables back through or left in situ. If left in situ there would be reduced risk to hydromorphology and groundwater. The Principal Site would be returned to the landowner after decommissioning and will be available for its original use and any planting would be retained.

9.4.10 A Framework DEMP will be prepared for DCO submission 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.

9.4.11 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.

9.4.12 During operation the following impacts may occur and will be assessed:

a. 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 (predominantly consisting of panel cleaning), assuming surface water run-off does ultimately drain to a surface watercourse rather than simply to ground;

b. Potential for impact on groundwater or surface water from firewater runoff in the event of a fire in the battery energy storage system (BESS) area(s);

c. Potential impacts on hydrology as a result of the Proposed Development. This may also have a subsequent effect on aquatic habitats and water-dependent nature conservation sites;

d. Potential for permanent physical impacts to watercourses if crossings are required for access and depending on the design of the structure used;

e. Potential impacts on groundwater resources: quality, flow and level;

f. Potential impact on fluvial flood risk from changes in the rate and volume of run-off entering local watercourses;

g. Generation of a new source of foul wastewater from on-site welfare facilities that will need to be adequately managed and disposed of;

h. The need for a supply of water for solar panel cleaning.

i. The current arable fields are likely a source of diffuse agricultural pollutants (e.g. organic/inorganic fertiliser and pesticides). During the life of the project the use of such fertilisers and other chemicals will be ceased, which could lead to beneficial impacts on the water environment; and

j. Potential reduction in local surface and groundwater abstraction due to reduced agricultural irrigation requirements.

9.4.13 Water dependent habitats and designated sites are considered in as far as they inform the determination of water body importance. However, refer to **PEI Report Volume 1, Chapter 8: Ecology and Nature Conservation** for assessment of the effects of the Proposed Development on these sites. For assessment of potential effects to ponds refer to **PEI Report Volume 1: Chapter 8: Ecology and Nature Conservation.**

9.4.14 All the potential impacts and effects identified for all of the phases outlined above will be re-assessed once further design information is available at the ES stage.

Matters Scoped Out of the Assessment

Water Supply

9.4.15 Any assessment of potential impacts on public potable water supply from the Proposed Development has been scoped out of this chapter. It has been scoped out since the **Scoping Report** (**PEI Report Volume 3, Appendix 1-A**) was submitted, on the basis of design information described below.

9.4.16 The Study Area is wholly within the Anglian Water supply area. All water companies are required by the Government to produce a Water Resources Management Plan (WRMP) to show how they plan to maintain a secure supply of water to all their customers over the next 25 years.

9.4.17 During construction it is envisaged that a temporary potable water supply will be provided. Based on the assumption that each construction worker would require eight litres per day, a total of 1,500m^3 of potable water would be required over the construction period. Other sources of water use include wheel washers (assumed to be 500m^3 in total) and to support the preparation of concrete for use across the Site (assumed to be 25,000m^3 in total). The water will either be transported to the Site by road from an existing nearby licenced water abstraction source and stored on site in tanks of up to 10m^3 (10,000 litres) capacity or supplied through a mains connection.

9.4.18 The Proposed Development will contain solar PV technology with no residential usage of water required in the long term. Water would be stored on site for fire safety purposes. It is anticipated that there would be up to four permanent full time members of staff, with up to 20 being in attendance for periods of maintenance or solar infrastructure replacement. This will have a very minor impact on local potable mains water supplies.

9.4.19 With regard to operational panel cleaning, this would be undertaken using a tractor mounted system with a rotating 'car-wash' type brush. It is anticipated that water would be brought to site in 1m^3 (one tonne/1,000 litres (l)) Intermediate Bulk Containers (IBCs). Individual IBCs would be mounted on the rear of the tractor to provide water supply during cleaning. Based upon cleaning water usage on similar schemes it is estimated that the cleaning will require 250 millilitres (ml) of water per panel per cycle and that, assuming cleaning of all panels is required, the total volume of cleaning water per cleaning cycle would be approximately 200,000 l (200 m^3). A two-year cleaning cycle is expected (see also **PEI Report Volume 1, Chapter 3: The Proposed Development**).

9.4.20 Given that no new permanent operational water connection to mains supply is required and that water use by the Proposed Development is relatively light, the assessment of potable water supply during operation has not been considered further.

Foul Water

9.4.21 There will be welfare facilities associated with the Proposed Development for up to four permanent full time members of staff, with up to 20 being in attendance for certain periods as described above. Given the low daily

occupancy only small volumes of foul drainage will be generated. As the site compound in the area of the single BESS compound is more than 30m from a public sewer and due to the low flows anticipated, the foul water flows will be dealt with via a sealed cesspit, i.e. with no overflow to ground pipe system. This would be regularly emptied under contract with a registered recycling and waste management contractor.

9.4.22 As there would be no discharge of foul water to a watercourse, and no discharge to the public foul sewer is anticipated, the assessment of foul water drainage has been scoped out.

Nutrient Neutrality

9.4.23 North Kesteven District Council is not a Local Planning Authority currently affected by nutrient pollution (nutrient enrichment from elevated nitrogen and phosphorus levels) whereby reduced water quality is leading to adverse nutrient impacts on some designated habitats sites. It is concluded therefore that in line with Natural England advice, nutrient neutrality assessment can be scoped out of the assessment.

Surveys

9.4.24 An initial site walkover survey was undertaken by a water scientist and hydromorphologist on 3 October 2023 in dry and overcast conditions to assess watercourse connectivity, quality and condition. This survey covered the Site Boundary as described at the time of survey and while minor design changes have been made since the EIA Scoping Report, the survey covered the waterbodies that might be affected by the Proposed Development and has since been supported by further observations undertaken as part of the development of **PEI Report Volume 3, Appendix 8-C: Aquatic Ecology**, thus ensuring that survey findings remain valid.

9.4.25 Water quality surveying has not been undertaken given that the water features associated with the Proposed Development are generally minor. It is considered that the nature of the Proposed Development, having a relatively light footprint and limited ground works, does not warrant a water quality monitoring programme. Water quality of the more significant water features in the Study Area has been determined with reference to background water quality data from routine Environment Agency monitoring.

9.4.26 Further water quality monitoring is not considered necessary given the Environment Agency data that is publicly available, and that importance of water features will be determined from a holistic review of water body features and so does not solely rely on water quality due to the principle that by law no controlled water may be polluted (i.e. no matter what the baseline water quality is there should be no pollution from the Proposed Development). Water quality impacts have been assessed based on a risk assessment that does not require input of raw background water quality data (described further below). Furthermore, pre-construction monitoring of potentially affected watercourses would be required and is detailed later in this chapter.

Impact Assessment Methodology

Source-Pathway-Receptor Approach

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

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

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

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

c. A pathway by which the two are linked.

9.4.29 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 Proposed Development, including the size and nature of the proposed development, anticipated construction methodologies and timescales.

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

9.4.31 The last stage of the approach 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 relevant 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).

Assessment of Surface Water Runoff for the Operational Phase

9.4.32 Surface water runoff from the additional areas of hardstanding (primarily the BESS and Substation areas) 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 adverse impacts to surface water or groundwater. An assessment is therefore undertaken to determine the potential risk to the receiving waterbodies and to inform the development of suitable mitigation and treatment measures.

9.4.33 The appropriateness of the surface water drainage measures in terms of providing adequate treatment of diffuse pollutants has been assessed with reference to the Simple Index Assessment method described in the SuDS Manual (Ref 9-27). The Simple Index Approach follows three steps:

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

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

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

9.4.34 The SuDS Manual (Ref 9-27) only provides a limited number of land use types and so those selected will be the most suitable for the components of the Proposed Development, based on professional judgement. Where more than one pollution hazard category applies to a component of the Proposed Development, the worst pollution hazard will be selected.

Hydromorphology

9.4.35 Potential hydromorphological impacts have been qualitatively appraised based on a desk study, a site walkover and a review of the Proposed Development components that may affect the physical form of water bodies. Morphological effects are described within this chapter according to the method for determining effect significance as described later in this section.

9.4.36 Consideration has been given to how the Proposed Development is likely to impact upon the WFD objectives for the relevant watercourses within **PEI Report Volume 3, Appendix 9-B: Water Framework Directive Screening Assessment**.

Preliminary Surface Water Drainage Strategy

9.4.37 The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design flood, with an allowance for climate change.

9.4.38 A **Preliminary Surface Water Drainage Strategy (PEI Report Volume 3, Appendix 9-D)** has been developed to ensure the risk of surface water flooding is not increased as a result of the Proposed Development and any increased land take for foundations and any access roads.

9.4.39 Careful consideration of the SuDS features, in-keeping with local planning policy and through liaison with the LLFA, the Internal Drainage Board (IDB), and Environment Agency, will be undertaken to ensure that the Surface Water Drainage Strategy adequately attenuates and treats runoff from the Proposed Development, whilst not increasing flood risk to the site and surrounding areas.

9.4.40 In accordance with planning policy and general good practice, mitigation will be provided by restricting surface water discharge rates and providing on-site attenuation, primarily via SuDS, such as Rural SuDS (RSuDS) techniques or other appropriate solutions.

9.4.41 A water quality risk assessment of all above ground installations will be undertaken using the Simple Index Approach described in the SuDS Manual (2nd edition) (Ref 9-27) and summarised above. This will inform what, if any treatment measures are required to manage the risk from diffuse urban runoff to watercourses or ground.

Preliminary Flood Risk Assessment

9.4.42 A **Preliminary Flood Risk Assessment (FRA) (PEI Report Volume 3, Appendix 9-C**) has been prepared as a technical appendix to this chapter to review the current and future flood risk to the Study Area from all sources (including surface water, groundwater, tidal and fluvial sources), in-keeping primarily with the NPS (NPS EN-1 (Ref 9-16), EN-3 (Ref 9-17) and EN-5 (Ref 9-18) and also in accordance with NPPF guidance (Ref 9-19), to inform the Proposed Development design and set out any proposed mitigation requirements that are to be addressed within the Drainage Strategy.

9.4.43 The NPPF classifies solar farms as Essential Infrastructure (Annex 3). This classification is acceptable within Flood Zone 1 with regards to not requiring the Exception Test. Cable routes are not generally considered in long term flood risk terms, other than temporary works during installation, as the cables are buried with no above ground installation required to impact flood risk in the long term. Flood risk during construction, mitigation, and construction methods is captured within the Framework Construction Environmental Management Plan (CEMP) **(PEI Report Volume 3, Appendix 3-A)**.

9.4.44 Part of the Site lies within a significant flood storage area associated with the Lincoln Flood Alleviation Scheme (Witham Washlands Flood Storage Area). Liaison with the Environment Agency has been undertaken to discuss the impacts of the Proposed Development to ensure no increase in flood risk will occur as a result of the Proposed Development.

9.4.45 Where development is to take place within areas at risk of flooding, review of fluvial modelling has been undertaken to assess the construction of flood compensation or mitigation measures to ensure no detrimental effect to flooding potential within or from the affected watercourse in the catchment once the Proposed Development is operational.

9.4.46 However, all above ground installations, other than some of the solar PV panels, in the Principal Site are located away from areas at risk of fluvial flooding where practicable and mitigated within areas at risk of surface water flooding and from any other identified source of flood risk.

9.4.47 Any impacts identified during the operational phase through the **Preliminary FRA** (**PEI Report Volume 3 Appendix 9-3**) have been evaluated for the preliminary impact assessment presented in this chapter and an effect significance value attributed to each impact in accordance with the methodology outlined in this chapter. The impact assessment only considers

the potential impact of the Proposed Development on flood risk, not the suitability of the Proposed Development in the context of flood risk acting on the Site. The Preliminary FRA considers the flood risk to the Proposed Development.

Water Framework Directive Assessment

9.4.48 Proposed developments 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 bodies. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

a. Cause a deterioration of a water body from its current status or potential; and/or

b. Prevent future attainment of Good status (or potential where not already achieved).

9.4.49 The following guidance on how to undertake WFD assessments has been used to inform the assessment presented in **PEI Report Volume 3, Appendix 9-B: Water Framework Directive Screening Assessment**:

a. The Planning Inspectorate Advice Note 18: The Water Framework Directive (Ref 9-101);

b. The Planning Inspectorate Advice Note - Nationally Significant Infrastructure Projects: Advice on the Water Framework Directive (Ref 9-102); and

c. Environment Agency Advice Note – Water Framework Directive Risk Assessment: How to assess the risk of your activity (Ref 9-100); and

9.4.50 WFD assessment is undertaken in three stages. The first stage is ‘screening’, the aim of which is to identify the Proposed Development components that could affect WFD status and ‘screen out’ aspects of the Proposed Development 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, including consideration of the criteria for derogation (if one is expected to be required) as outlined in Regulation 19 of The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 9-8).

9.4.51 **PEI Report Volume 3, Appendix 9-B: Water Framework Directive Screening Assessment** presents the WFD Screening Assessment, with further assessment to follow at the ES stage.

Determining the Significance of Effect

9.4.52 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 9-49) and LA 104 Environmental Assessment and Monitoring (Ref 9-50) adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, the

criteria are largely generic and suitable for use on any development project. They provide a robust and well tested method for predicting the significance of effects and have been used to assess the impact of numerous solar NSIPs on the water environment.

9.4.53 In a change to the standard methodology set out in **PEI Report Volume 1, Chapter 5: Environmental Impact Assessment (EIA) Methodology and Consultation**, whilst other disciplines may consider 'receptor sensitivity', '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 feature. 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.

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

a. A level of importance (low to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity, and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding, see **Table 9-1**;

b. The magnitude of potential and residual impact (classed as negligible, minor, moderate or major adverse / beneficial) is determined based on the criteria listed in **Table 9-2** and the assessor's professional judgement. Embedded or standard mitigation measures are considered in the initial assessment, but any other mitigation is not considered until the assessment of residual effects; and

c. A comparison of the importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in **Table 9-3**. The significance of each identified effect (both potential and residual) is classed as very large, large, moderate, slight or neutral and either beneficial or adverse.

Table 9-1: Criteria to Determine Receptor Importance

Importance	General Criteria	Surface Water[1]	Groundwater	Hydromorphology[2]	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.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95[3] ≥ 1.0 m^3/s; site protected / designated under international or UK habitat legislation (Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI), Water Protection Zone (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 Groundwater Dependent Terrestrial Ecosystems (GWDTE); Water abstraction: >1,000 m3/day	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0 m^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	Principal Aquifer providing locally important source supporting rover ecosystem; SPZ2; Groundwater supports GWDTE; Water abstraction: 500–1,000 m3/day.	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	More vulnerable development.

Importance	General Criteria	Surface Water[1]	Groundwater	Hydromorphology[2]	Flood Risk
		such as water supply, navigation or mineral extraction.			
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. Q95 >0.001 m^3/s. May be designated as a Local Wildlife Site (LWS) and support a small / limited population of protected species. Limited social or economic uses.	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water abstraction: 50–499 m3/day.	Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated in its own right. Q95 ≤0.001 m^3/s. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.	Generally Unproductive strata. Water abstraction: <50 m3/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	Water compatible development.

Importance	General Criteria	Surface Water[1]	Groundwater	Hydromorphology[2]	Flood Risk
				strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category	
Negligible	The receptor is resistant to change and is of little environmental value.	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Adapted from DMRB LA113 (Ref 9-49)

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and, in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2016 (Ref 9-10) and the Water Resources Act 1991 (Ref 9-6) (each as amended), and future WFD targets also need to be considered.

Note 2: Based on the water body 'Reach Conservation Status' presently being adopted for another major infrastructure project (and developed originally by Atkins) and developed from the Environment Agency conservation status guidance (Environment Agency, 1998a; 1998b (Ref 9-51) as LA113 (Ref 9-53) does not provide any criteria for morphology.

Note 3: Q95 flow is the flow rate that is exceeded 95% of the time.

9.4.55 The magnitude of impact will be determined based on the criteria in **Table 9-2,** taking into account the likelihood of the effect occurring. The likelihood of an effect occurring is based on a scale of certain, likely or unlikely. Likelihood has been considered in the case of the assessment of potential impacts to water bodies only, as likelihood is inherently included within the flood risk.

Table 9-2: Magnitude of Impact Criteria

Magnitude	Magnitude criteria
Major Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute.
Moderate Adverse	Results in impact on integrity of attribute, or loss of part of attribute.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.
Minor Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.
Moderate beneficial	Results in moderate improvement of attribute quality.
Major beneficial	Results in major improvement of attribute quality
No change	

Adapted from DMRB LA113 (Ref 9-49)

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

a. Negligible: An imperceptible effect or no effect to a water resources receptor;

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

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

9.4.57 At a spatial level, 'local' effects are those affecting the Site and neighbouring receptors, while effects upon receptors beyond the vicinity of the Site 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.

9.4.58 The importance of the receptor (**Table 9-1**) and the magnitude of impact (**Table 9-2**) are determined independently from each other and are then used to determine the overall significance of effects (**Table 9-3**). Options for mitigation will be considered and secured where practicable to avoid, minimise and reduce adverse impacts, particularly where significant effects may have otherwise occurred. The residual effects of the Proposed Development with identified mitigation in place will then be reported. Effects

of moderate or greater magnitude are considered significant in planning terms (i.e. shaded cells in **Table 9-3**). Where there is a range of potential effect (e.g. Large or Very Large) in **Table 9-3**, professional judgement is exercised to determine the most suitable effect.

Table 9-3: Matrix for Assessment of Significance

Importance of Receptor	Magnitude of Change				
	Major	Moderate	Minor	Negligible	No change
Very High	Very Large	Large or Very Large	Moderate or Large	Slight	Neutral
High	Large or Very Large	Moderate or Large	Slight or Moderate	Slight	Neutral
Medium	Moderate or Large	Moderate	Slight	Neutral or Slight	Neutral
Low	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight	Neutral

Adapted from DMRB LA113 (Ref 9-49)

Assessment Assumptions and Limitations

9.4.59 This preliminary assessment has been undertaken based on baseline data and design information at the time of writing (September 2024), and as described in **PEI Report Volume 1, Chapter 3: The Proposed Development**.

9.4.60 Where there is uncertainty in the design, reasonable assumptions have been made and these are described at relevant points within this assessment. Further assessment or updates may therefore be required at the ES stage if there are material changes to the design elements or it is determined that proposed embedded mitigation cannot be implemented as currently proposed for whatever reason.

9.4.61 A request for water resources and WFD information was issued to the Environment Agency to inform the baseline study in April 2023. A full response had been received in May 2023 and has therefore been taken into account in this assessment. It is considered that sufficient baseline information has been gathered from the desk study to enable this preliminary impact assessment to be undertaken.

9.4.62 Flood risk receptors considered in this assessment will include existing infrastructure assets, residential buildings, commercial buildings, agricultural land, and property potentially affected by the Proposed Development.

9.4.63 Requirements for hydraulic modelling of watercourses will be discussed with the Environment Agency / LLFA; any modelling required will be undertaken as part of the ES.

9.4.64 Temporary works will not be assessed unless they are of a potentially significant scale and have the potential to adversely affect flood risk or

impact the quality or form of water bodies. The temporary works where such risks are considered significant (for example, excavations for the cable route), have been identified and assessed where there is sufficient detail to do so at this stage. Operational maintenance activities are generally considered of insufficient scale to require assessment.

9.4.65 At the time of writing, the specific locations and methodologies of construction and installation of the cables within the Principal Site and the Cable Corridor remain subject to further design. However, it has been confirmed at this stage that the River Witham and the River Brant will be crossed using non-intrusive, underground techniques (e.g. horizontal directional drilling (HDD)) that would not disturb the watercourse. The depth of the cable below the bed will be a minimum of 5m so as not to disturb the channel or risk being exposed by future bed scour. The launch and receiving pits will be set back from the bank top of the watercourse to protect riparian habitats. Where the Interconnecting Cable Corridor is proposed to cross the River Witham, this setback will be extended to a minimum of 100m in recognition of the presence of a potential Otter holt. Construction methods including the size and depths of any launch or receiving pits are yet to be confirmed.

9.4.66 Cable crossings of smaller watercourses are currently assumed to require open-cut installation techniques. As such, open-cut crossings are assumed as a worst-case scenario at this stage, with a maximum width of 5m being affected in each case (but will be reviewed at the ES stage). For these crossings it is assumed that water flow would be maintained by damming and over pumping. Several of the ditches within the Site Boundary are ephemeral and if works could be carried out in the drier months this would reduce the risk of pollution propagating downstream, although this cannot be guaranteed and thus no weight has been attributed to this at this stage. 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.

9.4.67 Decisions on final watercourse crossing proposals associated with cables and internal access roads will be determined at the ES stage and the relevant statutory stakeholders consulted. Indicative locations are shown in **PEI Report Volume 2, Figure 9-1: Surface Water Features and their Attributes**. Where watercourses/ditches are crossed for access (either temporarily during construction or permanently during operation), it is preferred that new crossings will be clear span and wide enough to avoid the loss of in-channel and riparian habitats. Existing crossings will be used where practicable, and the number of crossings required will also be reduced wherever practicable. Nonetheless, as crossing structures are yet to be confirmed, a worst case has been assumed for the PEI Report that new crossings may be culverted.

9.4.68 Where culverts are required, it will be expected that the least impacting design that is reasonably practicable is proposed (e.g. arch rather than box culverts, and box culverts in preference to pipes etc.). The maximum width would be 6m to allow sufficient width for the access tracks. The crossings will

be sized at detailed design in order to not impact on flow conveyance and be sized to ensure capacity for the peak flow rate. The culvert inverts will be buried below the natural bed level to allow for natural bed formation and passage of sediments, typically at least 0.3m. Where arch culverts are not provided, it has been assumed that the design of the structure will allow for a naturalised bed to be formed through the structure. There is varying guidance as to what minimum depth is required, but there are also design considerations. Therefore, this will be considered at detailed design stage. Furthermore, the crossing should be perpendicular to the flow, and connectivity maintained for aquatic species and riparian mammals, with a mammal ledge if there is sufficient room.

9.4.69 The Proposed Development infrastructure will be set back from all water features by at least 10m to create a buffer zone. The point of measurement will be agreed with the Environment Agency, the LLFA or IDB as appropriate through further consultation, but it is expected this would be measured from the water's edge / channel extents under normal flow.

9.4.70 This buffer from water features will ensure all construction activities for the installation of solar PV panels, Onsite Substation, BESS and other associated development would be offset from surface watercourses, other than where there is a need for crossing of a watercourse (such as for cabling installation or temporary vehicle access for construction) or connection for surface water drainage (that may be for temporary works or from the operational Proposed Development). Any works to enhance watercourses would also require direct works to the channel and banks, although given the aim of these works, their small-scale and 'soft-engineering' nature, construction impacts would be expected to be minimal. Overall, the inclusion of this buffer reduces the risk of pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) where they are required and maintaining access (e.g. for the IDBs).

9.4.71 The risk from surface water runoff to surface or groundwater features has been provisionally assessed on the basis of **PEI Report Volume 3, Appendix 9-D: Preliminary Surface Water Drainage Strategy** and will be further developed prior to submission within the ES. The delivery of the detailed Drainage Strategy and implementation of the measures it contains will be secured through a Requirement of the DCO.

9.4.72 The pollution risk from runoff across the Principal Site is generally minimal as solar PV panels do not contain any liquid (hazardous or not) that could contaminate rainwater. They will be cleaned on two yearly cycles as a worst case. As the use of cleaning products (chemicals) can damage panels and void manufacturer's warranties no cleaning products would be used, only water. 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.

9.4.73 The BESS will have built-in fire detection and be fitted with an automatically operated internal fire extinguisher system. A Framework Battery Safety Management Plan (BSMP) will be presented as part of the DCO application. To inform its production, engagement will take place with the local Fire and

Rescue service to understand their approach to tackling any BESS fire. It is currently anticipated that fire water supply may be needed on site (rather than the water being taken from nearby hydrants or provided through the onboard storage capacity of attending fire engines) and allowance has been made for fire water storage within the design. The ES will contain details of the water supply and storage capacities where/if appropriate. Similarly, provision of fire water containment (impermeable water capture to prevent used firewater reaching ground/the surrounding environment) will be required. It is currently proposed to contain the external fire water runoff within the swale surrounding the BESS areas, where it can be held and tested before either being released into the surrounding watercourses or to ground (if found to have no contaminants present, or contaminants that are within acceptable legal limits) or taken off site by a tanker for treatment elsewhere. It is expected that this will be confirmed at the ES stage, pending further design.

9.4.74 Land use change relating to ceasing productive arable agriculture within the Site to accommodate the Proposed Development will reduce water quality risk to watercourses associated with diffuse agricultural chemicals and possibly reduce soil erosion and need for local abstractions for irrigation, thereby providing a beneficial impact. However, there is limited data on the existing conditions and activities, and therefore no further consideration has been given to this potential benefit at this stage.

9.4.75 There will be welfare facilities associated with the Proposed Development for up to four permanent full time members of staff, with up to 20 being in attendance for periods of maintenance, cleaning or solar infrastructure replacement. Given the low daily occupancy only small volumes of foul drainage will be generated. This will be managed using a self-contained foul drainage system to a sealed cesspit. These tanks would be regularly emptied under contract with a registered recycling and waste management contractor.

9.4.76 In the UK climate, solar PV panels are largely self-cleaning and deterioration in PV system output due to dust or dirt is generally low. The requirement for, and the frequency of, cleaning of the solar PV panels due to the build-up of dust and dirt varies depending upon site- specific conditions. Therefore, as a worst case it is assumed that the solar PV panels will be cleaned on two yearly cycles (although the period between cleaning can be much longer). As the use of cleaning products (chemicals) can damage panels and void manufacturer's warranties, no cleaning products would be added to the water for panel cleaning. Panel cleaning will therefore not lead to any significant pollution risk.

9.5 Baseline Conditions

9.5.1 This section describes the baseline environment within the Study Area with specific reference to surface water, groundwater and flood risk. It identifies any sensitive receptors, considers their attributes and defines their individual importance.

Existing Baseline

Topography, Land Use, Climate

Principal Site

9.5.2 The topography of the Proposed Development is relatively flat, with existing ground levels generally under 20m Above Ordnance Datum (AOD) according to online Ordnance Survey mapping (Ref 9-35) with gentle undulations around the larger watercourses. There are flood plains associated with:

a. The River Witham (Main River) which flows through the Study Area;

b. The River Brant (Main River), a tributary of the River Witham which flows through the Study Area and meets the Witham to the south of South Hykeham; and

c. The South Hykeham Catchment, a Main River located to the northeast of the Study Area.

9.5.3 These watercourses are shown in **PEI Report Volume 2, Figure 9-1: Surface Water Features and their Attributes**. In addition, there are numerous other Ordinary Watercourses within the Study Area that fall under the jurisdiction of the LLFA (Lincolnshire County Council) or IDB (Upper Witham Internal Drainage Board and Trent Valley Internal Drainage Board areas both cross into the Study Area, see **PEI Report Volume 2, Figure 9-1: Surface Water Features and their Attributes**). These watercourses drain surface water from the surrounding agricultural areas.

9.5.4 The area is currently used mainly for agriculture, with a mosaic of agricultural fields. There are several small villages, hamlets, and farms throughout the Study Area. The villages include Bassingham, Norton Disney, Witham St Hughs and Thorpe on the Hill.

9.5.5 Based on the Meteorological Office website (Ref 9-54), the nearest weather station is located in Waddington (NGR SK 98952 65231), approximately 3.5km north of the Study Area. Using data from this weather station, for the period 1991-2020, it is estimated that the Study Area experiences approximately 614mm of rainfall per year, with it raining more than 1mm on approximately 116 days per year, which are both low in the UK context. This is relevant to the whole Study Area.

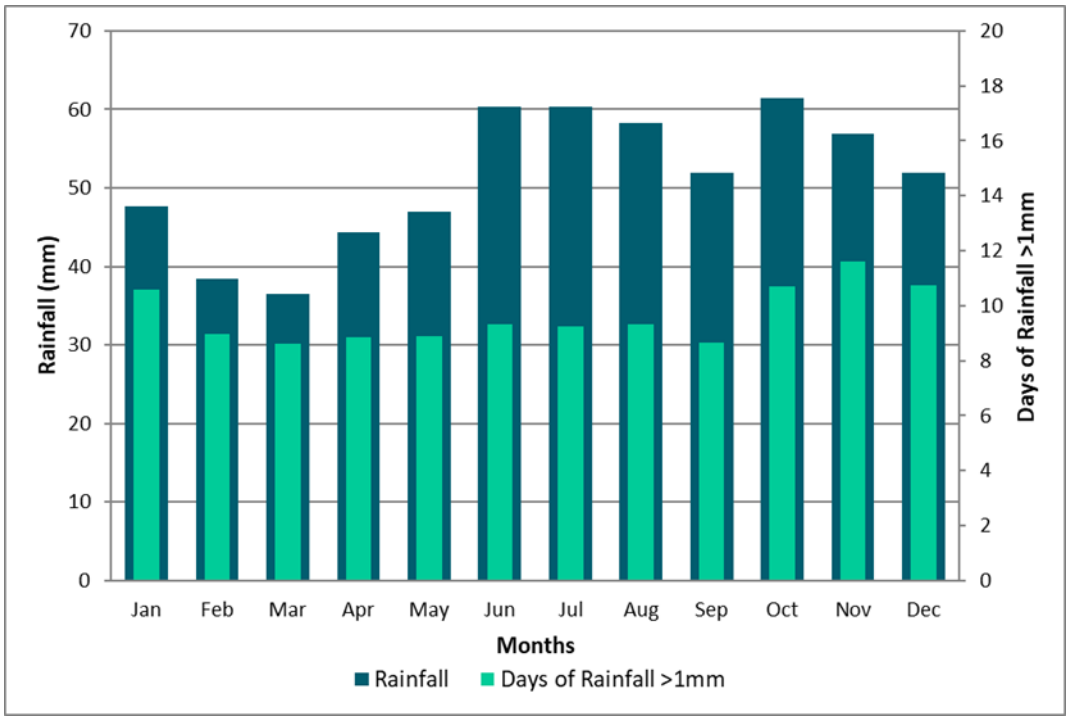

Plate 9-1: Waddington weather station: monthly rainfall and days of rainfall greater than 1mm between 1991–2020

Source: Met Office (Ref 9-54)

Cable Corridor

9.5.6 The topography of the Cable Corridor Study Area generally rises gently east of the River Brant (at less than 10m AOD) to a high point around 80m AOD at Navenby and this high point broadly follows the A607. The land gently recedes in elevation beyond Navenby, falling to around 40m AOD to the east of the Study Area of Scopwick Heath. Land use is generally agricultural, but with the villages of Coleby, Navenby, Boothby Graffoe and Wellingore all falling within the Study Area.

9.5.7 Rainfall for the Cable Corridor is the same as described for the Principal Site above.

Surface Water Features

9.5.8 The Proposed Development is located within the Anglian River Basin District, with a small area around Morton Hall falling under the Humber River Basin District. It extends across two management catchments, namely Witham (Anglian) (Ref 9-55) and Trent Lower and Erewash (Humber) (Ref 9-56).

9.5.9 The Principal Site falls under the Witham Upper Operational Catchment and Trent and Trib Operational Catchment.

9.5.10 The Cable Corridor falls under the Witham Upper Operational Catchment to the west of the A607 and the Witham Lower Operational Catchment to the east of the A607. All watercourses in the Study Area ultimately drain to the River Witham (confluence of the Brant to confluence of Catchwater Drain).

9.5.11 The River Witham flows northeast from the southwest of the Study Area and passes through the Principal Site to the west of Aubourn, with the River Brant flowing into the River Witham just north of the Study Area, roughly 2.8km east of Aubourn. The River Brant also passes through the Cable Corridor close to Broughton Lane. The Study Area includes the catchments of seven surface water WFD water bodies, within three operational catchments as listed below. WFD water bodies in the Study Area are describe further in **Table 9-4**.

a. Witham Upper Operational Catchment / Brant Lower Water Body from Brant Upper Water Body to River Witham Water Body (GB105030056770);

b. Witham Upper Operational Catchment / Witham from Cringle Brook to Brant Lower Water Body GB105030056780);

c. Witham Upper Operational Catchment / Boultham Catchwater Drain Water Body (GB105030062380);

d. Witham Upper Operational Catchment / South Hykeham Catchwater Water Body (GB105030062460);

e. Witham Lower Operational Catchment / Metheringham Beck Water Body (GB105030056210);

f. Witham Lower Operational Catchment / Dunston Beck Water Body (GB105030056230); and

g. Trent and Trib Operational Catchment / The Fleet Lower Catchment (tributary of Trent) Water Body (GB104028058250).

Table 9-4: WFD Surface Water Features on Site

Waterbody	Ecological Status / Potential (2022)	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
Brant Lower Water Body from Brant Upper Water Body to River Witham Water Body (GB105030056770)	Moderate Ecological Potential (note that both Biological Status and Physico-chemical status are moderate)	2022 – Does Not Require Assessment 2019 – Fail (due to Mercury and its compounds PFOS, PBDE and benzo(g-h-i)perylene)	Good (2027)	Heavily modified	The watercourse designation extends from the town of Brant Broughton (approximately 5.3km south of Fosse Green Energy as the crow flies) from where it flows predominantly north-north east for 12.05km to Waddington where the waterbody is then designated as the Witham – Brant to Catchwater Drain waterbody. The catchment has an area of 88.9km^2	Physical modifications relating to agriculture, continuous sewage discharges, diffuse agricultural pollution, poor nutrient and livestock management in the catchment, transport drainage, surface water abstraction and riparian/in-channel activities (including bank erosion)
Relation to Proposed Development: The River Brant crosses the Cable Corridor near Broughton Lane and will have the Grid Connection Cable laid beneath it using a trenchless approach. Several tributaries of the River Brant (generally agricultural ditches) are also located within the Cable Corridor or wider Study Area. **Site Observations**: When observed on site close to the potential Cable Corridor crossing location near to Sand Syke Pumping Station, the River Brant had a bank top to bank top width of roughly 10m and an estimated bankfull depth of 5m. The channel appeared heavily modified and straightened at the point of observation, possessing very little variation or diversity. There were also steep embankments along both banks that will have limited any lateral connectivity. The channel margins had abundant emergent and floating macrophytes and the bed was smothered by fine sediment. Adjacent tributaries consisted of agricultural drainage channels, being trapezoidal and heavily modified in nature with little flow and densely vegetated.						
Witham from Cringle Brook to confluence with Brant Water Body (GB105030056780)	Moderate Ecological Potential (on the basis of Moderate physico-chemical quality elements, notably	2022 – Does Not Require Assessment 2019 – Fail (due to	Moderate (2015)	Heavily Modified	The watercourse designation has a large catchment area of 156.7km^2 which starts at Great Ponton to the south of the Proposed Development and terminates close to South	Physical modifications relating to agriculture, continuous sewage discharges, diffuse agricultural pollution, poor nutrient and

Waterbody	Ecological Status / Potential (2022)	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
	phosphates which have a poor status)	Mercury and its compounds PFOS and PBDE)			Hykeham. The watercourse catchment includes a relatively large part of the south westerly portion of the Proposed Development and the River Witham flows through the Site boundary (west of Aubourn) and has a length of 56.9km.	livestock management in the catchment.

Relation to Proposed Development: This water body underlies a large portion of the Proposed Development's area and would cross the Principal Site, with a cable crossing required by trenchless techniques.

Site Observations: The River Witham is a Main River with a bank top to bank top width of approximately 8m. The channel when visited on the site walkover was embanked at the point of observation which will have limited lateral connectivity, yet the channel still exhibited a degree of flow variation and geomorphological process. The Aubourn fish pass is located close to Aubourn and consists of a rock ramp (boulders and carefully-placed smaller stones form bars across the channel) built in 2016 to open up the upstream reaches of the channel to fish and eels following removal of the Aubourn weir. On the day of the site visit the water was turbid and the channel bed smothered with fine sediment.

Existing Improvement Schemes: The Environment Agency are undertaking partnership projects with East Mercia Rivers Trust and the Wild Trout Trust to deliver river restoration and floodplain and wetland creation within the River Witham. This has been on-going for several years and there are future projects to be delivered. These are generally upstream of Belton and so are upstream of the Study Area.

Boultham Catchwater Drain Water Body (GB105030062380)	Moderate Ecological Potential (on the basis of Poor status for macrophytes, and moderate for phosphate).	2022 – Does Not Require Assessment 2019 - Fail (due to Mercury and its compounds PFOS, PBDE and benzo(g-h-i)perylene)	Good (2027)	Heavily Modified	This water body catchment area overlaps with a small portion of the Proposed Development near Thorpe on the Hill (north west proportion of the Site). With the watercourse itself being further to the north between Skellingthorpe Big Wood and St Catherines in Lincoln. It has a catchment area of 43.8km^2 and a river length of 7.3km.	Diffuse and point source pollution from urban and transport processes and physical modification relating to land drainage.

Waterbody	Ecological Status / Potential (2022)	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
Relation to Proposed Development: A significant proportion of the Principal Site and its Study Area west of between Thorpe on the Hill and A46 is within the wider catchment of this water body. Nonetheless the water body itself is over 3.5km northeast as the crow flies and so would not be directly impacted but there may be hydrological connectivity through tributaries that extend into the Site Boundary. **Site Observations**: Given that the water body itself is over 1km from the Proposed Development and would not be directly impacted, it was not visited during the site walkover.						
South Hykeham Catchwater Water Body (GB105030062460)	Moderate Ecological Status (on the basis of dissolved oxygen and phosphate which is at Moderate status)	2022 – Does Not Require Assessment 2019 - Fail (due to Mercury and its compounds, PBDE and benzo(g-h-i)perylene)	Moderate (2015)	Heavily Modified	The watercourse flows west to east to the north of South Hykeham, from Danker Wood to the River Witham. It has a length of 3.1km and drains a total area of 4.8km^2.	Physical modifications for land drainage, sewage discharge pollution (continuous discharges and Private Sewage Treatment), trade/industry discharge, and poor livestock and nutrient management in the catchment.
Relation to Proposed Development: South Hykeham Catchwater is not within the Study Area (it is located to the east), but its wider catchment and associated tributaries do extend across the northeastern extent of the Principal Site and there is therefore hydrological connectivity to the water body. **Site Observations**: Given that the water body itself is not within the Study Area and would not be directly impacted, it was not visited during the site walkover.						
Metheringham Beck Water Body (GB105030056210)	Moderate Ecological Potential (on the basis of phosphate which is at poor status)	2022 – Does Not Require Assessment 2019 - Fail (due to Mercury and	Moderate (2015)	Heavily Modified	The designated watercourse flows in a northeasterly direction from the south of Metheringham towards Car Dyke South and Delph System. However, this is designated watercourse is approximately 6 km east of the Study Area as the crow flies. Nonetheless, the wider	Physical modification for agriculture and rural land management, and continuous sewage discharge pollution.

Waterbody	Ecological Status / Potential (2022)	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
		its compounds and PBDE)			catchment overlaps with a small portion of the Study Area east on Navenby. The water body has a catchment area of 35.5km^2 and a river length of 2.7km.	
Relation to Proposed Development: The wider WFD catchment overlaps with a small portion of the Study Area east of Navenby although mapping suggests there are few watercourses in this part of the Study Area (see **PEI Report Volume 2: Figure 9-1 Surface Water Features and their Attributes**).						
Site Observations: Given that the water body itself is not within the Study Area and would not be directly impacted, it was not visited during the site walkover.						
Dunston Beck Water Body (GB 105030056230)	Moderate Ecological Potential (note that Biological Status is bad due to a bad classification for fish and moderate for invertebrates)	2022 – Does Not Require Assessment 2019 - Fail (due to Mercury and its compounds and PBDE)	Good (2021)	Heavily Modified	The designated waterbody rises approximately 3.6km east of the Study Area at Dunston Heath and flows easterly towards Car Dyke South and Delph System. It is 6.3km in length and drains a catchment area of 40.1km^2. The Study Area east of Navenby falls within this catchment.	Physical modifications relating to agriculture, agricultural pollution, poor soil management and surface water abstraction
Relation to Proposed Development: The wider WFD catchment overlaps with a small portion of the Study Area east of Navenby although mapping suggests there are few watercourses in this part of the Study Area (see **PEI Report Volume 2: Figure 9-1 Surface Water Features and their Attributes**).						
Site Observations: Given that the water body itself is not within the Study Area and would not be directly impacted, it was not visited during the site walkover.						
Existing Improvement Schemes: The Environment Agency are undertaking partnership projects with East Mercia Rivers Trust and the Wild Trout Trust to deliver river restoration and floodplain and wetland creation within the Dunston Beck Water Body. This has been on-going for several years and there are future projects to be delivered. No further details were provided by the Environment Agency.						
The Fleet Lower Catchment (tributary of the Trent) Water Body (GB104028058250)	Poor Ecological Status (note that Biological Status is poor due to a poor classification for	2022 – Does Not Require Assessment	Moderate (2015)	Not designated artificial or heavily modified	The designated waterbody rises approximately 1.2km west of the Study Area north of Eagle Hall Wood and flows west to meet the River Trent. It is 6.4km in	Physical modifications relating to flood defence structures, drought and poor soil management.

Waterbody	Ecological Status / Potential (2022)	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach	Reasons for Not Achieving Good Status
	Macrophytes and Phytobenthos sub element and for dissolved oxygen. Invertebrates and phosphate are at moderate status.	2019 - Fail (due to Mercury and its compounds and PBDE)			length and drains a catchment of 30.8km^2. The western extent of the Study Area overlaps with the wider WFD catchment to the east of Morton Hall.	

Relation to Scheme: The wider WFD catchment overlaps with a small portion of the Principal Site east of Moreton Hall, with some of the tributaries of the Fleet Lower Catchment water body extending into the Site Boundary.

Site Observations: Given that the water body itself is not within the Study Area and would not be directly impacted, it was not visited during the site walkover.

9.5.12 There are various other water features within the Study Area, which do not have WFD classifications in their own right, but which would all ultimately drain to the River Witham or The Fleet (and these are covered by their WFD designations). The key water features are all outlined below.

a. **West Brant Syke** watercourse rises at Broughton Clays and flows in a north and northeasterly direction for approximately 8.5km to meet the River Brant east of Bassingham. If flows within the Study Area for a total length of approximately 2km and borders the Principal Site along Fen Lane immediately upstream of its confluence with the River Brant. Based on site observations the channel was judged to be heavily modified, straightened and of an artificial character for much of its length. Bank top to bank top width was estimated to be 10m, with a bankfull depth of 5m. On the day of observation, there was only a minimal amount of water within the watercourse, which was flowing very slowly eastwards towards the River Brant.

b. **Pike Drain** rises in the north of the Study Area near Thorpe on the Hill and flows in a northeast direction through Whisby Nature Park and on through North Hykeham where it reaches its confluence with the River Witham at Bracebridge. It has a total length of approximately 9.4km. Two tributaries of Pike Drain extend into the Principal Site at its northernmost extent.

c. **Mill Dam Dyke** rises in the western extent of the Principal Site, immediately west of Morton Lane. It flows northwest out of the Study Area towards North Scarle and ultimately drains into the Fleet near Girton. It has a total length of approximately 6.5km.

d. There are several large **sand and gravel pit lakes** to the north of the Study Area near Thorpe on the Hill including several within Whisby Nature Park. These appear to be important sites for recreation with fishing and sailing usage.

e. There are a collection of large lakes immediately south of Witham St Hughs within the Study Area. These are located immediately west of the Principal Site. Given the fall of the land here is sloping gently west to east, and decreasing towards the Site boundary, there would not be anticipated to be any potential impacts on these water bodies and they will not be considered any further (i.e. they are upslope of the Principal Site).

f. There are two small reservoirs roughly 800m west of Carlton le-Moorland, at NGR SK 89687 58156 and SK 89511 58226, one of which partly falls within the Study Area. There is no direct hydrological connectivity to these water features and they will also not be considered any further.

g. Various small agricultural ponds are situated throughout the Study Area. See **PEI Report Volume 1: Chapter 8: Ecology and Nature Conservation** for further details.

Hydrology

9.5.13 The nearest gauging station for the River Witham on the National River Flow Archive (Ref 9-41) is located 1.6km downstream from the confluence of the River Witham and River Brant at North Hykeham, Lincolnshire (Station U3001, Witham at North Hykeham). The annual mean flow is 3.41m³/s.

9.5.14 The nearest gauging station with available records of Q95 flow (flow exceeded 95% of the time) is 11km upstream from the Study Area. The Q95 at this monitoring station (Station ID 30001, Witham at Claypole Mill) between 1959-2021 is 0.385m^3/s. The mean flow recorded at this station is 1.899m^3/s.

9.5.15 The nearest gauging station to the River Brant in the Study Area is located at Brant Boughton (Station ID 30033, Ref 9-41). This is located approximately 2.3 km upstream of the Site boundary, to the east of the Brant Broughton area. The annual mean flow is 0.26 m³/s with a Q95 flow of 0.007 m³/s and mean flow of 0.256 m^3/s, with data recorded between the period 1990-2021.

Water Quality

9.5.16 Water quality data for the River Witham (at Aubourn Bridge), River Brant (at Blackmore Bridge), South Hykeham Catchwater (at South Hykeham headwaters), Dunston Beck (at Dunston Beck Spring), Pike Drain (off Rochester Road) and Metheringham Beck (at Metheringham downstream of sewage treatment works) has been interrogated from the Environment Agency's Water Quality Archive website (Ref 9-64). Data has been compared to WFD Environmental Quality Standards (EQS) (Ref 9-42) and is expanded upon in **Table 9-5**.

9.5.17 The water quality within the Witham at Aubourn Bridge is slightly alkaline in nature with an average pH of 8.09 but falls within the threshold for WFD high classification based on data sampled here from 2008 to 2023. A 10th percentile dissolved oxygen saturation of 80.30% falls within the high WFD classification (with 70% being high). Electrical conductivity is moderate (mean 912µS/cm). Ammonia (90^{th} percentile of 0.00094mg/l) would fall under the WFD high classification.

9.5.18 Water quality within the River Brant at Blackmore Bridge is circum-neutral with an average pH of 7.85 but falls within the WFD high classification based on data sampled here from 2000 to 2023. A 10th percentile dissolved oxygen saturation of 38.8% falls within the poor WFD classification (with <45% being poor). A 90th percentile of 1.76 mg/l and 0.0020 mg/l for Biological Oxygen Demand (BOD) and ammonia respectively, fall under the high WFD classifications. Electrical conductivity is moderate (mean 942µS/cm).

9.5.19 Water quality within the South Hykeham Catchwater at South Hykeham is circum-neutral with an average pH of 7.79 and falls within the WFD high classification based on data sampled here from 2012 to 2023. A 10th percentile dissolved oxygen saturation of 51.40% is within the poor WFD classification (with 45-54% being poor). A 90th percentile for BOD of 6.0mg/l falls within the moderate WFD classification (with >5mg/l being the threshold

to moderate). A 90th percentile for ammonia of 0.012mg/l falls within the high WFD classification. Electrical conductivity is moderate (mean 1095µS/cm).

9.5.20 Water quality within the Dunston Beck WFD water body at Dunston Beck Spring is circum-neutral with a pH of 7.73, falling within the WFD high classification based on data sampled here from 2000 to 2019. A 10th percentile dissolved oxygen saturation of 89.6% falls within the WFD high classification. There has been no monitoring of BOD at this site. Electrical conductivity is moderate (mean 871µS/cm).

9.5.21 Water quality within Metheringham Beck at Metheringham Ds Stw is circum-neutral with an average pH of 7.61 but falls within the WFD high classification based on data sampled here from 2012 to 2023. A 10th percentile dissolved oxygen saturation of 76.1% is within the good WFD classification. A 90th percentile for BOD of 5.75mg/l falls within the moderate classification and 0.003 mg/l for ammonia both fall within the high WFD classifications. Electrical conductivity is moderate (mean 874µS/cm).

9.5.22 Pike Drain has a slightly alkaline pH of 8.09. It has moderate electrical conductivity (680 µS/cm), but fewer determinants have been monitored at this site (which is not a WFD water body).

9.5.23 Nitrate and orthophosphate values are somewhat elevated for all monitored sites and indicates probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourses. Orthophosphate (reactive as P) classifications for the River Brant, River Witham and Metheringham Beck at the aforementioned locations are all within the moderate classification band. Respectively, these locations had a mean orthophosphate value of 0.49mg/l, 0.389mg/l and 0.575mg/l (with a moderate classification being above 0.222 mg/l [River Brant], 0.217 mg/l [River Witham] and 0.224 mg/l [Metheringham Beck]). The South Hykeham WFD waterbody is within the good classification with a mean value of 0.129mg/l (with a good classification being above 0.097mg/l).

Table 9-5: Summary Environment Agency water quality monitoring data

		Pike Drain (2019-2023)					River Witham, Aubourn Bridge (2019-2023)				
Determinant	Units	Mean	Max	Min	90th %tile	10th %tile	Mean	Max	Min	90th %tile	10th %tile
pH	pH Units	8.09	8.67	7.9	8.44	7.9	8.09	8.39	7.69	8.33	7.84
Temperature of Water	°C	-	-	-	-	-	12.12	20.80	3.30	20.10	5.10
Conductivity at 25 C	µs/cm	-	680	680	-	-	912	1027	824	970	832
Ammoniacal Nitrogen as N	mg/l	-	-	-	-	-	0.04	0.13	0.03	0.04	0.03
Nitrogen, Total Oxidised as N	mg/l	-	-	-	-	-	9.10	15.00	2.00	13.00	4.50
Nitrate as N	mg/l	-	-	-	-	-	9.06	14.90	1.97	13.00	4.47
Nitrite as N	mg/l	-	-	-	-	-	0.04	0.08	0.01	0.06	0.02
Ammonia un-ionised as N	mg/l	-	-	-	-	-	0.00076	0.00304	0.00033	0.00094	0.00038
Alkalinity to pH 4.5 as CaCO3	mg/l	-	-	-	-	-	211	230	180	220	190
Orthophosphate, reactive as P	mg/l	-	-	-	-	-	0.23	0.57	0.09	0.41	0.12
Calcium, Dissolved	mg/l	105.6	120	84	116.8	90.4	-	-	-	-	-
Carbon, Organic, Dissolved as C :- {DOC}	mg/l	6.17	7.0	4.7	6.95	5.0	-	-	-	-	-
Nickel, Dissolved	µg/l	1.3	1.6	1.1	1.6	1.1	-	-	-	-	-
Nickel : BLM Bioavailable	µg/l	0.6	1.6	0.3	1.1	0.3	-	-	-	-	-
Oxygen, Dissolved, % Saturation	%	-	-	-	-	-	92.92	109.80	76.90	104.30	80.30
Oxygen, Dissolved as O2	mg/l	-	-	-	-	-	10.13	13.20	7.19	12.50	7.89

		River Brant Blackmore Bridge (2019-2023)					South Hykeham (2019-2023)				
Determinant	**Units**	**Mean**	**Max**	**Min**	**90th %tile**	**10th %tile**	**Mean**	**Max**	**Min**	**90th %tile**	**10th %tile**
pH	pH Units	7.85	8.37	7.06	8.2	7.165	7.79	8.81	7.47	7.96	7.56
Temperature of Water	°C	11.2	19.3	2.1	17.17	4.51	10.3	20.2	2.2	16.8	4.4
Conductivity at 25 C	µs/cm	942	1111	677	1038	835	1095	1535	776	1303	826
BOD: 5 Day ATU	mg/l	1.6	1.8	1.4	1.76	1.44	2.72	9.00	1.00	6.00	1.19
Ammoniacal Nitrogen as N	mg/l	0.10	0.48	0.03	0.214	0.03	0.38	2.10	0.03	0.78	0.04
Nitrogen, Total Oxidised as N	mg/l	10.2	21.0	0.2	18.7	2.3	5.38	28.0	0.20	13.0	0.3
Nitrate as N	mg/l	10.11	20.90	0.20	18.60	2.24	5.29	27.90	0.01	13.00	0.18
Nitrite as N	mg/l	0.070	0.220	0.004	0.117	0.031	0.090	0.550	0.004	0.160	0.020
Ammonia un-ionised as N	mg/l	0.00101	0.00253	0.00026	0.00203	0.00033	0.00509	0.04230	0.00019	0.01280	0.00060
Alkalinity to pH 4.5 as CaCO3	mg/l	216	260	170	247	190	214	300	79	250	180
Orthophosphate, reactive as P	mg/l	0.3115	1.300	0.030	0.742	0.0589	0.110	0.470	0.020	0.210	0.030
Oxygen, Dissolved, % Saturation	%	84.9	132.6	8.1	122.7	38.79	83.4	167.8	43.2	98.6	51.4
Oxygen, Dissolved as O2	mg/l	9.5	13.7	0.8	12.9	3.8	9.5	18.7	4.1	11.6	6.5

		Metheringham Beck Headwaters (2019-2023)					Dunston Beck (2019-2023)				
Determinant	**Units**	**Mean**	**Max**	**Min**	**90th %tile**	**10th %tile**	**Mean**	**Max**	**Min**	**90th %tile**	**10th %tile**
pH	pH Units	7.61	7.93	7.31	7.75	7.47	7.73	8.00	7.47	8.00	7.50
Temperature of Water	°C	11.02	13.70	8.20	13.01	8.78	10.66	14.70	8.60	11.88	9.39
Conductivity at 25 C	µs/cm	874	1048	253	930	868	871	903	798	896	845
BOD: 5 Day ATU	mg/l	2.65	8.6	1	5.75	1.05	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.143	0.340	0.032	0.340	0.032	-	-	-	-	-
Nitrogen, Total Oxidised as N	mg/l	9.9	12.0	1.5	12.0	8.9	16.8	22.0	13.0	19.1	14.2
Nitrate as N	mg/l	9.841	12.00	1.48	12.00	8.843	16.80	22	13	19.1	14.19
Nitrite as N	mg/l	0.010	0.038	0.005	0.014	0.005	0.005	0.007	0.0042	0.00645	0.0046
Ammonia un-ionised as N	mg/l	0.00128	0.00471	0.00020	0.00316	0.00022	-	-	-	-	-
Alkalinity to pH 4.5 as CaCO3	mg/l	235	260	79	251	225	249	264	239	260	240
Orthophosphate, reactive as P	mg/l	0.0401	0.1200	0.0120	0.0815	0.0140	0.0038	0.0072	0.0015	0.0061	0.0021
Calcium, Dissolved	mg/l	-	-	-	-	-	148.2	168.0	140.0	151.4	140.3
Oxygen, Dissolved, % Saturation	%	82.6	94.1	74.3	88.5	76.1	95.2	101.4	85.9	100.6	89.6
Oxygen, Dissolved as O2	mg/l	9.1	10.4	7.9	9.6	8.5	10.5	11.4	9.5	11.12	9.8

Aquatic Ecology

9.5.24 The aquatic ecology desk study described in **PEI Report Volume 3, Appendix 8-C: Aquatic Ecology** provides an overview of any protected, notable or invasive species of aquatic macroinvertebrates, macrophytes and fish within the Study Area based on desk study and site survey. A summary is provided below.

Fish

9.5.25 The desk study identified ten records of the protected species European Eel *Anguilla anguilla* within 2km of the Study Area within the last 20 years, with the closest record being 600m downstream of the Site on the River Witham. This species is afforded protection under the Eels (England and Wales) Regulations 2009 (Ref 9-84), which places a requirement upon developers and abstracters to ensure continued eel passage and to prevent eel entrainment.

9.5.26 European Bullhead *Cottus gobio* was also identified at the same Environmental Agency monitoring station with the most recent record in 2017. This species is a Habitats Directive Annex II species (Ref 9-85) and UK Biodiversity Action Plan (UK BAP) Priority Species (Ref 9-87).

9.5.27 The most recent record of Brown Trout *Salmo trutta* identified during the desk study was in 1997, 1.7km upstream of the Site on the River Witham. Brown Trout is listed as a Section 41 species of principal importance (Ref 9-65).

9.5.28 The desk study also revealed that Barbel *Barbus barbus* was found 600m downstream of the proposed site boundary on the River Witham, with the latest record in 2005. This species is a Habitats Directive Annex V species (Ref 9-86).

9.5.29 In addition, Spined Loach *Cobitis taenia* was recorded in a section of the River Brant within the Site, with the most recent record in 2011. This species is listed in Annex II of the Habitats Directive (Ref 9-86) and it is a Section 41 species of principal importance (Ref 9-65). It is restricted to central and eastern England.

9.5.30 Due to the presence of the above notable fish species in connected water bodies, there is the potential that they may occur within the watercourses and ditches to be impacted within the Site. European Eel for example may utilise all connected watercourses and ditches in a catchment and may cross land between them. Therefore, consideration will need to be given to maintaining passage along watercourses and ditches for transitory fish species and avoiding impacts to them during construction.

9.5.31 No suitable spawning habitat for fish was identified in any of the surveyed water bodies, and therefore there are no seasonal constraints due to the presence of spawning fish.

Aquatic Macroinvertebrates

9.5.32 No aquatic macroinvertebrate species were recorded that receive specific legal protection via Schedule 8 of the Wildlife and Countryside Act (WCA) 1981 (Ref 9-65), or that are listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 Act (Ref 9-66) as being of principal importance for nature conservation in England. However, there were two Regionally Notable macroinvertebrate species found in the Site: a water beetle *Hydraena testacea* and a dragonfly *Sympetrum vulgatum* (larva found) in drain WC3 (see **PEI Report Volume 2, Figure 9-1** for drain locations). Four Locally Notable species were also found across the Site: a freshwater snail, Leach's Bithynia (*Bithynia leachii*), three water beetle species, two water scavenger beetles, *Laccobius colon* and *Anacaena bipustulata* and a diving beetle *Ilybius quadriguttatus*.

9.5.33 Macroinvertebrate communities were typical of watercourses subject to significant human modification and man-made drainage ditches in lowland Lincolnshire, with most ditch communities including freshwater snails, water beetles, and Odonata (dragonflies and damselflies).

9.5.34 Aquatic macroinvertebrate surveys undertaken for the Proposed Development revealed that watercourses within Principal Site are all subject to habitat diversity and water quality pressures throughout. Current Average Score Per Taxon (WHPT) scores suggest that the majority of surveyed water bodies suffer from Poor, Polluted or Impacted water quality (see **PEI Report Volume 2, Figure 9-1** for drain locations). There are some exceptions where Moderate, Moderately impacted water quality and Good, Clean water quality is recorded (refer to **PEI Report Volume 3, Appendix 8-C: Aquatic Ecology**). The macroinvertebrate communities in all surveyed water bodies were indicative of environments with high levels of siltation. In line with these results, the aquatic macroinvertebrate community of all surveyed watercourses had either a Low or Moderate conservation value.

Aquatic Macrophytes

9.5.35 A single notable plant species, Opposite-leaved Pondweed *Groenlandia densa*, was present in drains BL5 and BL6 only. This threatened species has a Vulnerable status on the England Red List of vascular plants (Ref 9-88) but does not receive specific legal protection. Online mapping indicates that this species has a patchy distribution across Lincolnshire, where it is mostly found in smaller water bodies such as streams, canals, ditches and ponds. As such, it is considered of Local conservation value. Water body BL6 supports a total of 12 qualifying freshwater macrophyte species listed in the Local Wildlife Site Guidelines for Greater Lincolnshire (Ref 9-89). This water body therefore meets the criteria for selection of LWS and is of County conservation value.

9.5.36 Most of the water bodies do not support a notably diverse aquatic plant assemblage, with the majority being fairly species poor. Although some (WC8, BL8 and BI5) do support a moderate number of aquatic plant species (>15), these are comprised of common species typical of drainage ditches and / or slow flowing water bodies. It is highly likely that similar aquatic

plants communities occur within suitable habitats across the wider landscape, and as such these plant species and assemblages are judged to be of Site conservation value.

Mammals

9.5.37 **PEI Report Volume 1, Chapter 8: Ecology and Nature Conservation** indicates the presence of Otter *Lutra lutra* along the River Brant and River Witham, including a potential Otter holt within the Site on the River Witham within woodland east of the watercourse. Otter is protected under various legislation in the UK and the presence of a potential holt within the Site and activity levels along the River Witham means the Site is likely to support an Otter population of District Importance.

9.5.38 **PEI Report Volume 1, Chapter 8: Ecology and Nature Conservation** also indicates the presence of Water Vole *Arvicola amphibius* along the along the eastern end of the Solar and Energy Storage Park on the River Witham. Water Vole are protected under Schedule 5 of the Wildlife and Countryside Act, 1981 (Ref 9-66). The limited number of records of Water Vole, suitable habitat and absence of Mink, which predate Water Vole, means the Site is likely to support a population of District importance, in consideration of this species' declining status in a national and county context.

Aquatic Invasive Non-Native Species

9.5.39 The presence of the non-native but non-invasive New Zealand Mud Snail and freshwater amphipod shrimp, either *Crangonyx pseudogracillis* or *Crangonyx floridanus*, constituted the only notable macroinvertebrate records. As these species are widespread and not currently listed in UK legislation, there are no statutory constraints to the spread of either species.

9.5.40 Two submerged plants, Canadian Waterweed and Nuttall's Waterweed, are listed on Schedule 9 of the WCA (Ref 9-65) and the latter also list on the Invasive Alien Species (Enforcement and Permitting) Order (Ref 9-70). As such it is an offence to cause either species grow in the wild and in the case of Nuttall's Waterweed, there should be a plan for dealing with this species as under the (Enforcement and Permitting) Order. To this end, a Biosecurity Management Plan would be produced to ensure that neither species was spread outside the Site during construction, operation, and decommissioning. Nuttall's waterweed was recorded in water bodies WC8 and WC9; Canadian pondweed was recorded in water bodies BL4 and BL5.

Nature Conservation Sites

9.5.41 Statutory sites designated for nature conservation were identified through a review of Defra's MAGIC map (Ref 9-40). The following are located within the Study Area, or within a few kilometres downstream (considered in order of nearest to the Proposed Development):

a. Whisby Nature Park (Local Nature Reserve (LNR)) – Located approximately 340m north of the Principal Site, the LNR consists of flooded gravel pits, wetlands, scrub woodland and some grassland. The LNR supports various species such as water voles, bats and various

species of bird. There are no known hydrological connections between watercourses flowing through the Study Area to the waterbodies at Whisby Nature Park on the basis of Ordnance Survey mapping and it is not considered further.

b. Swanholme Lakes (Site of Special Scientific Interest (SSSI)) – The SSSI is located approximately 4.2km northeast of the Principal Site. The site is designated for the diversity of ecology resulting from unpolluted water and range of physical and chemical conditions. The area supports several uncommon species of submerged plants and an outstanding community of breeding dragonflies, as well as various other fauna. There are no known hydrological connections between watercourses flowing through the Study Area to Swanholme lakes on the basis of Ordnance Survey mapping and on this basis, it is not considered further.

Geology and Soils

Principal Site

9.5.42 The bedrock and superficial geology for the proposed development is identified by the BGS GeoIndex online mapping (Ref 9-43).

9.5.43 The Principal Site is underlain by the Scunthorpe Mudstone Group which was formed during the Jurassic period. The lithological description of this formation by the BGS Geoindex is as follows "*Grey, variably calcareous and silty, blocky or fissile mudstone with thin beds of argillaceous limestone (bioclastic or micritic) and calcareous siltstone, particularly near base and in upper part, which is ferruginous in the type area"*. This formation can be up to 128m thick.

9.5.44 Most of the Proposed Development is not overlain by any superficial deposits. There are some small areas of superficial deposits, particularly around watercourses off the River Witham, where there are areas of Alluvium, made up of clay, silt, sand and gravel.

9.5.45 The soils underlying the Proposed Development are described on the Cranfield Soilscapes website (Ref 9-39) as *"Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils"* with impeded drainage. Soils closer to watercourses are described differently, as "*Loamy and clayey floodplain soils with naturally high groundwater*" and are naturally wet

Cable Corridor

9.5.46 The Cable Corridor Study Area is underlain by four bedrock formations orientated north to south. The bedrock formations underlying the Proposed Development were formed during the Jurassic period.

9.5.47 A small section to the western extent of the Cable Corridor is underlain by the Scunthorpe Mudstone Group, as described above. The boundary between this formation and the next bedrock formation to the east is approximately 1.5km from the River Witham.

9.5.48 The bedrock formation east of the Scunthorpe Mudstone Group is the Charmouth Mudstone Formation. The lithological description of this formation is as follows: "*Dark grey laminated shales, and dark, pale and bluish grey mudstones; locally concretionary and tabular limestone beds; abundant argillaceous limestone, phosphatic or ironstone (sideritic mudstone) nodules in some areas; organic-rich paper shales at some levels; finely sandy beds in lower part in some areas*". This formation can be up to 335m thick. The boundary between this formation and the adjacent formation to the east is approximately 1km to the west of A607.

9.5.49 To the east of the Charmouth Mudstone formation is a narrow band of Whitby Mudstone Formation. The lithological description is as follows: "*Medium and dark grey fossiliferous mudstone and siltstone, laminated and bituminous in part, with thin siltstone or silty mudstone beds and rare fine-grained calcareous sandstone beds; dense, smooth argillaceous limestone nodules very common at some horizons; phosphatic nodules at some levels. Nodular and fossiliferous limestones occur at the base in some areas*". This formation can be up to 120m thick. This narrow band runs north – south in between the Charmouth Mudstone Formation and Lincolnshire Limestone Member.

9.5.50 The Lincolnshire limestone formation underlies the eastern section of the Cable Corridor. This formation is further categorised into the lower and upper Lincolnshire limestone formation. The lithological description is as follows: "*Limestone, typically calcilutites, and peloidal wackestones and packstones in the lower part (Lower Lincolnshire Limestone) and high energy ooidal and shell fragmental grainstones in the upper part (Upper Lincolnshire Limestone). Commonly includes sandy limestone in basal part and may contain substantial units of mudstone particularly from the Lincoln area northwards*". The thickness of this formation can be up to 30m thick. The Lower Lincolnshire Limestone Member underlies a small area of the corridor near Boothby Graffoe. The Upper Lincolnshire Limestone Member bedrock, underlies the eastern section of the corridor, south of the B1202.

9.5.51 Much of the Cable Corridor is not underlain by superficial deposits. Specifically, the section of the corridor to the east of Broughton Lane records no superficial deposits at all. To the west of the Broughton lane are some areas of superficial deposits. Superficial deposits of Balderton Sand and Gravel Member are found between Aubourn and Bassingham. A mix of Alluvium, River Terrace deposits and Fulbeck sand and gravel member are found in an area to the east of the River Brant. These deposits are made up of mainly sand of gravel, and were formed during the Quaternary period.

9.5.52 Soils between Brassingham and Aubourn are described on the Soilscapes website (Ref 9-39) as "*Naturally wet very acid sandy and loamy soils*" with naturally wet drainage. Soils on either side of the River Brant are described as "*Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*" with impeded drainage. Soils close to the River Brant are described as "*Loamy and clayey floodplain soils with naturally high groundwater*" with naturally wet drainage. Soils east of the A607 are

described as "*Shallow lime-rich soils over chalk or limestone"* and are freely draining.

Groundwater

Hydrogeology

9.5.53 The Scunthorpe Mudstone Formation Group is a designated Secondary B aquifer, as a result the Principal Site is underlain mainly by Secondary B Aquifer. However, a narrow band of this bedrock formation is classed as secondary A aquifer. This band runs down the east side of the site. The Charmouth Mudstone Formation Group is also a Secondary B aquifer. The Lincolnshire Limestone formation to the east is classed as a Principal aquifer.

9.5.54 The overlying superficial deposits which include the river terrace deposits, alluvial deposits, Balderton Sand and Gravel Member and the Fulbeck Sand and Gravel Member are designated as a Secondary A aquifers.

9.5.55 Principal aquifers comprise layers that have high permeability, meaning they usually provide a high level of water storage and transmission. They may support water public/private supply and/or river baseflow on a strategic scale.

9.5.56 Secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of baseflow to rivers.

9.5.57 Secondary B aquifers comprise 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.

9.5.58 Secondary undifferentiated aquifer has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. 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.

9.5.59 No site-specific ground investigation information is currently available at this stage, however a review of selected BGS borehole records available on the Geoindex website was undertaken (Ref 9-44, Ref 9-75). Only five within the area of the Proposed Development described groundwater level.

9.5.60 Borehole data for the Scunthorpe Mudstone Group which underlies the Proposed Development for the Principal Site was investigated. BGS borehole record SK86SE139, located in Tunman Wood approximately 100m from the north western site boundary for the Principal Site, reported groundwater levels 2.5m below ground level. BGS borehole record SK96SW4 and SK96SW38, located in the centre of Aubourn 660m north east from the site boundary for the Cable Corridor, reported groundwater levels as being 4.5m below ground level.

9.5.61 Borehole data for the Lincolnshire Limestone Formation which underlies the Cable Corridor was investigated. BGS borehole record SK95NE1/A and

SK95NE1/B reported groundwater levels to be around 11m below ground level.

9.5.62 The Environment Agency has provided further data on groundwater levels. Three stations in the area provide data on groundwater levels (dipped only) from the past five years.

9.5.63 Thorpe on the Hill monitoring station, located north of the Proposed Development for the Principal Site, reported average groundwater levels of 1.8m below ground level.

9.5.64 Norton Lane Thurlby, located south of the Proposed Development for the Principal Site, reported average groundwater levels of 3.7m below ground level

9.5.65 Coleby station, located north of the Cable Corridor, reported average groundwater levels of 8.2m below ground level.

WFD Groundwater Bodies

9.5.66 The Proposed Development is mostly located within the Anglian (WFD groundwater) Management Catchment. However, the northernmost section of the Principal Site lies within the Humber (WFD groundwater) Management Catchment. The Study Area is underlain by three groundwater water bodies (see also **PEI Report Volume 2, Figure 9-2**):

a. Witham Lias (WFD ID: GB40502G401400);

b. Witham Limestone Unit A (WFD ID: GB40501G444800); and

c. Trent Lower Erewash – Secondary Combined (WFD ID: GB40402G990300).

9.5.67 The Witham Lias (WFD ID: GB40502G401400) generally covers the area west of the A607 from Waddington to William St Hughs and Thorpe on the Hill. It has a surface area of 683km². This has an overall classification of Good (Cycle 3 classification), with an objective of maintaining Good status. The quantitative elements including dependant surface water body status, GWDTE test, saline intrusion and water balance were all classified as Good. The chemical elements including dependant surface water body status, drinking water protected area, GWDTE test, saline intrusion and general chemical test were all classified as Good.

9.5.68 The Witham Limestone Unit A (WFD ID: GB40501G444800) generally covers the area east of the A607 and Waddington and stretches towards the villages of Dunston and Metheringham, as shown on **PEI Report Volume 2 Figure 9-2**. The groundwater body has an overall classification of poor (Cycle 2 classification) with both quantitative elements and chemical status being poor. From 2013-2019 the Quantitative Dependent Surface Water Body Status is designated as Poor, as well as Quantitative Water Balance being Poor between 2015-2016. The General Chemical Test was classified as Poor between the 2013-2019 period. The waterbody has an overall waterbody objective of Poor by 2015 and was not higher due to being disproportionately expensive and technically infeasible. However, the water body has an objective of Good status by 2027 for Quantitative Elements. The

reasons for not achieving Good status are poor nutrient management and groundwater abstraction.

9.5.69 The Trent Lower Erewash – Secondary Combined (WFD ID: GB40402G990300) covers the area at the far west of the Study Area, around the village of Morton and generally west of the A46. The surface area of this WFD is 1924.402km^2 and the groundwater area is 192440.179 ha. This has an overall cycle 3 classification of Good for 2019 for both Quantitative elements and Chemical Status, with an objective of maintaining Good status. The quantitative elements including dependant surface water body status, GWDTE test, saline intrusion and water balance were all classified as good. The chemical elements including dependant surface water body status, drinking water protected area, GWDTE test, saline intrusion and general chemical test were all classified as good. This is following improvements from 2016 where overall water body, chemical status element and chemical dependent surface water body status were classified as Poor due to activity from an abandoned mine.

Source Protection Zones

9.5.70 Groundwater Source Protection Zones (SPZ) are defined zones centred on groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution to the source and surrounding area. The closer the activity to the source, the greater the risk. The SPZs are subdivided into three zones; where Zone 1 is the Inner Protection Zone, Zone 2 is the Outer Protection Zone and Zone 3 is the Total Catchment:

a. SPZ 3 (Total Catchment) is defined as the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

b. SPZ 2 (Outer Catchment) is the area defined by a 400 day travel time from any pollution to the groundwater source.

c. SPZ 1 (Inner Catchment) is defined by 50 day travel time of pollutant to source with a 50 metres default minimum radius.

9.5.71 There is an area of SPZ Zone 3, total catchment, in the area of Boothby Graffoe to Harmston in the northeast of the Study Area. This surrounds an SPZ Zone 2 – Outer Protection Zone located 3.2km from the Site Boundary, which surrounds an SPZ Zone 1 – Inner Source Protection Zone located 6.3km from the Site Boundary Also, there is an SPZ Zone 1 approximately 4.6km east of the A15. This is outside of the Cable Corridor but lies within the Study Area. These relate to abstraction in the Lincolnshire Limestone Principal aquifer (Ref 9-40).

Water Resources

Protected Areas

9.5.72 Within the Study Area there is a Drinking Water Protected Area, which contains land to the east and west of the River Witham. 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 9-72). The Drinking Water Protected Area encompasses the majority of the Principal Site between Bassingham and the A46.

9.5.73 No areas of the Proposed Development are contained within a drinking water safeguard zone for surface water or groundwater. Drinking Water Safeguard Zones are established around public water supplies where additional pollution control measures are needed. (Ref 9-72).

9.5.74 The entirety of the Study Area is contained within the Lower Witham Nitrate Vulnerable Zone (NVZ) (Number S375) and The Fleet Lower Catchment (trib of Trent) NVZ (Number S338). NVZs are areas designated as being at risk from agricultural nitrate pollution. The designations are made in accordance with the Nitrate Pollution Prevention Regulations 2015 (Ref 9-73).

Pollution Incidents

9.5.75 Information on pollution incidents for the period 2018-2023 has been obtained from the Environment Agency. There were 14 incidents in the Study Area in this time period and these are listed in **Table 9-6** and shown in **PEI Report Volume 2, Figure 9-1**. Pollution incidents to water are classified as Category 1 (serious impact) through to Category 4 (no impact). There were no Category 1 or 2 pollution incidents within the Study Area, all the incidents were split between Category 3 (minor) and 4 (no impact). The majority are related to illegal waste disposal.

Water Activity Permits

9.5.76 Information on water activity permits (i.e. discharge consents) has been obtained from the Environment Agency for the Study Area and are listed in **Table 9-7** and shown in **PEI Report Volume 2, Figure 9-1**.

9.5.77 There are 17 water activity permits (i.e. consents for discharge) within the Study Area. The majority of these are related to sewage discharges some of which are for water companies while others are private (non-water company) discharges.

Surface and Ground Water Abstractions

9.5.78 There are three surface water and seven groundwater abstraction licenses located within the Study Area on the basis of information provided by the Environment Agency. These are displayed below in **Table 9-8** and shown in **PEI Report Volume 2, Figure 9-1**.

9.5.79 None of these are located within the Site Boundary. The surface water abstractions are used for trickle and spray irrigation and the groundwater abstractions are predominantly used for spray irrigation and in some cases mineral washing.

9.5.80 Details of PWS in the Study Area were requested from North Kesteven District Council, who confirmed that there are none within the Study Area.

Table 9-6: Pollution Incidents in the Study Area (2018-2023)

Fig 9-1 Reference Code	Notification Date	Location	National Grid Reference	Water - Incident Category	Cause of incident	Pollutant	X	Y
P1	14/04/2018	South Farm	SK 90770 62103	Category 4 (No Impact)	Fly-Tipping	Containers	490770	362103
P2	18/11/2020	Foss Way (Roman Road)	SK 89626 62580	Category 3 (Minor)	Illegal Waste Site	Hydrocarbons	489626	362580
P3	07/08/2020	Scotwater Bridge	SK 88996 58981	Category 4 (No Impact)	Other Authorised Activity	Other Atmospheric Pollutant or Effect	488996	358981
P4	27/05/2020	Bassingham	SK 91464 59890	Category 4 (No Impact)	Storage Tank or Container Failure (Unbunded)	Gas and Fuel Oils	491464	359890
P6	17/09/2020	Coleby	SK 98091 60822	Category 4 (No Impact)	Other Inadequate Control or Containment	Lubricating Oils	498091	360822
P7	18/11/2020	Foss Way (Roman Road)	SK 89626 62580	Category 3 (Minor)	Illegal Waste Site	Solvents	489626	362580
P8	16/05/2018	Haddington	SK 91333 62611	Category 3 (Minor)	Not Identified	Not Identified	491333	362611
P9	18/01/2019	Norton Disney	SK 88910 59167	Category 4 (No Impact)	Burning of Waste	Fumes	488910	359167
P10	21/12/2022	Haddington	SK 91159 63955	Category 4 (No Impact)	Other Unauthorised Activity	Unidentified Oil	491159	363955
P11	11/01/2023	Foss Way (Roman Road)	SK 89341 62523	Category 3 (Minor)	Pipe Failure above ground	Crude Sewage	489341	362523
P12	09/11/2020	Scotwater Bridge	SK 89298 58726	Category 3 (Minor)	Control System Failure	Petrol	489298	358726
P13	07/07/2020	Norton Disney	SK 88703 59492	Category 3 (Minor)	Fly-Tipping	Commercial Waste	488703	359492
P14	03/11/2018	Middle lane, Thorpe on the Hill	SK 90970 65456	Category 4 (No Impact)	Burning of Waste	Smoke	490970	365456
P15	17/08/2019	Hykeham Grange	SK 92072 65251	Category 4 (No Impact)	Other	Other Animal Matter	492072	365251

Table 9-7: Consented discharges (Water Activity Permits) in the Study Area

Fig 9-1 Reference Code	Consent number	Long Name	National Grid Reference	Discharge type	X	Y
D1	ANNNF10345	BASSINGHAM WATER RECYCLING CENTRE	SK9045359920	WwTW/Sewage Treatment Works (water company)	490453	359920
D2	ANNNF10345	BASSINGHAM WATER RECYCLING CENTRE	SK9045359920	WwTW/Sewage Treatment Works (water company)	490453	359920
D3	AW3NF802	BOOTHBY GRAFFOE PS	SK9833059060	Pumping Station on Sewerage Network (water company)	498330	359060
D4	AW3NF824	HALLWATH PUMPING STN	SK9090059940	WwTW/Sewage Treatment Works (water company)	490900	359940
D5	AW3NF827A	NORTON DISNEY PS	SK8918059040	Pumping Station on Sewerage Network (water company)	489180	359040
D6	ANNNF13397	SWINDERBY(EXRAF) STW	SK9063061840	WwTW/Sewage Treatment Works (water company)	490630	361840
D7	EPRGB3097VL	GRANGE FARM COTTAGE	SK9235060027	Domestic property (single) (incl farm house)	492350	360027
D10	EPRJB3790NJ	SWINDERBY QUARRY	SK8844160953	Waste Collection/Treatment/Disposal/Materials Recovery	488441	360953
D11	AW3NFF706	SPS HADDINGTON	SK9180062800	Pumping Station on Sewerage Network (water company)	491800	362800
D12	PR3NF908	THORPE-ON-THE-HILL SERVICE AREA	SK9200065400	Holiday Accom/Camp Site/Caravan Site/Hotel/Hostel	492000	365400
D13	PR3NF907	FILLING STATION AND RESTAURANT	SK9200065300	Shop incl Garden Centre/Retail Trade(not Motor Vehicle)	492000	365300
D14	AW3NFF702	SPS THORPE ON THE HILL	SK9097466042	Pumping Station on Sewerage Network (water company)	490974	366042
D15	AW3NFF703	SPS THORPE ON THE HILL	SK9081865133	Pumping Station on Sewerage Network (water company)	490818	365133
D16	EPRZP3224XR	HOUSHAM WOOD FARM	SK8943364453	Domestic property (single) (incl farm house)	489433	364453
D18	EPREB3894VF	UNITS 1,2 & 3 GREEN MAN FARM	TF0176059190	Domestic property (multiple) (incl farm houses)	501760	359190
D19	EPREB3494AX	GREENMAN CLUBHOUSE	TF0168659108	Making of Machinery/Engine/Pump/Furnace/Tractor	501686	359108
D20	T/69/07294/S	THE COTTAGES	SK8820063200	WwTW (not water co) (not STP at a private premises)	488200	363200

Table 9-8: Abstraction Licenses in the Study Area

Fig 9-1 Reference Code	License Number	Source Type	X	Y
A1	4/30/03/*S/0082	Surface water	493300	361600
A3	AN/030/0003/007	Surface water	489298	358720
A4	AN/030/0003/007	Surface water	491024	361105
G4	AN/030/0003/002	Groundwater	490520	366680
G5	03/28/69/0296/1/R01	Groundwater	487400	365325
G6	4/30/03/*G/0068	Groundwater	488450	365700
G7	4/30/03/*G/0109/R01	Groundwater	489402	365964
G8	4/30/03/*G/0109/R01	Groundwater	489746	365987
G9	4/30/03/*G/0081	Groundwater	491900	365700
G12	4/30/03/*G/0049	Groundwater	488490	361090

G – Groundwater Abstraction, A – Surface Water Abstraction

Flood Risk from all sources

9.5.81 Existing flood risk from all sources for the Principal Site is summarised in **Table 9-9**. Refer to **PEI Report Volume 2, Figure 9-3** for mapping of fluvial flood risk in relation to the Proposed Development, and **PEI Report Volume 2, Figure 9-4** for mapping of surface water flood risk. Full details of flood risk are outlined in **PEI Report Volume 3, Appendix 9-C: Preliminary Flood Risk Assessment** with a brief summary provided in **Table 9-9**.

Table 9-9: Flood Risk from all sources for the Site

Flood Risk Sources	Pre-Development Flood Risk	Comments
Tidal/ Fluvial	Low to High	**Main Rivers:** The majority of the Principal Site and Cable Corridor is located within Flood Zone 1 with areas of Flood Zone 2 and 3 at the extents associated with the Upper Witham and Lower Brant main rivers. Land in Flood Zone 1 is assessed as having less than a 0.1% Annual Exceedance Probability (AEP) of fluvial or tidal flooding. The land in Flood Zone 2 is assessed as having between a 1% and 0.1% AEP of river flooding; or land having between a 0.5% and 0.1% AEP of tidal flooding. Flood Zone 3 is separated into 3a and 3b. The land in Flood Zone 3a is assessed as having a 1% or greater annual probability of fluvial flooding or a 0.5% or greater AEP of tidal flooding. The

Flood Risk Sources	Pre-Development Flood Risk	Comments
		land in Flood Zone 3b is assessed as having a 3.3% or greater AEP of flooding. There are flood defences along the River Witham and River Brant, which are operated and maintained by the Environment Agency to a high standard, such that the flood risk up to an including the return periods noted is considered a low residual risk. The Proposed Development also crosses a significant flood storage area associated with the Lincoln Flood Alleviation Scheme (Witham Washlands Flood Storage Area), see Figure 9-3 (**PEI Report Volume 2, Figure 9-3**). **Ordinary Watercourses:** Various ordinary watercourses and land drains located within the Principal Site extent are present. An area of Flood Zone 2 and 3 is present in the northeast of the Principal Site associated with Mill Dam Dyke. The Principal Site and Cable Corridor do not lie within a tidal flood risk extent.
Surface Water	Low to High	The risk of surface water flooding within the Principal Site and Cable Corridor varies from very low to high. The areas of high risk are likely associated with areas of low topography where surface water sits and pools rather than draining away or show areas at risk of flooding from smaller ordinary watercourses and/or local land drains.
Groundwater	Low	North Kesteven District Council's Strategic Flood Risk Assessment indicates the Principal Site is deemed not to be at risk of groundwater flooding. With regard to the Cable Corridor, no historical groundwater flooding events are mentioned specifically within the North Kesteven Strategic Flood Risk Assessment. However, where the Cable Corridor crosses the River Witham, groundwater may be elevated within the alluvial deposits. There is no risk mapping for groundwater in this area, but as soils are largely impermeable the risk is considered medium, as the bedrock geology would not support large amounts of water storage, such as an aquifer.
Sewers	Low	The Principal Site and Cable Corridor is located in a predominantly rural location, however where the route crosses a highway or in proximity to a settlement there is potential for flooding from sewer sources.
Reservoirs	Low	Environment Agency online mapping shows no artificial sources of flood risk associated within the Site Boundary. Residual Risk is Low.

9.5.82 Main Rivers are defined according to criteria set under the Water Resources Act 1991 (Ref 9-6) as usually larger rivers and streams with a potentially significant flood risk associated with them. There are two Main Rivers within the Study Area, for which the Environment Agency is the regulating authority. These are the River Brant and the River Witham. Other watercourses are Ordinary Watercourses and the LLFA (Lincolnshire County Council) is the regulating authority for these, other than those that are IDB drains.

Future Baseline

9.5.83 The future baseline scenarios are set out in **PEI Report Volume 1, Chapter 5: EIA Methodology and Consultation** and are described below.

Surface Water

9.5.84 Three WFD surface water body catchments identified within the Study Area (Brant Lower Water Body from Brant Upper Water Body to River Witham Water Body, Boultham Catchwater Drain Water Body, Dunston Beck Water Body) have a target of Good by 2024/2027, four (Witham from Cringle Brook to Brant Lower Water Body, South Hykeham Catchwater Water Body, Metheringham Beck Water Body, the Fleet Lower Catchment (tributary of the Trent) Water Body) with a target of Moderate (or maintaining Moderate status) by 2015.

9.5.85 It is likely that through the action of new legislative requirements and ever more stringent planning policy and regulation, that the health of the water environment will continue to improve post-2027. The Environment Act 2021 (Ref 9-1) and the Levelling-Up and Regeneration Act 2023 (Ref 9-19) include measures to tackle storm sewage discharges and set new requirements relating to nutrient (nitrogen and phosphorous) pollution standards, respectively (see Part 7 of the Act). 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.

9.5.86 The current receptor importance criteria presented below in **Table 9-10** is largely based on the presence or absence 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 Proposed Development, 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

9.5.87 The Study Area is underlain by three groundwater water bodies. The Lower Erewash – Secondary Combined WFD Groundwater body and the Witham Lias Trent WFD Groundwater body are both at their objectives of Good Status (2021), and Good Status (2015) respectively. The Witham Limestone

Unit A WFD Groundwater body has an objective of Poor (2015), meaning that there should be no further deterioration from its current position. The importance level of the groundwater feature is based on SPZs, abstractions, and the Principal or other status of the aquifer. Thus, an increase in WFD designation from Poor to Good would not change the importance attributed to the groundwater feature at this stage.

9.5.88 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

9.5.89 Climate change is predicted to alter both future fluvial and pluvial flood risk with changing rainfall intensity, and thus it is important that this is taken into account by the Preliminary FRA **(PEI Report Volume 3, Appendix 9-C)**. Climate change resilience has been accounted for within the Preliminary Surface Water Drainage Strategy **(PEI Report Volume 3, Appendix 9-D**) for the Proposed Development, accommodating current government climate change projections. Refer to the Preliminary FRA **(PEI Report Volume 3, Appendix 9-C)** and Preliminary Surface Water Drainage Strategy **(PEI Report Volume 3, Appendix 9-D)** for further details.

Future Baseline – approximately 2093

9.5.90 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. However, as outlined above, the current receptor importance criteria presented in **Table 9-10**is largely based on the presence or not of various attributes. The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future for surface water or groundwater.

9.5.91 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 Proposed Development 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 Proposed Development. Therefore, no significant adverse changes to current baseline conditions are predicted for the future baseline for decommissioning, assumed to be in 2093 (assumed to be the decommissioning date for the purposes of this assessment based on final commissioning in 2033 and a fixed lifespan of 60 years, as per **PEI Report Volume 1, Chapter 3: The Proposed Development**, and so the impact assessment within this chapter is undertaken against existing baseline conditions. It is noted that changes to the construction period altering the date of start of operation and hence the decommissioning date would not alter this outcome.

Importance of Receptors

9.5.92 **Table 9-10** provides a summary of the water features that may be impacted by the Proposed Development (i.e. there is a source and a possible pathway), a description of their attributes, and states the importance of the water feature as used in this preliminary assessment. Importance is based on the criteria set out in **Table 9-1**. Separate importance classifications are provided for water quality and morphological aspects of waterbodies 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 importance may be high by virtue of supporting protected species or other important potable or socio-economic and recreational uses).

Table 9-10: Importance of identified receptors

Waterbody	Importance
River Brant Lower Water Body	**High importance receptor for water quality** on the basis of being a WFD water body (Brant Lower, WFD ID: GB105030056770) with an estimated Q95 flow of less than 1.0 m^3/s (recorded as 0.007m^3/s). Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution but it has recorded protected species (Spined Loach *Cobitis taenia* in a section within the Study Area, although the most recent record was in 2011. Spined Loach is an Annex II species, and protected through the Conservation of Habitats and Species Regulations 2017. Otter are present and is a protected species. **Low Importance for morphology** due to the heavily modified and straightened nature of the channel.
River Witham	**High importance receptor for water quality** on the basis of being a WFD water body (River Witham from Cringle Brook to confluence with Brant, WFD ID: GB105030056780) with an estimated Q95 flow of less than 1.0m^3/s (recorded as 0.383m^3/s). Water quality monitoring data indicates that the watercourse is under pressure from agricultural pollution but it has recorded protected species (European eel, bullhead, brown trout and barbel). The watercourse is also associated with a Drinking Water Protected Area. Otter and water vole are present and are protected species. **Medium Importance for morphology** due to the heavily modified nature of the channel but showing some signs of features indicative of more natural geomorphological processes.
Boultham Catchment Drain	**High importance receptor for water quality** on the basis of being a WFD water body (Boultham Catchment Drain, WFD ID: GB105030062380) with an estimated Q95 flow of less than 1.0m^3/s. **Low Importance for morphology** due to the heavily modified nature of the channel. Nonetheless the channel

Waterbody	Importance
	itself is over 3km from the Study Area and so there are no morphological impacts to consider.
South Hykeham Catchwater	**High importance receptor for water quality** on the basis of being a WFD water body (South Hykeham Catchwater Water Body, WFD ID: GB105030062460) with an estimated Q95 flow of less than 1.0 m^3/s. **Low Importance for morphology** due to the heavily modified nature of the channel. Nonetheless the channel itself is not located within the Study Area and so there are no morphological impacts to consider.
The Fleet	**High importance receptor for water quality** on the basis of being a WFD water body (The Fleet, WFD ID: GB104028058256) but with an estimated Q95 flow of less than 1.0m^3/s. **Low Importance for morphology** due to the heavily modified nature of the channel. Nonetheless the channel itself is not located within the Study Area and so there are no morphological impacts to consider.
West Brant Syke, Pike Drain, Mill Dam Dyke	As highly modified and often artificial agricultural watercourses and drains, these are **considered low importance water features for water quality**. Furthermore, no species with specific legal protections have been found within any of these watercourses during aquatic survey or desk study. They are also considered **low importance for morphology** as they are generally straight, often dredged, grossly over-deepened trapezoidal ditches lacking hydraulic variation.
Ubiquitous agricultural drains (ordinary watercourses / IDB watercourses)	As highly modified and often artificial, frequently ephemeral agricultural drains and ditches, these are **considered low importance water features for water quality**. Furthermore, no species with specific legal protections have been found within any watercourse during aquatic survey or desk study. They are also considered **low importance for morphology** as they are generally straight, often dredged, grossly over-deepened trapezoidal ditches lacking hydraulic variation.
Sand and Gravel Pit Lakes at Thorpe on the Hill	**High importance for water quality** as they have recreational use for fishing and sailing and include Whisby Nature Park. **Low importance for morphology** as artificial waterbodies derived from quarrying activity.
Groundwater – bedrock aquifers	Scunthorpe Mudstone Group and Charmouth Mustone Group are Secondary aquifers and do support groundwater abstractions and so are considered of **Medium importance**. Lincolnshire Limestone Group is Principal aquifer and so is considered to be of **High importance**. It is also

Waterbody	Importance
	associated with SP3 to the eastern extent of the Cable Corridor.
Groundwater – superficial aquifers	Superficial deposits of Balderton Sand and Gravel Member, Alluvium, River Terrace deposits and Fulbeck sand and gravel member Secondary aquifers and so considered to be of **Medium importance.**

Floodplain Sensitivity for Impact Assessment

9.5.93 For the construction assessment, the key receptors in terms of all forms of flood risk are the construction workers present within the Site, who are considered to be of 'Very High' sensitivity.

9.5.94 For the operational assessment, the importance is based on understanding of the receptors present within areas at risk of flooding and the existing risk of flooding from all sources.

9.5.95 The majority of the Principal Site and Cable Corridor lies in Flood Zone 1 and the risk of fluvial or tidal flooding is low. However, there are areas of Flood Zone 2 and 3 present associated with the River Brant, River Witham and Mill Dam Dyke (see **PEI Report Volume 2, Figure 9-3**). Within these areas, flood risk is considered to be high but flood defences are present which lower the residual risk. These areas at risk of flooding are predominantly agricultural land but also the western extent of Bassingham village.

9.5.96 The criteria described in **Table 9-1** does not provide examples of sensitivity for other forms of flood risk and so the sensitivity is based on the existing baseline risk described earlier in this chapter. For the purpose of this impact assessment the sensitivity of non-fluvial forms of flood risk is as follows:

a. Flooding from surface water – generally very low risk (annual chance of flooding of less than 0.1% AEP) for most of the site, with areas of low (chance of flooding between 0.1% and 1% AEP), medium (chance of flooding between 1% and 3.3% AEP) and high risk (chance of flooding of greater than 3.3% AEP) generally associated with flow pathways following topographic low points including drains and agricultural ditches.

b. Flooding from groundwater – North Kesteven District Council's Strategic Flood Risk Assessment indicates the area the Proposed Development Site is located is deemed not to be at risk of groundwater flooding, and so groundwater flood risk is low for the Principal Site. Where the Cable Corridor crosses the River Witham the risk is considered medium.

c. Flooding from sewers – the Proposed Development is located in a predominantly rural location, however where the route crosses a highway or in proximity to a settlement there is potential for flooding from sewer sources. However, residual risk is Low.

d. Flooding from artificial sources – Environment Agency online mapping shows no artificial sources of flood risk associated within the Proposed Development boundary. Residual risk is Low.

9.5.97 Flood risk sensitivity is discussed further within the Preliminary FRA (**PEI Report Volume 3, Appendix 9-C**).

9.6 Embedded Mitigation Measures

9.6.1 Where practicable, mitigation measures have been incorporated into the Proposed Development design and/or the methodologies for how it shall be constructed. Through iterative assessment, potential impacts have been predicted and opportunities to mitigate them identified with the aim of preventing or reducing impacts as much as practicable. This approach provides the opportunity to prevent or reduce potential adverse impacts from the outset. This embedded mitigation/mitigation by design approach has been taken into account when evaluating the significance of the potential impacts within this preliminary assessment.

Construction and Decommissioning

Framework CEMP

9.6.2 The construction of the Proposed Development will take place in accordance with a Construction Environmental Management Plan (CEMP). The **Framework CEMP** (**PEI Report Volume 3, Appendix 3-A**) details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. It provides the framework for the detailed CEMP, which will be produced post-consent once a contractor is appointed and will be secured through a requirement of the DCO.

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

9.6.4 The **Framework CEMP** will be reviewed, revised and updated as the project progresses to ensure all potential impacts and residual effects are considered and addressed as far as practicable, in keeping with available good practice at that 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).

9.6.5 The **Framework CEMP** will set out standard procedure for the Proposed Development and will describe the principles for the protection of the water environment during construction. The detailed CEMP will be supported by a Water Management Plan (WMP), that will provide greater detail regarding the mitigation to be implemented to protect the water environment from

adverse effects during construction. The potential for adverse impacts would be minimised by the adoption of the general mitigation measures outlined below, which will be described in the WMP and CEMP.

Good Practice Guidance (GPP)

9.6.6 The construction of the Proposed Development will be undertaken in accordance with good practice as detailed below. Where not disapplied through the DCO, temporary and relevant permanent consents/permits would be obtained where necessary, and these are outlined later in the chapter. The principal contractor will comply with any conditions imposed by any relevant permission.

9.6.7 The following relevant GPPs have been released to date on the NetRegs website (Ref 9-90) and are listed below. While these are not regulatory guidance in England where the UK government website outlines regulatory requirements (Ref 9-91), it remains a useful resource for good practice. They are documented in the **Framework CEMP** and secured through the detailed CEMP:

a. GPP 1: Understanding your environmental responsibilities – good environmental practices;
b. GPP 2: Above ground oil storage;
c. GPP 3: Use and design of oil separators in surface water drainage systems;
d. GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer;
e. GPP 5: Works and maintenance in or near water;
f. GPP 6: Working on construction and demolition sites;
g. GPP 8: Safe storage and disposal of used oils;
h. GPP 13: Vehicle washing and cleaning;
i. GPP 19: Vehicles: Service and Repair;
j. GPP 20: Dewatering underground ducts and chambers;
k. GPP 21: Pollution Incident Response Plans;
l. GPP22: Dealing with spills; and
m. GPP26: Safe storage – drums and intermediate bulk containers.

9.6.8 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:

a. PPG7: Safe storage – the safe operation of refuelling facilities (Ref 9-92); and

b. PPG18: Managing fire water and major spillages (Ref 9-93).

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

a. British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works (Ref 9-79)

b. British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites (Ref 9-79);

c. CIRIA (2015) C753 The SuDS Manual (second edition) (Ref 9-27);

d. CIRIA (2023) C811d Environmental good practice on site guide (fifth edition) (Ref 9-80);

e. C648 (2006) Control of water pollution from linear construction projects, technical guidance (Ref 9-81);

f. C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref 9-82);

g. C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors (Ref 9-83); and

h. C736F Containment systems for prevention of pollution (Ref 9-84).

Management of Construction Site Runoff

9.6.10 Mitigation measures are described in detail below, which are also included in the **Framework CEMP** (**PEI Report Volume 3, Appendix 3-A)** and would be adhered to during the construction phase of the Proposed Development. These measures apply equally to all components of the Proposed Development.

9.6.11 The measures outlined below, will be required for the management of fine particulates in surface water runoff as a result of the Proposed Development construction activities:

a. All reasonably practicable measures will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse, arising from construction activities. The measures will accord with the principles set out in industry guidelines including the CIRIA report 'C532: Control of water pollution from construction sites' (Ref 9-83) and CIRIA report ‘C648 Control of water pollution from linear construction sites’ (Ref 9-81). Measures may include use and maintenance of temporary lagoons, tanks, bunds and fabric silt fences or silt screens as well as consideration of the type of plant used etc.;

b. A temporary drainage system will be developed to prevent runoff contaminated with fine particulates from entering surface water drains without treatment. This will include identifying all land drains and water features in the Site Boundary and ensuring that they are adequately protected using drain covers, sand bags, earth bunds, geotextile silt

fences, straw bales, or proprietary treatment (e.g. lamella clarifiers). Any land drains damaged during the works would be reinstated as required;

c. Where practical, earthworks will be undertaken during the drier months of the year. When undertaking earth moving works periods of very wet weather will be avoided, where practical, 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;

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

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

f. Construction site runoff will either be treated on site and discharged under a Water Discharge Activity Permit from the Environment Agency to Controlled Waters (potentially also including infiltration to ground) or to the nearest public sewer with sufficient capacity for treatment following discussions with Anglian Water, or removed from site for disposal at an appropriate and licensed waste facility;

g. Equipment and plant are to be washed out and cleaned in designated areas within the Proposed Development construction compound where runoff can be isolated for treatment before disposal as outlined above;

h. 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;

i. 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; and

j. Should the use of herbicide or other spray chemical be required, a method statement, operating procedure or similar will be prepared prior to the work commencing. This will include measures to protect ground and surface water, including that such work would not be undertaken during or before rainfall and high winds where practicable. Such work will only be carried out by competent personnel using products approved for UK use with adherence to manufacturer's instructions; and

k. 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 sampling, and reviews of the Environment Agency's automatic water quality monitoring network.

Management of Spillage Risk

9.6.12 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 are secured in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** and will be adopted during the construction works:

a. Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002 (Ref 9-13), and the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 9-12). Particular care will be taken with the delivery and use of concrete and cement as it is highly corrosive and alkaline;

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

c. Any plant, machinery or vehicles will be inspected before every use and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off site if practicable or, if on site, only at designated areas within the Proposed Development 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;

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

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

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

g. All fixed plant used on the Site will be self-bunded;

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

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

j. The Site will be secure to prevent any vandalism that could lead to a pollution incident;

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

l. Surface water drains on public roads trafficked by plant or within the construction 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;

m. Where practicable, concrete mixing and washing down of mixing plant is to be carried out by the suppliers and away from the Site. Should on-site concrete washout be required, suitable facilities (e.g. geotextile wrapped sealed skip placed within a bunded area or specialist mobile concrete washout facility) will be provided to ensure that the high alkalinity wash water is adequately contained and prevented from entering surface or groundwater. Wash water will be removed from the Site for appropriate disposal at a suitably licenced waste facility. Concrete washout is prohibited within a minimum of 20m of any body of water, including ditches and ponds, or surface water drains, and within 5m of a foul drain. Where practical, this will increase to 50m; and

n. Water quality monitoring of potentially impacted watercourses will be undertaken to ensure that pollution events can be detected against baseline conditions and can be dealt with effectively. Full monitoring details would be outlined in the detailed CEMP.

Management of Flood Risk

9.6.13 The **Framework CEMP** (**PEI Report Volume 3, Appendix 3-A)** incorporates measures to prevent an increase in flood risk or pollution during the construction works, in addition to the provision of temporary settlement and drainage measures as detailed above.

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

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

a. Topsoil and other construction materials will be stored outside of the 1 in 100 year floodplain extent where feasible. If areas located within Flood Zone 2/3 are to be utilised for the storage of construction materials, this would be done in accordance with the applicable flood risk activity regulations, if required;

b. Connectivity will be maintained between the floodplain and the adjacent watercourses, with no changes in ground levels within the floodplain as far as practicable;

c. During the construction phase, the contractor will monitor weather forecasts on a monthly, weekly and daily basis, and plan works accordingly. For example, works in the channel of any watercourse will be avoided or halted were there to be a significant risk of high flows or flooding; and

d. 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.

9.6.16 The contractor will be required to produce an Emergency Response Plan following receipt of DCO consent and prior to construction, which will provide details of the response to an impending flood and include:

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

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

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

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

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

f. If water is encountered during below ground construction, suitable de-watering 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 9-6) and the Environmental Permitting Regulations (2016) (Ref 9-10); and

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

Grid Connection Cable and Onsite Cables: Overview

9.6.17 It is proposed that the electricity generated by the Proposed Development is expected to be exported via a 400kV connection between the Onsite Substation and a proposed National Grid 400kV substation in the Navenby Area. The cabling will be installed underground. Further feasibility studies and options appraisals are to be undertaken to determine the exact routeing and installation method for the cable.

9.6.18 The Grid Connection Cable will be installed using an open trench method requiring a 30m to 40m working width, with trench widths approximately 3m wide and up to 3m deep.

9.6.19 Low voltage cabling between PV panels and the inverters (typically via 1.5/1.8kV cables) will typically be located above ground level (along a row of racks), fixed to the mounting structure, and then underground (between racks and in the central inverter's and or transformer input). Medium voltage cables (around 33kV) are required between the transformers, switchgear and the Onsite Substation. These buried interconnecting cables will be located within the Solar PV Array Areas and within the Interconnecting Cable Corridors between the Solar PV Array Areas. The trench will typically be up to 1m wide with a maximum depth of 1.2m and will be dependent on the method of installation, ground conditions and number of cables laid in parallel.

Trenchless Crossings – River Witham and River Brant (Horizontal Directional Drill)

9.6.20 It is proposed to install the Grid Connection Cable beneath the River Brant and a section of the Interconnecting Cabling beneath the River Witham using underground techniques such as horizontal directional drilling beneath the bed of the channel. Indicative locations at this stage are NGR SK 91183 62349 for the River Witham and NGR SK 94314 60111 for the River Brant.

9.6.21 The cable would be installed a minimum of 5m beneath the bed in each case. A maximum depth would be finalised based on site specific risk assessment at each crossing location in order to minimise groundwater interactions where practicable. Information will be sought from the Environment Agency on the construction details of the flood defence embankments that may need to be crossed to inform the drilling approach for directional drilling beneath the Rivers Brant and Witham and associated flood defences. There will be a minimum 16m buffer between HDD send or receive pits from the landward toe of flood defences. Furthermore, in the case of the River Witham this distance is to be increased to 100m due to the presence of a potential Otter holt.

9.6.22 In addition to the control and management measures for site runoff and spillage risk noted above, the methodology of the drilling, or other trenchless techniques, would include measures to minimise the risk to the environment. There are risks associated with the use of drilling muds and plant close to the channel. For example, although rare, without due care there is a risk that drilling muds can 'break out' into watercourses leading to pollution (known as 'hydraulic fracture' or 'frac-out'). A site-specific Hydraulic Fracture Risk Assessment would be developed prior to construction following further investigation of specific ground conditions at the crossing locations, and appropriate mitigation developed in line with best construction practice.

9.6.23 There is also a need to manage drilling muds and wastewater so that this will not be spilt into the channel when working close to the banks of a watercourse. The requirement for a Hydraulic Fracture Risk Assessment is included in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** and will be secured through a requirement of the DCO.

9.6.24 Directional drilling, or other trenchless techniques, would be undertaken by a specialist contractor and the water column above the drill path would be

continuously monitored during drilling. It is acknowledged that drill fluid leakage into a watercourse is not a common problem, particularly given the proposed depths. However, where there is an increased perceived risk (i.e. lack of drilling mud returns) the drilling/boring operation would be suspended, remediation action implemented, and subsequently the methodology for that crossing re-evaluated.

9.6.25 The drill fluids used within the drilling machine would be water based, such as naturally occurring bentonite clay. The fluid component of the drilling mud would be mains water, obtained from a nearby supply and tankered to site when required. There would be some recycling of drilling muds by the drilling plant used.

9.6.26 The bentonite within the drilling fluid enables the fluid to have sufficient viscosity to carry the cutting chips back to the surface machine whilst lubricating and cooling the drilling bit. The drilling fluid that returns to the drilling rig would be recycled within that drilling rig. Any wastewater/drilling products that are not recycled will be stored and removed from the Site by a suitable waste management contractor and disposed of at a licenced wastewater facility.

9.6.27 The sections of the cables that will be installed via trenchless approaches will require send and receive pits to be installed at each crossing point.

9.6.28 The send and receive pit excavations for drilling/boring will be located at least 10m from the watercourse edge, as measured from the top of bank (or 16m from the landward toe of flood defences or 100m for the River Witham where the potential otter holt is located). This may require survey work (prior to construction) in some locations to adequately define and agree the top of bank position with the Environment Agency.

9.6.29 The exact dimensions of the send and receive pits would be determined by site and ground conditions but will be kept to a safe minimum in terms of length, width and depth. Maximum parameters considered here as a worst case are dimensions of 8m length x 4m width x 1m depth. A shoring system appropriate to the ground conditions will be used as appropriate to minimise water ingress into the pits. The ingress of any groundwater will be carefully managed through design of the send or receive pit, shoring method, and a pumping and treatment system. Excessive ingress of water would make the pit unsafe and thus it is important that ingress is minimised and that a suitable system of managing that water is implemented.

9.6.30 Once the cable is installed beneath the watercourse the pits and any cable trenches will be backfilled to the original ground level and seeded to reduce the risk of runoff and fine sediments entering the watercourse.

Grid Connection Cable, Interconnecting Cables and Onsite Cabling: Management of Risk to Morphology of Watercourses

9.6.31 The Grid Connection Cable, Interconnecting Cable and Onsite Cabling would require a number of watercourse crossings. With the exception of the River Brant and River Witham, all crossings are currently assumed to use intrusive open-cut techniques for cable installation as a worst case.

9.6.32 Based on the Cable Corridor boundary, there would be expected to be four watercourse crossings required. For the Onsite Cabling, three indicative locations for watercourse crossings have been identified at this stage. These are listed in **Table 9-11** and shown in **PEI Report Volume 2, Figure 9-1**. Crossing locations will be revisited prior to the DCO application and any revisions would be presented in the ES.

Table 9-11: Indicative watercourse crossing locations for cables

Watercourse Crossing Points	Proposed Development Section	WFD Catchment	NGR
B3 – crossing of drainage ditch	Onsite Cabling (indicative) – Principal Site	Boultham Catchwater Drain Water Body	SK 90114 64614
B4 - crossing of drainage ditch	Onsite Cabling (indicative) – Principal Site	Boultham Catchwater Drain Water Body	SK 89577 64481
WC1 – crossing of drainage ditch	Cable Corridor (indicative location)	Witham - conf Cringle Bk to conf Brant Water Body	SK 92114 61598
WC12 – crossing of drainage ditch	Onsite Cabling (indicative) – Principal Site	Witham - conf Cringle Bk to conf Brant Water Body	SK 91107 62453
BL5 – crossing of drainage ditch	Cable Corridor (indicative location)	Brant - Lower Water Body	SK 93905 60339
BL6 – crossing of drainage ditch	Cable Corridor (indicative location)	Brant - Lower Water Body	SK 93557 60588
BL7 – crossing of drainage ditch	Cable Corridor (indicative location)	Brant - Lower Water Body	SK 92780 60914

9.6.33 This will be subject to further refinement of the Proposed Development design post-consent and the number of crossings will be minimised where practicable. All of the potential crossings outlined in **Table 9-11** are agricultural drains and ditches, with many being ephemeral.

9.6.34 In each case, a Pre-works Riparian and Morphology Survey of the channel of the watercourse to be crossed will be undertaken prior to construction. This would be within the area to be crossed as determined at detailed design. 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.

9.6.35 At this stage it is assumed that where open-cut crossings are required that a maximum channel length of 5m would be impacted. Water flow would be maintained by damming and over-pumping or fluming. Works will be carried out in the drier months where practicable 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 will 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 secured in the WMP (via the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)**.

Access Track Crossings of Watercourses

9.6.36 Access tracks will be constructed across the Proposed Development Site. These would typically be 5m wide with passing bays provided as required. Initially at each of the main access points, access tracks would be required to be 6m wide on approach to the construction compounds to facilitate two-way Heavy Goods Vehicle (HGV) traffic. The internal access tracks will likely be constructed of compacted stone or gravel with excavation kept to a minimum, or for secondary tracks left as grass. Where drainage is required a ditch or a swale may be located downhill of the internal access track to control any potential for surface water run-off.

9.6.37 The access tracks will adhere to the appropriate 10m buffer from water features, except where crossings are required.

9.6.38 The Proposed Development layout has been designed to avoid new drainage ditch and watercourse crossings where practicable. **Table 9-12** lists the eight crossings that are expected to be required. The indicative locations are also shown in **PEI Report Volume 2, Figure 9-1**.

Table 9-12: Indicative watercourse crossing locations for access tracks

Watercourse Crossing Points	WFD Catchment	NGR
B1 – drainage ditch	Boultham Catchwater Drain Water Body	SK 90234 64503
B2 – drainage ditch	Boultham Catchwater Drain Water Body	SK 90791 64675
WC2- drainage ditch	Witham - conf Cringle Bk to conf Brant Water Body	SK 91672 61845
WC3 – drainage ditch	Witham - conf Cringle Bk to conf Brant Water Body	SK 91566 61781
WC9 – drainage ditch	Witham - conf Cringle Bk to conf Brant Water Body	SK 90029 61470

Watercourse Crossing Points	WFD Catchment	NGR
WC10 – drainage ditch	Witham - conf Cringle Bk to conf Brant Water Body	SK 90463 62552
WC11 – drainage ditch	Witham - conf Cringle Bk to conf Brant Water Body	SK 90437 62706
BL7 – drainage ditch	Brant - Lower Water Body	SK 92623 60624

9.6.39 Where existing crossings are to be used, it is assumed as a worst case that some degree of strengthening or improvement of the structures may be required (which may require minor widening). Where such upgrades are required, they are assumed to be a maximum extension to the structure width of 2m. Where a new drainage ditch crossing is required, the preference would be to use an open span bridge crossing, with the specific type of crossing selected being determined based on site specific factors and in consultation with the relevant authority (generally the IDB/LLFA). Where open-span crossings are used, bridge foundations would be set back from the edge of the channel. However, at this stage the structures proposed to be used across the Site for watercourse crossings is yet to be confirmed. As such, as a worst case it is assumed that crossings would require new culverts.

9.6.40 Where new culvert structures are required (assumed as a worst case), this will follow environmentally sensitive design features (e.g. arch rather than box culverts, and box culverts in preference to pipes). The maximum width would be 6m to allow sufficient width for the access tracks. The crossings will be sized at detailed design in order to not impact on flow conveyance and be sized to ensure capacity for the peak flow rate. The culvert inverts will be buried below the natural bed level to allow for natural bed formation and passage of sediments, typically at least 0.3m. Where arch culverts are not provided, it has been assumed that the design of the structure will allow for a naturalised bed to be formed through the structure. There is varying guidance as to what minimum depth is required, but there are also design considerations. Therefore, this will be considered at detailed design stage (post consent).

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

9.6.42 Where new culverts are required, length-for-length watercourse enhancements are required in each case to mitigate the impacts, and to ensure compliance against WFD objectives (see **PEI Report Volume 3, Appendix 9-B Water Framework Directive Screening**). This length-for-length watercourse enhancement also applies to culvert extensions, and the requirements will be outlined in a WFD Mitigation and Enhancement Strategy (to be produced post consent).

9.6.43 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 culvert capacity or span and soffit height of any open span bridge works to ensure no increase in flood risk.

9.6.44 As with intrusive cable installation, it is assumed that during installation works flow would be maintained by damming and over pumping.

Operation (and Maintenance)

Design

9.6.45 Detailed information on the Proposed Development design and infrastructure is provided in **PEI Report Volume 1, Chapter 3: The Proposed Development**.

9.6.46 All infrastructure will be off set from watercourses by 10m (except where crossings are required). For small channel watercourses/agricultural drainage channels this would be measured from the top of bank as required by IDBs. This will likely require survey which will be undertaken post-consent to reflect the detailed design. For larger watercourses with channel widths typically greater than 3m (such as the River Ouse and River Derwent), this would be measured from the water's edge / channel extents under normal flow conditions.

9.6.47 Indicative foundation depths and types associated with the development include typical depths as follows:

a. **Solar PV foundations** will typically be galvanised steel piles driven or screwed into the ground. Indicative maximum depth of 2m for south facing fixed strings and indicative maximum depth of 4m for single axis tracker strings depending upon ground conditions and subject to archaeological and geotechnical surveys. In archaeologically sensitive areas solar PV panels may be mounted on concrete blocks, subject to further archaeological investigation and agreement with the relevant stakeholders.

b. **BESS and BESS battery containers** – foundations would consist of a concrete base or monolith plinth with a maximum depth of 1m.

c. **Onsite cabling** – maximum trench dimensions to be 0.8–1.2m depth, and 1.2–5m wide depending on the number of circuits within the trench. Greater depth would be required when drilled beneath the River Witham (>5m depth from the bed of the channel).

d. **Grid connection cable** - for open trench excavation, up to 2.5m below ground level subject to design and ground conditions, with a minimum cover of 0.9m for the cable. For horizontal directional drilling, a minimum 5m depth under watercourses subject to design and ground conditions.

e. **Control building and office**– maximum foundation depth of 2m.

f. **Access tracks** - the internal access tracks will likely be constructed of compacted stone or gravel with excavation kept to a minimum, or for secondary tracks left as grass.

g. **Onsite Substation, Solar Station, Inverters, Transformers, Switchgear Enclosures** – assumed maximum depth of 2m. This will be confirmed at the ES stage.

Preliminary Surface Water Drainage Strategy

9.6.48 A **Preliminary Surface Water Drainage Strategy** has been prepared and is included within **PEI Report Volume 3, Appendix 9-D**. This Preliminary Surface Water Drainage Strategy will provide attenuation of surface water runoff from the Proposed Development, whilst minimising flood risk to the Proposed Development and surrounding areas. In accordance with planning policy guidance (as outlined in **PEI Report Volume 3, Appendix 9-A**), runoff from the Proposed Development will be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water.

9.6.49 Individual solar PV panels will be held above the ground surface on mounting structures. This prevents sealing the ground with an impermeable surface beneath the solar panels, allowing rainfall/runoff to infiltrate to ground throughout the Principal Site. The Solar PV Panels are on tracker systems, as they track, they will direct any rainwater to different areas of ground. As a result, it is considered that the impermeable area within solar PV panel areas will remain substantively consistent to its pre-development state.

9.6.50 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.

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

9.6.52 Attenuation in the form of swales has been incorporated to control any increase in the rate of flow towards the receiving watercourses. The rate of runoff from each location across the Principal Site will ensure nil detriment in terms of no increase in runoff rate from the Proposed Development to receiving watercourses.

9.6.53 The **Preliminary Surface Water Drainage Strategy (PEI Report Volume 3, Appendix 9-D**) allows for 100% of the total area for the BESS and Solar Station Compound areas, solar farm control centre, equipment storage and onsite substation within the Principal Site to be impermeable. Increases to existing runoff will be balanced by swales to encourage natural infiltration.

9.6.54 The drainage system for new impermeable areas has been designed to accommodate the 1 in 100-year storm, plus a 40% allowance for an increase in peak rainfall intensity due to climate change. For an extreme storm event in advance of this, any exceedance flows that cannot be retained by the proposed attenuation will flow overland, following the existing topography, where ultimately, they will be contained within the perimeter swales, or discharge to the nearest watercourse as the existing flow paths convey at present.

9.6.55 The solar PV panel areas are to be treated as Greenfield runoff, as existing, i.e. permeable, with nil detriment to existing surface water runoff rates and volumes.

9.6.56 New access tracks will be permeable, in accordance with paragraph 2.10.85 from the NPS EN-3 (Ref 9-17). Therefore, the new internal access tracks will not lead to an increase in impermeable area. The drainage regime of the access roads is therefore assumed to remain consistent with its predeveloped agricultural land use.

9.6.57 Transformers will be installed with suitable bunds to contain any oil spillage in case of an oil-leakage event. Bunds will be designed to contain at least 110% of the volume of the oil to ensure there is some tolerance to prevent breaching of the bund. Under normal conditions any rainwater collected within the bund will be removed by use of special pump, which automatically switches off if it detects the smallest presence of oil in the water. Pumps will be linked to control and monitoring equipment to raise alarms if oil is detected.

9.6.58 No drainage design is proposed for the Cable Corridor during operation, as the Cable Corridor is not deemed to contribute any additional runoff due to the cables being buried below ground.

9.6.59 It is important that there is a requirement for 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 practicable. The maintenance and monitoring requirement for the drainage system will be secured via the Drainage Strategy submitted with the DCO application.

Drainage Outfalls

9.6.60 Where practicable, surface water will drain from the Proposed Development's swale-based drainage system to local receiving watercourses via a new ditch, as this avoids the need to construct an engineered outfall. If engineered outfalls are required, any additional impacts will need to be assessed at ES stage. 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.

Fire Water Runoff

9.6.61 The BESS areas require fire water tanks to supress a fire, should one break out. The BESS containers will contain an internal fire suppression system, with a sump to contain any water used in the event of an internal fire. This water will not be directed to the surrounding swales.

9.6.62 It is proposed to contain the external fire water runoff within the swale surrounding the BESS areas, where it can be held and tested before either being released into the environment (if found to have no contaminants present, or contaminants that are within acceptable legal limits) or taken off site by a tanker for treatment elsewhere. The swale will then be cleaned of all contaminants. A Framework BSMP will be submitted with the DCO application and will discuss fire management in more detail.

9.6.63 The swale will be underlain with an impermeable liner to prevent any contaminants entering the ground. The swale will be controlled by a penstock valve that can be closed before a fire is put out. The penstock valves will be located in proximity to the access road so they can be easily reached in the event of a fire. They will also be located to the west of the BESS and Onsite Substation wherever practicable to reduce the potential of their operation being affected by the prevailing wind conditions directing a potential fire towards the penstock.

9.6.64 National Fire Chiefs Council (NFCC) guidance ("Grid Scale Battery Energy Storage System planning – Guidance for Fire and Rescue Services", 2022, (Ref 9-94) has been used to determine the volume storage of fire water runoff. The NFCC guidance states firefighting supplies '*should be capable of delivering no less than 1,900 litres per minute for at least 2 hours*'. On top of this supply requirement, a 30% additional capacity has been applied for storage in the swale. This equates to approximately 300m^3. It should be noted that the 300m^3 storage is required for each group of BESS (i.e. 300m^3 will be required if there is one BESS container on its own or several BESS grouped together). This is based on the likely scenario that, in the unlikely event of a fire, only one BESS would be on fire at the any given time.

9.6.65 By using the swale for fire water storage as well as surface water storage, there is the potential that, in the event of a fire, the swale may already contain surface water and reduce the capacity for fire water storage. Therefore, the swale should be sized to serve both purposes. It is considered overly conservative to provide the required fire water storage on top of the 1 in 100 year + 40% storage already provided, as it is extremely unlikely a fire will occur at the same time as the 1 in 100 year event. Therefore, taking a pragmatic approach, an allowance has been made that a 1 in 2 year event could occur at the same time as a fire. Therefore, the swale will need to contain the 1 in 2 year event plus the fire water storage runoff or

the 1 in 100 year + 40% event on its own, whichever is greater (thereby providing for the worst case scenario).

9.6.66 Further detail on storage volumes are provided in the **Preliminary Surface Water Drainage Strategy** (**PEI Report Volume 3, Appendix 9-D**). The volume requirements for containment of fire water runoff within the swale and its configuration are subject to agreement with the Local Fire and Rescue Service.

Operational Panel Cleaning

9.6.67 The cleaning requirements for the Proposed Development can only be accurately determined once operational, therefore, to present a reasonable worst case for the assessment, a two-year cleaning cycle is assumed.

9.6.68 It is assumed that a tractor mounted system (currently the system typically used on UK solar farms) will be used. A tractor mounted cleaning system uses a rotating 'car-wash' type brush. It is anticipated that water would be brought to site in 1 m^3 (one tonne/1,000 litres (l)) IBCs. Individual IBCs would be mounted on the rear of the tractor to provide water supply during cleaning. Based upon cleaning water usage on similar schemes it is estimated that the cleaning of each panel will require 250 millilitres (ml) of water and that, assuming cleaning of all panels is required, the total volume of cleaning water per cleaning cycle would be 200,000 litres (200 m^3). As the use of cleaning products (chemicals) can damage panels and void manufacturer's warranties no cleaning products would be used, only water. If required, a water softener would be added to prevent wash-residue forming on the panels, this would be biodegradable and would have no impact to the environment.

Weed Management

9.6.69 With regard to weed management, the Applicant has identified options for the management of the grassland created within the solar farm. This includes management by grazing and/or by mowing/strimming.

9.6.70 Where mowing/strimming is required, as a worst case there may be localised use of herbicide or other spray chemical in small volumes. Should this be required, a method statement, operating procedure or similar will be prepared prior to the work commencing, this will include measures to protect ground and surface water, including working in dry weather and not in high winds, and maintaining appropriate buffers from watercourses. Application of chemicals would only be carried out by suitably competent personnel using products approved for UK use with adherence to manufacturer's instructions. This mitigation would be secured through the Framework Operational Environmental Management Plan (OEMP) within the DCO application.

Permits and Consents

9.6.71 Various water-related permissions may be required where it is not agreed with the relevant regulating authority to disapply them through the DCO.

9.6.72 These permissions may include:

a. Land drainage consent(s) under section 23 of the Land Drainage Act 1991 (Ref 9-5) for works affecting the flow in Ordinary Watercourses;

b. Flood risk activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref 9-10) in connection with watercourse crossings and drainage outfall installation;

c. Water activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref 9-10) for temporary construction and permanent operational discharges;

d. Trade effluent consent under the Water Industry Act 1991 (Ref 9-95) for the purposes of discharging trade effluent from welfare facilities during construction;

e. Full or temporary water abstraction licence(s) under section 24 of the Water Resources Act 1991 (Ref 9-6) (if more than 20 m^3/d is to be dewatered/over-pumped and exemptions do not apply) – see further detail below;

f. Temporary water impoundment licence under section 25 of the Water Resources Act 1991 (Ref 9-6) in connection with the laying of cables; and

g. Under IDB byelaws, prior written consent (outside of the planning process) is needed for certain works that may affect IDB watercourses such as any works within the channel or any drainage into an IDB watercourse.

9.6.73 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 entry and exit 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’.

Decommissioning

9.6.74 The design life of the Proposed Development is expected to be at least 60 years, although the operational life could be longer than this; the condition of equipment will be reviewed at the end of the anticipated design life to determine whether it remains in a viable condition to continue operation after that time. Decommissioning is expected to take between 24 and 30 months and would be undertaken in phases.

9.6.75 When the operational phase ends, the Principal Site will require decommissioning. All PV modules, mounting poles, inverters and transformers would be removed and recycled or disposed of in accordance

with good practice and market conditions at the time. Buried medium voltage cables would either be removed or left in situ. The Principal Site would be returned to the landowner after decommissioning and will be available for its original use and any planting would be retained.

9.6.76 A Framework DEMP will be prepared and submitted with the ES. This will set out the general principles to be followed in the decommissioning of the Proposed Development. A detailed DEMP will be prepared and agreed with the relevant authorities at that time of decommissioning, in advance of the commencement of decommissioning works, and would include timescales and transportation methods.

9.7 Preliminary Assessment of Effects

9.7.1 Taking into account the embedded mitigation measures as detailed in **Section 9.6** above, the potential impacts and effects of the Proposed Development was assessed using the methodology as detailed in **Section 9.4** of this Chapter.

Construction (2031 to 2033)

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

a. Pollution of surface water or groundwater (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 or piling;

b. Temporary impacts on the hydromorphology of watercourses (e.g. from open-cut watercourse crossings and temporary vehicle access crossings as may be required). Temporary access from vehicles has been assessed as part of the overall construction activities taking place;

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

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

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

9.7.3 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 current available information is not sufficient to undertake a full water feature specific assessment at this stage.

Surface Water Features – Water Quality

9.7.4 The Principal Site is located predominantly in the catchments of the River Witham, River Brant and the Fleet (all of which are WFD water bodies). A crossing of the River Witham is required for the Onsite Cabling and the River Brant for the Grid Connection Cable. These cables would be installed using a trenchless approach. There would also be numerous intrusive crossings of the various drains and ditches for Onsite Cabling, the Grid Connection Cable and for access tracks (as outlined in Section 9.6).

9.7.5 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.

9.7.6 Construction works within, along the banks of, 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.

9.7.7 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).

9.7.8 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.

9.7.9 The majority of construction works across the Principal Site are set back from watercourses and on relatively flat topography. The Proposed Development design includes a 10m buffer around all watercourses and ponds. With the exception of watercourse cable crossings and access track crossings (and potentially drainage outfalls) there will be no further requirement to work in immediate proximity to watercourses or ponds. As such, the water pollution risk to watercourses within the Study Area from general construction activities is considered to be low. The greater risks of adverse impacts are where direct works are required within a watercourse or works in very close proximity for specific activities (such as cable crossings).

9.7.10 As stated in the assumptions (Section 9.4), it is currently assumed that with the exception of the River Brant and River Witham that all watercourses that

need to be crossed by cabling will be done so using open-cut, intrusive techniques. As outlined in Section 9.6 these crossings are all of the ditches and drains, and there are seven locations in total (to be confirmed at ES stage). The use of an open-cut approach is a precautionary, worst-case assumption for the purposes of this initial assessment, while final crossing approaches will be informed by site specific conditions. Where these crossings are required, there would be unavoidable works within the channel, with potential for adverse water quality impacts requirement mitigation.

Trenchless Crossings for Cable Installation

9.7.11 Where trenchless approaches (such as HDD) are to be used for the River Witham and River Brant cable crossings, the send and receiving pits would be no closer than 10m from the water/channel edge (or 16m from the landward toe of flood defences where present or 100m for the River Witham where there is a potential Otter holt). Despite this buffer, there remains a risk of sediment mobilisation in runoff and for chemical spillages to occur that could enter the channel if not managed accordingly. These mitigation requirements will be outlined in a WMP that will be produced as part of the detailed CEMP after consent and prior to construction. 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, as outlined in Section 9.6.

9.7.12 There is also a chance of 'frac-out' events (i.e. hydraulic fluid break out) from drilling if not appropriately mitigated for site specific conditions. To manage this risk a site-specific Hydraulic Fracture Risk Assessment will be produced prior to commencing works to define the mitigation required based on specific local ground conditions.

9.7.13 Given the non-intrusive nature of the works and the mitigation that will be in place, the risk to water quality of the River Witham and River Brant is considered to be low and a short term, temporary negligible adverse impact is predicted. For these high importance receptors this would result in a **slight adverse impact (not significant)**.

Intrusive Crossings for Cable Installation

9.7.14 Seven intrusive open-cut crossings are currently assumed to be required for the Cable Corridor and Onsite Cabling (as outlined in **Table 9-11**). These watercourses will require unavoidable works within the channel, with potential for adverse water quality impacts. It is also assumed at this stage that a maximum channel length of 5m would be affected in each case. For intrusive cable installation, a dry working environment would be created thus creating a barrier for contamination of the watercourses, although it will also be necessary to maintain a flow downstream. This would be achieved by temporarily damming and over pumping. Works will be carried out in the drier months where practicable when flows are likely to be lower and easier to manage across the dry working area, thus reducing the risk of sediment mobilisation and pollution occurring. Silt fences, geotextile matting or straw bales or other similar method would be used initially once the channel is

reinstated to filter the flow and capture mobilised sediments until the watercourse has returned to a settled state. Affected banks will be protected with suitable biodegradable matting to protect them from erosion until vegetation re-establishes. Water quality monitoring will be undertaken prior to, during, and following on from the construction activity. These requirements will be described in the WMP (appendix to the detailed CEMP).

9.7.15 There would be a risk of sediment disturbance when trenching through the channel, reinstating the channel bed, and when working on the adjacent banks. There also remains potential for construction runoff and spillages to enter the watercourse given the direct nature of the work. However, given implementation of good practice measures as outlined in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** and the WMP (that will accompany the detailed CEMP), this would be a temporary and localised minor adverse impact in terms of water quality. For the low importance watercourses affected (crossing of unnamed ditches at B3, B4, WC1, W12, BL5, BL6 and BL7 as shown in **PEI Report Volume 2, Figure 9-1**) this would result in a **slight adverse effect (not significant)**.

Access Track Crossings of Watercourses

9.7.16 A total of eight watercourse crossings for access tracks have been identified across the Proposed Development at this stage (see **Table 9-13**). While open span crossings are preferred, at this stage the use of culverts are assumed as a worst case, with culvert parameters outlined in Section 9.6. A maximum length of 6m is currently assumed. Where these culverts are required there would be an unavoidable need to work directly within the watercourse channel in each case, and therefore for mobilisation of sediment directly in the channel or for accidental spillages to occur. However, good practice mitigation measures as outlined in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** and WMP (that will accompany the detailed CEMP) would be implemented.

9.7.17 In most cases, the ditches and drains that are likely to be affected by the proposed works across the Principal Site are ephemeral/intermittently flowing. When visited during the site survey in October 2023 they were dry in many cases or had ponded standing water that was not flowing. Nevertheless, some of these drains are known to flow and carry significant amounts of water at certain times of the year. If the works occur when flowing there is potential for adverse water quality impacts from runoff containing fine sediments and chemical spillages relating to use of plant adjacent to and within the watercourses.

9.7.18 To mitigate this, works will be carried out in the drier months where practicable as this would reduce the risk of pollution propagating downstream, particularly in the case of ephemeral watercourses. However, this may not be possible, thus as with intrusive cable crossings, a dry working area would be established by damming and over pumping around the cable or structure installation, with reconnection only made once the works are complete. Silt fences, geotextile matting or straw bales or other similar method would be used initially once the channel is reinstated to filter the flow and capture mobilised sediments until the watercourse has returned

to a settled state. Affected banks will be protected with suitable biodegradable matting to protect them from erosion until vegetation re-establishes. It will be a requirement that the watercourses are reinstated as found around each cable or structure crossing and water quality monitoring will be undertaken prior to, during, and following on from the construction activity. These requirements will be defined in the WMP.

9.7.19 Given implementation of good practice measures as outlined in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** and the WMP (that will accompany the detailed CEMP), this would be a temporary and localised minor adverse impact in terms of water quality. Given that potentially impacted watercourses are of low importance for water quality, this minor impact would result in a temporary **slight adverse effect (not significant)** in all cases. This will be re-appraised at the ES stage when further details regarding the installation of crossings are available.

Drainage Outfalls

9.7.20 At this stage 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 at this stage of assessment.

9.7.21 It is assumed that construction of any outfalls would be within a dry working area, but that 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.

9.7.22 Within the Principal Site, the River Witham is of high importance for water quality, with all other receptors being of low importance. Overall, a temporary, localised minor magnitude of impact would be anticipated to surface water quality in relation to outfall installation given implementation of good practice mitigation measures. This would result in a temporary **slight adverse impact (not significant)** in all cases, should engineered outfalls be required.

Construction Compounds

9.7.23 There is proposed to be one main construction compound and five secondary construction compounds for the Proposed Development. Their locations are described in **PEI Report Volume 1, Chapter 3 Proposed Development** and shown in **PEI Report Volume 2, Figure 3-1.**

9.7.24 Within these compounds there is intended to be materials storage, car parking, and potential for refuelling activities. Within the embedded mitigation measures there is a requirement for a 10m buffer from watercourses to ensure minimisation of risk to watercourses from any spills or leaks, together with ensuring any equipment or plant washing takes place in designated areas. It is considered that with the proposed embedded mitigation in place (including a 10m buffer zone, standard construction measures and appropriate management of runoff) this would result in a negligible impact on

the high importance River Witham and low importance drains and ditches within the Principal Site. This results in a **slight adverse effect (not significant)** for the River Witham and **neutral effect (not significant)** for the remainder of watercourses within the Principal Site.

9.7.25 It is noted that there may be additional construction compounds located within the Cable Corridor. The location of these compounds will be determined, and the impacts associated with these compounds will be assessed at the ES stage. However, same mitigation measures will apply to the construction compounds on the Cable Corridor as described above, and no likely significant effects are anticipated.

Surface Water Features – Morphology

Intrusive Crossings for Cable Installation

9.7.26 The open-cut installation of Onsite Cables and Grid Connection Cables at seven locations (as provisionally indicated in **PEI Report, Volume 2: Figure 9-1** and **Table 9-11** but which will be reviewed at the ES stage) will require intrusive works across drains and ditches. The affected watercourses across the Principal Site and Cable Corridor are all considered low importance for morphology given that they are generally artificially straight, trapezoidal channels often lacking significant geomorphic and bedform features.

9.7.27 Where open-cut crossings are required, a Pre-works Riparian and Hydromorphological Survey will be undertaken at each crossing point prior to construction commencing (post consent). The cables will be buried at sufficient depth to prevent exposure (minimum 1.5m below the bed) and the flow over-pumped or flumed during the works to minimise the risk of water pollution. However, there will unavoidably be short term, temporary adverse impacts on the watercourse and riparian habitats, and the hydrological and sediment regimes during construction. These impacts would be very localised and short in duration, with the channels reinstated taking into account the pre-works morphological condition.

9.7.28 Despite the mitigation measures, a temporary moderate adverse magnitude of impact to morphology is considered appropriate as a worst-case scenario and taking into account current uncertainty regarding the delivery of mitigation at this stage. Full recovery of the channel would be expected within around five years. For these low importance receptors (in terms of morphology) this results in a **slight adverse effect (not significant)**.

Access Track Crossings of Watercourses

9.7.29 At this stage, it is assumed as a worst case that there will be requirement for eight culverts of agricultural drains and ditches for access track watercourse crossings. The affected watercourses across the Principal Site and Cable Corridor are all considered low importance for morphology given that they are generally artificially straight, trapezoidal channels often lacking significant geomorphic and bedform features.

9.7.30 The access track culverts will require intrusive works and physical impact to watercourses on a permanent basis. There would be unavoidable direct loss of riparian, bank and bed habitats where they are replaced by culverts and

the structures may also hamper movement of mammals. However, if culverts are progressed, then their design will aim to minimise changes in watercourse alignment and length as much as is feasible and be environmentally sensitive with a sunken bed to allow a naturalised substrate to develop, and provisions made for mammal passage where appropriate (see further details in Section 9.6). An equivalent length of watercourse enhancement will be delivered for every metre of watercourse directly impacted by a culvert, with this enhancement to be defined within a WFD Mitigation and Enhancement Strategy (produced post consent).

9.7.31 Despite the mitigation approaches to softening the impacts of potential culverts and the delivery of equivalent length watercourse enhancement, a moderate adverse magnitude of impact to morphology is considered appropriate as a worst-case scenario at this stage. For these low importance (in terms of morphology) agricultural drains and ditches this results in a permanent **slight adverse effect (not significant)**.

Drainage Outfalls

9.7.32 As outlined above, 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.

9.7.33 Within the Principal Site the surface water receptors are all of low importance for morphology with the exception of the River Witham, which is of medium importance. A localised, temporary minor adverse impact is predicted should outfalls be required, which would result in a **slight adverse effect (not significant)** for any watercourse affected within the Site. However, this will be considered in greater detail at the ES stage, should engineered drainage outfalls be required.

Groundwater

Impact on Groundwater Level and Flow – Cable Trenches, Trenchless Watercourse Crossings, Intrusive Watercourse Crossings and Foundations

9.7.34 As indicated in Section 9.6 (and described in **PEI Report Volume 1, Chapter 3: The Proposed Development**), low voltage cabling between PV panels and the inverters (typically via 1.5/1.8kV cables) will typically be located above ground level (along a row of racks), fixed to the mounting structure, and then underground (between racks and in the central inverter's and or transformer input). Medium voltage cables (around 33kV) are required between the transformers, switchgear and the Onsite Substation. These buried interconnecting cables will be located within the Solar PV Array Areas and within the Interconnecting Cable Corridors between the Solar PV Array Areas. The trench will typically be up to 1m wide with a maximum depth of 1.2m (except where trenchless crossings below watercourses are required whereby the cable would be a minimum of 5m below the channel bed).

9.7.35 The Grid Connection Cable will be installed using an open trench method requiring a 30m to 40m working width, with trench widths approximately 3m wide and up to 3m deep. The exception is where trenchless crossings below watercourses are required whereby the cable would be a minimum of 5m below the channel bed.

9.7.36 Other structures within the subsurface include the Solar PV foundations (2m maximum depth for south facing fixed strings and 4m maximum depth for single axis tracker strings), BESS and associated battery containers (1m maximum depth on concrete base or monolith plinth), the control building, office, warehouse and storage building (maximum foundation depth of 2m) and onsite Substation, Solar Station Compounds, Inverters, Transformers and Switchgear Enclosures (assumed maximum depth for all of 2m). These preliminary depths will be confirmed at the ES stage.

9.7.37 There is relatively limited groundwater level data across the Site. The shallowest groundwater levels recorded across the Study Area from a review of Geoindex and Environment Agency (see Section 9.5) was 2.5m in Tunman Wood, approximately 100m from the north western Site Boundary for the Principal Site, and a shallower level of 1.8m was recorded near Thorpe on the Hill and may suggest that groundwater within superficial deposits may be within 2m of the surface across parts of the Site at times. Therefore, groundwater in the superficial deposits may be encountered during construction.

9.7.38 Groundwater in the Lincolnshire Limestone Principal Aquifer (underlying the eastern extent of the Cable Corridor) is estimated to be at least 11m below ground level based on the available borehole data, and so is unlikely to be encountered by the construction works.

9.7.39 Groundwater in the superficial deposits may be encountered where deeper foundations are required across the Principal Site (e.g. solar PV foundations of up to 4m depth), although the spatial extent of these works would be very limited in the context of the wider aquifer. Where superficial deposits are underlain by Scunthorpe Mudstone Group and Charmouth Mudstone Group, it would not be expected to encounter significant quantities of groundwater due to the low permeability nature of the secondary aquifer. Where there is a requirement for trenchless crossings which would require deeper works below ground (at least 5m below the river bed), a site specific risk assessment would be undertaken for each crossing point, in order to inform a methodology that minimises groundwater interactions where practicable.

9.7.40 Overall, given that no continuous foundations are present in the design, the regularly spaced discrete solar PV panel foundations and infrastructure foundations across the Principal Site are considered to have negligible impact on groundwater level or flows. For the medium importance Scunthorpe Mudstone Group, Charmouth Mudstone Group and superficial deposits this results in a **neutral effect (not significant)**.

9.7.41 With regard to installation of the Grid Connection Cable over the high importance Lincolnshire Limestone Group, there is anticipated to be no change to groundwater levels or flows given the depth of identified

groundwater in comparison to the relatively shallow excavations required for the Cable Corridor works. No change would also result in a **neutral effect (not significant)**.

9.7.42 Where construction works to install cables beneath the River Brant for the Cable Corridor and River Witham within the Principal Site are required, the cable routes may be below the water table over part of their routes. The River Witham crossing is underlain by Scunthorpe Mudstone Group and the River Brant crossing is underlain by Charmouth Mudstone Group. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the aquifers. Therefore, the works are considered to have a negligible impact on groundwater level or flow for the medium importance Scunthorpe Mudstone Group and Charmouth Mudstone Group, resulting in a **neutral effect (not significant)** in both cases.

9.7.43 The use of trenchless installation beneath the River Brant and River Witham would necessitate a temporary send and receive pit either side of the watercourse (greater than 10m measured from the water's/channel edge under normal flows subject to survey, 16m from the landward toe of flood defences or 100m from River Witham where a potential Otter holt is present). Maximum parameters for the pit dimensions are 8m length x 5m width x 1m depth as a worst case.

9.7.44 As outlined above there may be potential for 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.

9.7.45 A temporary abstraction licence will be required from the Environment Agency if abstraction of more than $20m^3$/day of water, lasting less than 28 days, is required. Any discharge of groundwater to watercourses 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' (Ref 9-96) cannot be met.

9.7.46 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 that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the **Framework CEMP (PEI Report Volume 3, Appendix 3-A)**, there is potential for a short term, temporary minor adverse impacts on groundwater flow. For the high importance Lincolnshire Limestone aquifer this results in a **slight adverse effect (not significant)**. For the medium importance Scunthorpe Mudstone, Charmouth Mudstone and superficial aquifers this results in a **neutral effect (not significant)**.

Impact on Groundwater Resources

9.7.47 In terms of water resources, no PWS or groundwater abstractions have been identified within the Site, although there are several groundwater abstractions in the wider Study Area (see **PEI Report Volume 2, Figure 9-1**). There would be negligible impact to these abstractions given that no significant effects on groundwater level or flow have been identified. There is an area of SPZ 3 – Total Catchment, located at the eastern extent of the Cable Corridor. As no change is expected to occur to groundwater levels and flows in this area (which is underlain by Lincolnshire Limestone Group) then it is not considered that there would be any impact on the SPZ. As such, the effect of the Proposed Development on groundwater resources (abstractions and the SPZ) would be **neutral (not significant)**.

Impact on Groundwater Quality

9.7.48 The Principal Site is not known to have a significant history of potentially contaminating land uses, although there is a former airfield on site (Swinderby Airfield). Further details are available in **PEI Report Volume 1, Chapter 14: Other Environmental Topics** and in the **PEI Report Volume 3, Appendix 14-B: Phase 1 Preliminary Risk Assessment**.

9.7.49 The installation of the discrete PV module structures to a maximum depth of 4m below ground, and other foundation depths as outlined above (maximum 2m depth for new infrastructure aside from cables beneath watercourses) 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.

9.7.50 Nonetheless, prior to construction works commencing, a targeted scheme of Ground Investigation and testing followed by a Quantitative Risk Assessment will be completed. This will be in accordance, if and where necessary, with CLR11 Model Procedures for the Management of Contaminated Land (Ref. 9-98), BS10175:2011+ A2:2017 Investigation of Potentially Contaminated Sites: Code of Practice (Ref 9-98) and the Environment Agency's GPLC1 Guiding Principles for Land Contamination in Assessing Risks to Controlled Waters (Ref 9-99). Furthermore, a standalone, site specific Hydraulic Fracture Risk Assessment will be produced prior to drilling the cable crossings, as is standard practice, to mitigate any water quality deterioration from the drilling process, and similarly appropriate risk assessment would be undertaken for any piling requirements that are identified. This, along with standard measures for protection of groundwater quality, will be secured through the **Framework CEMP (PEI Report Volume 3, Appendix 3-A).**

9.7.51 Consequently, there would be negligible water quality impact to groundwater aquifers. For the high importance Lincolnshire Limestone aquifer this results in a **slight adverse effect (not significant)**. For the medium importance Scunthorpe Mudstone, Charmouth Mudstone and superficial aquifers this results in a **neutral effect (not significant)**.

Flood Risk

Fluvial Flood Risk

9.7.52 The majority of the Principal Site and Cable Corridor Study Area is in Flood Zone 1 (see **PEI Report Volume 2, Figure 9-3**) and considered to be at low risk from fluvial and tidal flooding. However, construction activity will involve work in areas of Flood Zone 2 and 3 associated with the River Witham, River Brant and Mill Dam Dyke. Should a fluvial flood event occur during construction, this could be a potential high risk to construction workers in the immediate vicinity (very high importance receptors). The baseline flood risk could be exacerbated during construction works by the temporary increase in the rate and volume of surface water runoff from an increase in impermeable areas caused by the compaction of soils and the presence of stockpiled materials. In addition, equipment may also be washed downstream where it may block the channel and lead to or increase the risk of flooding.

9.7.53 All five temporary construction compounds proposed for the Principal Site are located within Flood Zone 1 with very low risk of fluvial flooding. The temporary construction compounds are expected to be in place for up to 30 months during the Construction Phase, being replaced gradually throughout the construction phase with solar PV panels, where located within the Principal Site. It is also proposed that construction compounds required for the Cable Corridor would be located outside of Flood Zone 2 and 3.

9.7.54 As stated within Section 9.6 Embedded Mitigation, for the Cable Corridor, HDD will be used so that the cables will be installed under the River Witham and River Brant and adjacent flood defences. This will ensure there will be no impact on the banks and bed of the watercourses, and therefore no effect on the flow regime or flooding potential of these rivers. However, during construction there may be potential for flooding within the temporary launch and receive pits for the HDD work and this risk would need to be mitigated.

9.7.55 With the implementation of standard construction methods and mitigation as described in Section 9.6, fluvial flood risk in Flood Zone 2 and 3 can be effectively managed through a variety of measures, for example by monitoring weather forecasts and Environment Agency flood warnings, by undertaking works close to watercourses during periods of dry weather, by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase and avoiding stockpiling material on floodplains. An Emergency Response Plan would also be in place and will be secured via the CEMP (a **Framework CEMP** is presented in **PEI Report Volume 3, Appendix 3-A**).

9.7.56 As such, the magnitude of flooding from these sources during construction, both on site and further downstream to off-site receptors, is considered to be negligible once the mitigation is taken into account. When considering the construction workers on site who are a very high importance receptor, this gives a **slight adverse effect (not significant).** When considering agricultural land uses surrounding the site (medium importance receptor)

and surrounding villages and hamlets (high importance receptor) this results in a **slight adverse effect (not significant)**.

Surface Water (Pluvial Flood Risk)

9.7.57 The Principal Site and Cable Corridor is in general at a very low risk of surface water flooding, although in some areas (mainly associated with watercourses and localised shallow patches) there are areas of low, medium and high risk as outlined in the baseline and shown in **Figure 9-4** (**PEI Report Volume 2)**.

9.7.58 During construction, the following adverse impacts may occur with regard to surface water flood risk:

a. Existing surface water flow paths may be disrupted and altered due to site clearance, earthworks, and excavation work. The exposure and compaction of bare ground and the construction of new embankments and impermeable surfaces may increase the rates and volume of runoff and increase the risk from surface water flooding;

b. Temporary changes in flood risk from changes in surface water runoff (e.g. exacerbation of localised flooding due to deposition of silt, sediment in drains, ditches); and

c. Changes in flood risk due to the construction of Principal Site, Cable Corridor and site compound and storage facilities, which alter the surface water runoff from the Site.

9.7.59 Construction activities will take place with the Final CEMP in place (building on the **Framework CEMP (PEI Report Volume 3, Appendix 3-A**) to ensure no exacerbation of localised flooding from deposition of silt or sediment in drainage and ditches. A temporary drainage system will be in use where required (see Section 9.6).

9.7.60 Therefore, the impact during construction on surface water flooding and flood risk, to and from the Proposed Development and to other developments and receptors outside of the Proposed Development extents, is considered to be negligible. For the Very High importance construction workers this would be a **slight adverse effect** in EIA terms (**not significant**). When considering agricultural land uses surrounding the site (medium importance receptor) and surrounding villages and hamlets (high importance receptor) this results in a **slight adverse effect (not significant)**.

Groundwater Flood Risk

9.7.61 North Kesteven District Council's Strategic Flood Risk Assessment indicates the Principal Site and Cable Corridor are deemed not to be at risk of groundwater flooding. However, where the Cable Corridor crosses the River Witham, groundwater may be elevated within the alluvial deposits. 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.

9.7.62 There may be potential for shallow groundwater levels and therefore groundwater ingress to excavations during construction in parts of the Site. This will be managed following standard construction techniques potentially including pumping, damming, or shoring up excavation pits with sheet piling.

9.7.63 It is considered that groundwater flood risk both to and from the site is unlikely to increase from the Principal Site and Cable Corridor during construction as the majority of works will be above the ground surface with relatively limited excavations as outlined in Section 9.6. Infiltration into the soil and underlying geology will remain largely as per existing conditions except for localised areas of hardstanding and temporary drainage systems will be used where necessary as per the **Framework CEMP (PEI Report Volume 3, Appendix 3-A**).

9.7.64 Based on the above considerations, the impact during construction on groundwater flooding and flood risk, to and from the Proposed Development to other developments and receptors outside of the Proposed Development, is considered to be negligible. When considering the very high importance receptors, being the construction workers, this results in a **slight adverse effect (not significant)**. When considering agricultural land uses surrounding the site (medium importance receptor) and surrounding villages and hamlets (high importance receptor) this results in a **slight adverse effect (not significant)**.

Flood Risk from Sewers and Artificial Sources

9.7.65 The Principal Site and Cable Corridor Study Areas are considered to be at low risk of flooding from artificial sources and sewers.

9.7.66 It is not envisaged the flood risk from drainage infrastructure (e.g. sewers) will increase from the baseline situation with the construction of the Proposed Development. No new connections to foul water infrastructure are considered to be required for the Proposed Development.

9.7.67 There is not envisaged to be any impact on flood risk from artificial sources either on or off-site during construction (i.e., no change), and so no effect to on-or off-site receptors (e.g. ecological receptors). In terms of very high importance construction workers and off-site land uses (agricultural land, villages and hamlets) there is a **neutral effect (not significant)** from flood risk from drainage infrastructure and artificial sources**.**

Operation (and maintenance) (2033 to 2093)

9.7.68 Impacts on water features during operation of the Proposed Development are likely to include:

a. 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 (predominantly consisting of panel cleaning), assuming surface water run-off does ultimately drain to a surface watercourse rather than simply to ground;

b. Potential for impact on groundwater or surface water from firewater runoff in the event of a fire in the battery energy storage system (BESS) area(s);

c. Potential impacts on hydrology as a result of the Proposed Development;

d. Potential for permanent physical impacts to watercourses if crossings are required for access and depending on the design of the structure used;

e. Potential impacts on groundwater resources: quality, flow and level;

f. Potential impact on fluvial flood risk from changes in the rate and volume of run-off entering local watercourses;

g. Generation of a new source of foul wastewater from on-site welfare facilities that will need to be adequately managed and disposed of;

h. The current arable fields are likely a source of diffuse agricultural pollutants (e.g. organic/inorganic fertiliser and pesticides). During the life of the project the use of such fertilisers and other chemicals will be ceased, which could lead to beneficial impacts on the water environment; and

i. Potential reduction in local surface and groundwater abstraction due to reduce agricultural irrigation requirements.

Water Quality

Impacts from Operational Site Runoff and Accidental Spillages

Overview of Provisional Drainage Arrangements

9.7.69 The provisional drainage arrangements outlined in **PEI Report Volume 3, Appendix 9-D: Preliminary Surface Water Drainage Strategy** 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 9.6). More detailed surface water drainage proposals will be presented in an update to the Preliminary Surface Water Drainage Strategy that will be completed at the ES stage and submitted alongside the DCO application. The operation of the Site will be managed in accordance with an Operational Environmental Management Plan (OEMP).

9.7.70 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, Solar Station Compounds, Onsite Substation, switchgear enclosures, control building, office, warehouse and storage building and access tracks.

9.7.71 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 (minimum of 800mm above ground level) and incident rainfall will run off them to ground as it does now.

9.7.72 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 mix. This planting will intercept and absorb rainfall running off the Solar PV Panels, preventing it from concentrating and potentially forming channels in the ground. Planting types will be described within the Framework Landscape and Ecological Management Plan to be submitted with the DCO application.

9.7.73 New access roads will be permeable. Therefore, the Principal Site's access roads will not lead to an increase in impermeable area. The drainage regime of the access roads is therefore assumed to remain consistent with its pre-developed state.

9.7.74 The Indicative Site Layout Plans (included in **PEI Report Volume 2 Figure 3-2A and 3-2B**) show options for DC and AC coupled BESS areas, with DC coupled BESS co-located with Solar Station compounds spread across the Principal Site, and a single location AC coupled BESS Compound. These are assumed to be 100% impermeable. In order to drain surface water from these proposed impermeable areas, it is proposed to construct a swale around the BESS (or groups of BESS) and substation areas. The swales will collect and treat surface water before discharge.

9.7.75 Due to the current understanding of the ground conditions within the Principal Site, it is preferred to utilise surface water bodies to discharge runoff from the Solar Station Compounds, BESS Compound and Onsite Substation where practicable. Therefore, surface water runoff from the Substation compound swales and the majority of the BESS swales (where practicable within the Site Boundary) is proposed to be discharged to local watercourses. The discharge to these watercourses will be maintained at existing greenfield runoff rates by restricting rates using a flow control. The flow control will use a restriction on the outlet of the swale which will hold water back within the swale and release it at a controlled rate.

9.7.76 Swales around all of the BESS areas (for both AC coupled and DC coupled options) and Onsite Substation areas will be lined with an impermeable membrane or similar impermeable barrier to prevent any pollution associated with fire water runoff from entering the ground. Penstocks will also be used in the event of a fire to prevent any pollution associated with fire water runoff from entering the local watercourses without prior testing.

9.7.77 In the north of the Principal Site, there are eight Solar PV fields (as shown in Annex D of the **PEI Report Volume 3, Appendix 9-D: Preliminary Surface Water Drainage Strategy**) where surface water bodies are not available in suitable locations to discharge runoff from the lined BESS swales; it is, therefore, proposed to discharge flows from the lined BESS swales to infiltration swales lining the boundaries of fields. These field swales are to be designed to attenuate flows for the 1 in 100 year + 40% climate change event and slowly infiltrate surface water flows to ground whilst also making use of evapotranspiration. As set out above, discharge of runoff will be controlled from BESS areas by penstocks at each location which can isolate the runoff from the BESS prior to entering the infiltration swales.

9.7.78 In the event of an extreme event, which is an event greater than the design event, the drainage system will likely become inundated and overtop. In this

scenario, exceedance flows will be generated from the drainage system and will flow overland. To intercept these exceedance flows it is proposed to install perimeter swales within low laying areas on the edge of certain Solar PV fields. These swales will be installed with an outfall to the watercourses within the Principal Site Boundary where practicable, or infiltrate where no watercourse is present, to mimic the existing regime.

Water Quality Risk Assessment

9.7.79 To assess the risk to receiving watercourses, a provisional assessment has been undertaken of the proposed surface water drainage system in accordance with the Simple Index Approach (SIA) as detailed within CIRIA C753 The SuDS Manual (Ref 9-27). This method determines the pollution hazard level of the land use proposed and then assesses the level of treatment the proposed drainage system will provide to ensure it provides sufficient water quality mitigation. The provisional assessment is presented in **PEI Report Volume 3, Appendix 9-D: Preliminary Surface Water Drainage Strategy** (Section 4.6).

9.7.80 The assessment indicates that sufficient water quality mitigation has been proposed for the areas of hardstanding across the site and for the access tracks but will be re-appraised within the ES when the drainage strategy is further developed.

Firewater Management

9.7.81 Firefighting water, and its potential contaminants, is not included in the SIA assessment as there is no pathway to impact. The operational Proposed Development 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 Area. These swales will have an impermeable liner to prevent water quality impacts to the underlying groundwater receptor, and the outfall from the swale will be controlled via a penstock to allow the containment of all stored fire water if it becomes 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 disposal at a licenced waste facility. If not contaminated, this would be released with agreement of the Environment Agency if a permit was required.

Transformer and Fuel Storage Tanks

9.7.82 Transformers and fuel storage tanks will be installed with suitable bunds to contain any oil spillage in case of an oil-leakage event. Bunds will be designed to contain at least 110% of the volume of the oil to ensure there is some tolerance to prevent breaching of the bund. Under normal conditions any rainwater collected within the bund will be removed by use of special pump, which automatically switches off if it detects the smallest presence of oil in the water. Pumps will be linked to control and monitoring equipment to raise alarms if oil is detected.

Impact Assessment

9.7.83 During operation, the Proposed Development would operate using good practice and comply with environmental legislation through the application of an OEMP, including appropriate maintenance of SuDS and other drainage infrastructure.

9.7.84 Overall, given the implementation of a Surface Water Drainage Strategy including SuDS provision, there would be negligible impact to the receiving surface waters or groundwater from operational surface water runoff. This will be re-appraised at the ES stage to take account of any changes to the design.

9.7.85 For the high importance River Witham this negligible impact would result in a **slight adverse effect (not significant)**, whereas for the low importance drains and ditches that might be affected this would result in a **neutral effect (not significant)**.

9.7.86 As described above, there may be a requirement given distance from watercourses for part of the site to discharge surface water runoff to ground within the Principal Site where groundwater is considered a medium importance receptor (for both superficial and bedrock aquifers, see Section 9.5). As such, the negligible impact would result in a **slight adverse effect (not significant)**.

9.7.87 With regards to the Cable Corridor, once operational with the cable buried below ground, there would be no water quality impacts associated with this part of the Proposed Development.

9.7.88 As land within the Proposed Development is being taken out of agricultural usage, it is considered there would a decrease in surface water runoff of agricultural additives to the land (be that nutrients in the form of phosphates and nitrates, or from pesticides, herbicides or insecticides). Taking land out of arable production may also have other benefits by reducing the risk of soil erosion and the need for local water abstraction for crop irrigation. This effect is not formally assessed given that there is no data or information on the application of agri-chemicals to the existing land in the Proposed Development boundary, but nonetheless is worth noting as a potential water quality benefit associated with the Proposed Development.

Change in Site Hydrology

9.7.89 Once the Proposed Development is operational, there is the potential for a change in surface water runoff or change in hydrology of the watercourses around the Principal Site. However, **Appendix 9-D: Preliminary Surface Water Drainage Strategy (PEI Report Volume 3**) includes attenuation in the form of swales that have been incorporated to control any increase in the rate of flow towards the receiving watercourses. The rate of runoff from each location across the Principal Site will ensure nil detriment in terms of no increase in runoff rate from the Proposed Development to receiving watercourses.

9.7.90 On this basis there would be a negligible impact on site hydrology. For the River Witham as a high importance receptor for water quality, a negligible impact results in a **slight adverse effect (not significant)**, while for all other drains and ditches which are of low importance for water quality there would be a **neutral effect (not significant)**.

9.7.91 With regards to the Cable Corridor, once operational with the cable buried below ground, there would be no changes in hydrology associated with this part of the Proposed Development.

Morphology: Outfalls

9.7.92 Where practicable, surface water will drain from the Proposed Development's swale-based drainage system to local receiving watercourses via a new open green ditch. If a pipe system is required, the piped section will be shortened and the last 10m section of the outfall route will be open green ditch wherever practicable, unless this affects maintenance of the watercourse by the IDB or Environment Agency or there are other circumstances that prevent this from being possible.

9.7.93 Locations will be determined at the ES stage following further development of the drainage strategy. 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 in certain locations, then 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.

9.7.94 As full details and locations are not yet available, it is assumed as a reasonable worst case that new engineered outfalls are required. This would cause a very localised minor adverse impact against morphology due to the loss of bank habitat. For both the medium importance (for morphology) River Witham and low importance (for morphology) drains and ditches this results in a **neutral effect (not significant)** in all cases.

Groundwater Flow

9.7.95 The drainage design for the Proposed Development is not yet fully developed but it is anticipated that swales around the Solar PV Panels will collect runoff which is generally expected to be conveyed to watercourses, although there are parts of the site where infiltration swales will be used as not watercourses are located within close proximity.

9.7.96 Construction of building foundations, plinths, 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 in the context of the wider site and therefore the majority of the Site will remain permeable. As such, it is considered there would be no impact to infiltration of rainwater into the ground.

9.7.97 As such, there would be negligible localised changes in the spatial distribution and quantity of recharge of groundwater across the Site. It is

considered there would be a negligible impact on groundwater recharge, level and flow. For the medium importance superficial and bedrock groundwater aquifers (Scunthorpe Mudstone, Charmouth Mudstone) underlying the site, this results in a **neutral effect (not significant)**. There will be no impact on groundwater abstractions as none are situated within the Principal Site and once built there would be negligible impact on groundwater flows or quality given implementation of the Drainage Strategy as developed at the DCO stage.

9.7.98 With regard to the Cable Corridor, once operational there would be very limited potential for impact on groundwater flows given the limited scale of the cable ducting in the context of the wider groundwater aquifers, and no impediment to groundwater flow is anticipated. The impact would be no change, which would result in a **neutral effect (not significant)** for the high importance Lincolnshire Limestone and for the medium importance Scunthorpe Mudstone, Charmouth Mudstone and superficial deposits. There would be no impact on river baseflow or groundwater abstractions anticipated in the Study Area. There is an area of SPZ 3 – Total Catchment, located at the eastern extent of the Cable Corridor. As no change is expected to occur to groundwater levels and flows in this area (which is underlain by Lincolnshire Limestone Group) then it is not considered that there would be any impact on the SPZ. As such, the effect of the Proposed Development on groundwater resources (abstractions and the SPZ) would be **neutral effect (not significant)**.

Flood Risk

9.7.99 Flood risk impacts and effects for flood risk are summarised in **Table 9-13** for the Principal Site based upon the assessment undertaken within **Preliminary Flood Risk Assessment (PEI Report Volume 3, Appendix 9-C)**.

Table 9-13: Comparison of Pre- and Post-Proposed Development Flood Risk Summary

Flood Risk Source	Baseline Flood Risk Level	Mitigated Flood Risk Level	Comment
Fluvial	**Low–High** Low (majority of Principal Site and majority of Cable Corridor) – High (small area of Cable Corridor where crossing the River Brant and Witham Washlands Flood Storage Area).	**Low–High** Low (Principal Site and majority of Cable Corridor) – High (small area of Cable Corridor where crossing the River Brant and Witham Washlands Flood Storage Area).	Solar PV Panel infrastructure within Flood Zones 2 and 3. “interaction zones” are not envisaged to alter the existing flood extents or topography and are proposed to be installed to enable sufficient freeboard to remain operational in times of flood. No change to flood risk level.
Tidal	**Low** (Residual)	**Low** (Residual)	Tidal sea level assessment has been undertaken (within

Flood Risk Source	Baseline Flood Risk Level	Mitigated Flood Risk Level	Comment
			the within **Preliminary Flood Risk Assessment (PEI Report Volume 3, Appendix 9-C).** The Principal Site is at low risk from River Witham and River Brant due to site levels, except for Field 55 (See Annex D of **PEI Report Volume 3, Appendix 9-D: Preliminary Surface Water Drainage Strategy** for field numbering), where sea level rise may impact the site during the H++ scenario. However, residual risk is Low as tidal defences at Boston designed for beyond 300 years including climate change and, in addition, embedded mitigation for the credible maximum scenario exceed mitigation requirements for potential sea level rise. No change to flood risk level.
Pluvial / Surface Water	**Low–Medium**	**Low–Medium**	Increased surface water runoff is proposed to be managed on-site to mimic the pre-Proposed Development conditions for up to and including the 1 in 100 + 40% climate change event, with discharge rates limited to existing Greenfield rates. No change to flood risk level.
Groundwater	**Medium**	**Medium**	North Kesteven District Council's Strategic Flood Risk Assessment (SFRA) indicates the area the Site Boundary located within is deemed not to be at risk of groundwater flooding, with no recorded groundwater flood events. No Change to flood risk level.
Sewers	**Low**	**Low**	No records of sewer flooding in the Principal Site within the North Kesteven District Council SFRA. No proposed

Flood Risk Source	Baseline Flood Risk Level	Mitigated Flood Risk Level	Comment
			connection to public foul or surface water sewers. No change to flood risk level.
Artificial Sources	**Low**	**Low**	Environment Agency online mapping shows the maximum extent of flooding from artificial sources are not located within the vicinity of the Site Boundary. No change to flood risk level.

9.7.100 During the operation phase, there would be surface water runoff from the permanent structures, roofs, solar PV panels and access roads. This could impact surrounding watercourses and water features. A Preliminary Surface Water Drainage Strategy **(PEI Report Volume 3, Appendix 9-D)** has been prepared. This Drainage Strategy includes SuDS provision to attenuate flows from new areas of hardstanding as described in Section 9.6.

9.7.101 Based on the outcomes of the Preliminary Flood Risk Assessment **(PEI Report Volume 3, Appendix 9-C)** there would be no change to any receiving water feature from any source of flooding (fluvial, tidal, pluvial, groundwater, drainage or artificial source). This results in a **neutral effect (not significant)** in all cases.

9.7.102 The flood risk receptor is very high importance as essential infrastructure is present on the Site. However, the impact on flooding during operation within the Principal Site is considered to result in a no change impact, which would result in a **neutral effect (not significant)**.

9.7.103 The change of land use within the Principal Site has the potential to result in a change of flood potential for fluvial and surface water sources to off-site receptors (predominantly agricultural land but also the western extent of Bassingham). However, it is considered there would be a no change impact, which would result in a **neutral effect (not significant)** from all sources of flooding.

9.7.104 No part of the Cable Corridor is above ground; therefore, it is considered there would be a no change to future baseline conditions once the cable is installed and the land reinstated. As such, there would be **neutral effect (not significant)** in terms of flood risk on and off site in relation to the Cable Corridor.

Decommissioning (2093)

9.7.105 Potential impacts from the decommissioning of the Principal Site are similar in nature to those during construction, as some ground works would be required to remove infrastructure installed. A detailed Decommissioning Environmental Management Plan (DEMP) (based on the Framework DEMP

produced at the ES stage) will be prepared prior to decommissioning to identify required measures to prevent pollution and flooding during this phase of the development.

9.7.106 The mode of cable decommissioning for the Grid Connection and Onsite Cabling will be dependent upon government policy and good practice at that time. Currently, the most environmentally acceptable option is considered to be leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the cables can be removed by opening up the ground at regular intervals and pulling the cable through to the extraction point, avoiding the need to open up the entire length of the cable route.

9.7.107 The pits would be sensitively located so as not to impact watercourses. Given that all cables will be a minimum of 5m below the bed of the River Brant and River Witham and 1.5m below the drains and ditches across the site, this is not anticipated to prevent natural geomorphic evolution or potential future restoration of affected areas. As a result, it is considered the decommissioning impacts and effects would be no greater than those of the construction phase and no additional impacts are anticipated.

9.8 Additional Mitigation and Enhancement

9.8.1 As no significant adverse effects have been identified, following the incorporation of the standard and embedded measures described in Section 9.6, no additional mitigation measures are required during construction, operation or decommissioning.

9.8.2 Nonetheless, as part of the non-statutory consultation for the Proposed Development, residents along The Avenue in Morton, indicated that their properties experience surface water flooding from natural overland runoff from adjacent fields within the Site. The **Preliminary Flood Risk Assessment (PEI Report Volume 3, Appendix 9-C)** indicates a medium flood risk to these properties. As such, it has been agreed to provide edge swales to capture excess runoff from the neighbouring PV areas. These edge swales will capture the peak runoff from Solar Station Compounds and runoff from the solar PV areas, reducing peak runoff rates during storm events, for up to and including the 1 in 100 year plus 40% climate change event (for the where new impermeable surfaces are introduced). The existing surface water flood risk to properties along The Avenue will be reduced by the drainage proposals, thereby providing betterment.

9.8.3 As the land is being taken out of agricultural usage, it is considered there would be a decrease in surface water runoff of agricultural additives to land (i.e. nutrients in the form of phosphates or nitrates or from pesticides, herbicides or insecticides). However, it is considered this would not be a great enough change to result in an effect on the individual water features.

9.8.4 The WMP (to be produced post-consent) 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 as well as in-situ testing using hand-held water quality

meters only. This requirement is included within the **Framework CEMP** (**PEI Report Volume 3 Appendix 3-A**).

9.8.5 It is important that during the operation of the Proposed Development 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 practicable. This requirement would be included within the OEMP (a Framework OEMP will be provided with the DCO application).

9.8.6 Provision of enhancements to the water environment from the Proposed Development are being considered and, where relevant, further information will be provided within the ES.

9.9 Residual Effects and Conclusions

9.9.1 **Table 9-14** and **Table 9-15**: summarise the residual significant effects of the Proposed Development on the Water Environment.

9.9.2 Following the implementation of standard and embedded mitigation as outlined in Section 9.6, there are no likely significant effects resulting from the construction or operation of this Proposed Development. As no likely significant effects have been identified, no additional mitigation has been outlined at this stage.

9.9.3 There are limited maintenance activities of the scale requiring assessment. However, potential for impacts from activities such as panel cleaning and spillages from vehicles have been considered within the assessments where appropriate. As no likely significant effects have been identified, no additional mitigation has been outlined at this stage.

9.9.4 Effects for decommissioning are considered to be similar to those identified for construction. However, decommissioning activities will be reviewed at the ES stage, and more detailed assessment provided if appropriate.

9.9.5 The assessment will be reviewed and revised where necessary at the ES stage when further design detail is available and further consultation has been undertaken with statutory bodies.

Table 9-14: Summary of Residual Effects (Construction)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
River Witham	High	Water quality impacts to surface water features during construction and decommissioning (i.e. runoff containing fine sediments, accidental spillages) and in particular from proposed trenchless crossing for Onsite Cabling (River Witham) and Cable Corridor (River Brant)	Application of measures outlined in the **Framework CEMP** (including water quality monitoring) and DEMP. Appropriate trenchless crossing methodology including Hydraulic Fracture Risk Assessment.	Negligible	Slight adverse (not significant)
River Brant	High			Negligible	Slight adverse (not significant)
Agricultural Drains, Ditches – where direct works are required (e.g. open-cut cable crossings, installation of structures for access tracks)	Low	Water quality impacts to surface water features during construction and decommissioning (i.e. runoff containing fine sediments, accidental spillages), in particular from installation of open-cut cable crossings, potentially drainage outfalls and access track structures	Application of measures outlined in the **Framework CEMP** (including water quality monitoring) and DEMP. Appropriate Open-Cut Crossing Construction Methodology and Outfall and Structure Installation Methodology where required.	Minor adverse	Slight adverse (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
Agricultural Drains, Ditches – where no direct works are required	Low	Water quality impacts to surface water features during construction and decommissioning - where they are not directly impacted but could be indirectly impacted (e.g. by runoff)	Application of measures outlined in the **Framework CEMP** (including water quality monitoring) and DEMP.	Minor adverse	Slight adverse (not significant)
River Witham	High	Water quality impacts to surface water features during construction and decommissioning (i.e. runoff containing fine sediments, accidental spillages) in relation to activities at construction compounds (including satellite compounds)	Application of measures outlined in the **Framework CEMP** (including water quality monitoring).	Negligible	Slight adverse (not significant)
Agricultural Drains, Ditches	Low			Negligible	Neutral (not significant)
River Witham	Medium (for morphology)	Impacts to channel morphology during construction from watercourse crossings (trenchless crossing for Onsite Cabling)	Cable to be installed at least 5m below bed (minimum), with 10m buffer between HDD launch or exit pits from the top of bank, or 16m from the landward toe of flood defences where present.	No change	Neutral (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
River Brant	Low (for morphology)	Impacts to channel morphology during construction from watercourse crossings (trenchless crossing for Cable Corridor)	Cable to be installed at least 5m below bed (minimum), with 10m buffer between HDD launch or exit pits from the top of bank, or 16m from the landward toe of flood defences where present.	No change	Neutral (not significant)
Agricultural Drains, Ditches	Low (for morphology)	Impacts to channel morphology during construction from intrusive watercourse crossings for cabling, culverting for access tracks and/or outfall installation	Pre-works Riparian and Hydromorphological Survey and reinstatement as found as well as aftercare to ensure vegetation re-establishes. Working in dry weather where practicable. Appropriate Open-Cut Crossing Construction Methodology. Environmentally sensitive culvert design. Length-for-length equivalent watercourse enhancements are required for each new culvert extension.	Moderate adverse	Slight adverse (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
			These measures will be secured via the **Framework CEMP.**		
Groundwater – Superficial deposits	Medium	Impacts on groundwater flow (and potentially local abstractions, and river baseflow)	Application of measures outlined in the **Framework CEMP**.	Negligible	Neutral (not significant)
Groundwater – Secondary bedrock aquifer (Charmouth Mudstone and Scunthorpe Mudstone)	Medium	Impacts on groundwater flow (and potentially local abstractions, and river baseflow)	Application of measures outlined in the **Framework CEMP**.	Negligible	Neutral (not significant)
Groundwater – Principal bedrock aquifer (Lincolnshire Limestone Group)	High	Impacts on groundwater flow (and potentially local abstractions, and river baseflow)	Application of measures outlined in the **Framework CEMP**.	No change	Neutral (not significant)
Groundwater – Superficial deposits	Medium	Impacts on groundwater quality	Application of measures outlined in the **Framework CEMP**. Targeted scheme of Ground Investigation and testing followed by a Quantitative Risk Assessment	Negligible	Neutral (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
Groundwater – Secondary bedrock aquifer (Charmouth Mudstone and Scunthorpe Mudstone)	Medium	Impacts on groundwater quality	Application of measures outlined in the **Framework CEMP**. Targeted scheme of Ground Investigation and testing followed by a Quantitative Risk Assessment	Negligible	Neutral (not significant)
Groundwater – Principal bedrock aquifer (Lincolnshire Limestone Group)	High	Impacts on groundwater quality	Application of measures outlined in the **Framework CEMP**. Targeted scheme of Ground Investigation and testing followed by a Quantitative Risk Assessment	No change	Slight adverse (not significant)
Flood Risk (from tidal, fluvial, pluvial, drainage and artificial sources and sewers) – construction workers	Very High (construction workers)	Potential for increase of flooding from the site, or to the site as a result of construction	Application of measures outlined in the **Framework CEMP** (including water quality monitoring) and Emergency Response Plan.	Negligible	Slight adverse (not significant)
Flood Risk (from tidal, fluvial, pluvial, drainage and artificial sources and sewers)	High (residential receptors); Medium	Potential for increase of flooding from the site, or to the site as a result of construction	Application of measures outlined in the **Framework CEMP** (including water quality monitoring) and Emergency Response Plan.	Negligible	Slight adverse (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded and standard mitigation	Residual effect after embedded mitigation
– construction workers	(agricultural receptors)				

Table 9-15: Summary of Residual Effects (Operation)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded mitigation	Residual effect after embedded mitigation
River Witham	High	Water quality impacts from operational runoff (diffuse pollution)	Implementation of Surface Water Drainage Strategy.	Negligible	Slight adverse (not significant)
Agricultural Drains, Ditches	Low	Water quality impacts from operational runoff (diffuse pollution)	Implementation of Surface Water Drainage Strategy.	Negligible	Neutral (not significant)
River Witham	High	Change in hydrology from Proposed Development runoff	Implementation of Surface Water Drainage Strategy.	Negligible	Slight adverse (not significant)
Agricultural Drains, Ditches	Low	Change in hydrology from Proposed Development runoff	Implementation of Surface Water Drainage Strategy.	Negligible	Neutral (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded mitigation	Residual effect after embedded mitigation
River Witham	Medium (for morphology)	Impacts to channel morphology due to potential outfall installation	Environmentally sensitive outfall design if required, although outfalls are expected to use ditches for outfalls.	Minor adverse	Neutral (not significant)
Agricultural Drains, Ditches	Low (for morphology)	Impacts to channel morphology due to potential outfall installation	Environmentally sensitive outfall design if required, although outfalls are expected to use ditches for outfalls.	Minor adverse	Neutral (not significant)
Agricultural Drains, Ditches	Low (for morphology)	Impacts to channel morphology due to potential culvert installation	Environmentally sensitive design if culverts required (currently assumed as worst case).	Moderate adverse	Slight adverse (not significant)
Groundwater – Superficial deposits	Medium	Impacts on groundwater flow (and thereby local abstractions and river baseflow) and quality	Implementation of Surface Water Drainage Strategy.	Negligible	Neutral (not significant)
Groundwater – Secondary bedrock aquifer (Charmouth Mudstone and Scunthorpe Mudstone)	Medium	Impacts on groundwater flow (and thereby local abstractions and river baseflow) and quality	Implementation of Surface Water Drainage Strategy.	Negligible	Neutral (not significant)

Receptor	Importance (value)	Description of impact	Embedded mitigation	Magnitude of impact after embedded mitigation	Residual effect after embedded mitigation
Groundwater – Principal bedrock aquifer (Lincolnshire Limestone Group)	High	Impacts on groundwater flow (and thereby local abstractions and river baseflow) and quality	Implementation of Surface Water Drainage Strategy.	No change	Neutral (not significant)
Flood Risk (from tidal, fluvial, pluvial, drainage and artificial sources and sewers) – on site Essential Infrastructure and offsite agricultural land / villages	High-Low	Potential for increase of flooding from the site, or to the site as a result of operation	Implementation of Surface Water Drainage Strategy. Panels and field stations raised appropriate level above ground level in Flood Zone 2 and 3.	No change (for all sources of flooding)	Neutral (not significant) – for all sources of flooding

9.10 Cumulative Assessment

9.10.1 This section presents a preliminary assessment of the potential for cumulative effects to arise between the Proposed Development and other proposed and committed plans and projects including other developments (referred to as 'Cumulative Schemes') within the surrounding area.

9.10.2 This preliminary assessment has been made with reference to the methodology and guidance set out in **PEI Report Volume 1, Chapter 15: Cumulative Effects and Interactions** and shortlist of cumulative schemes identified also identified in **Chapter 15: Cumulative Effects and Interactions**.

9.10.3 Of the shortlisted developments listed in **Chapter 15: Cumulative Effects and Interactions**, 17 developments are considered to have the potential for cumulative effects when considered alongside the Proposed Development due to being located within the 1km Zone of Influence for the Water Environment.

9.10.4 This preliminary cumulative effect assessment identified for each receptor those areas where the predicted effects of the Proposed Development could interact with effects arising from other plans and, or projects on the same receptor based on a spatial and, or temporal basis.

Construction and Decommissioning

9.10.5 There is potential for overlap between construction of the Proposed Development and impacts from adjacent schemes. Thus, there is the potential for short term, temporary construction related pollutants generated from both the Proposed Development and the Cumulative Schemes to impact on watercourses in the Study Area.

9.10.6 The **Framework CEMP (PEI Report Volume 3, Appendix 3-A)** details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. Provided that standard and good practice mitigation is implemented on the construction sites through their respective CEMPs, which would be considered to follow similar good practice measures, and as per the conditions of the relevant planning permissions, environmental permits and licences which are assumed to be required, as is being proposed for this Proposed Development, the cumulative effects risk can be effectively managed and there would not be a significant increase in the risks to any relevant waterbodies. As such, there are not expected to be any significant cumulative effects during construction.

9.10.7 Potential impacts from the decommissioning of the Proposed Development are considered similar in nature to those during construction, as some ground disturbance and excavation will be required to remove infrastructure installed. These impacts would be controlled by a DEMP. A Framework DEMP will be produced at ES stage and will accompany the DCO application.

9.10.8 The short list of Cumulative Schemes identified in **PEI Report Volume 1, Chapter 15: Cumulative and Effect Interactions** have been screened for spatial and temporal overlaps with the Proposed Development. Where potential and, or temporal overlap of water environment receptors was thought to occur, the specific water environment receptors that fall within any area of overlap were identified. If the water environment receptors identified were considered to be sensitive, the overlapping development was taken forward for cumulative assessment.

9.10.9 From the short list of developments, the remaining developments have been scoped out of further assessment due to the Cumulative Developments existing outside of the 1km Zone of Influence for the Water Environment and were therefore deemed unlikely to have a combined impact due to there being no hydrological pathway for cumulative effects to occur (via surface water or groundwater pathways).

9.10.10 The ten Cumulative Schemes in **Table 9-16** were given consideration owing to their proximity to the Proposed Development or potential for impacts on the same water environment receptors as the Proposed Development. The impact assessment and significance of effects is presented in **Table 9-16**. Similar cumulative effects would be anticipated during decommissioning.

Table 9-16: Preliminary Assessment of Cumulative Effects during Construction

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
5	15/1347/OUT Associated applications: 24/0456/RESM / 22/0174/RESM / 21/0276/RESM	Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access)	123	This development is located in the Fleet Lower (trib of Trent) WFD catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
8	18/0760/OUT / 21/1045/RESM	Residential development of up to 144 dwellings and associated works (outline with means of access) / Reserved matters application for the erection of 144 no. dwellings and associated works with details of internal access road layout, appearance, landscaping, layout & scale pursuant to outline permission 18/0760/OUT	1006	This development is located in the South Hykeham Catchwater WFD catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
13	18/1560/EIASCO	Development of a 55km potable water pipeline from Lincoln to Grantham with associated	0	This development is located in the Dunston Beck WFD catchment. It will cross the Cable Corridor north of Navenby but does not appear to be in close proximity to

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		infrastructure including partially buried 20 million litre bulk potable water storage tank, 3km connecting pipeline to Anglian Water (AWS) site at Bracebridge Heath (Bracebridge Spur), connecting sections of pipeline to the existing Central Lincs Trunk Main, partially buried 3million litre break tank and the erection of 3 pumping stations (the Grantham Resilience Pipeline Project).		any watercourses at this crossing point which reduces the risk. Nonetheless, there is some potential for cumulative potential pollution to occur to more distant watercourses via runoff containing pollutants and fine sediment, chemical spillages, or to groundwater. There could also be increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
33	20/1523/FUL	Hybrid planning application consisting of full planning permission for Phase 4 - the erection of four units comprising uses E, B2 and B8 with associated access, car parking and landscaping and outline permission with all matters reserved for phases 5 to 7 consisting of the proposed erection of commercial units comprising use classes E, B2 and B8	615	This development is located in the Witham (confluence of Cringle Brook to confluence with the Brant) WFD catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
34	20/1736/RESM	Residential development of 70 no. affordable dwellings (Cell	257	This development is located in the Witham (confluence of Cringle Brook to confluence with the Brant) WFD

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		2B). Reserved Matters application comprising details of appearance, landscaping, layout and scale pursuant to outline planning permission 15/1347/OUT - Erection of up to 1,100 dwellings and 150 care/retirement units (C2/C3), the formation of a roundabout to Camp Road, A46 junction improvement works, public open spaces and associated service infrastructure (outline with means of access)		catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
37	21/1245/FUL	Installation of a 100.3kW ground mounted solar PV installation comprising of 264 solar panels.	942	This development is located in the Dunston Beck WFD catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
49	22/0520/FUL	Installation of a ground based solar PV array (approximately 6KW)	364	This development is located in the Witham (confluence of Cringle Brook to confluence with the Brant) WFD catchment. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
58	22/1785/FUL	Erection of 18 no. affordable houses with associated infrastructure	528	This development is located in the Witham (confluence of Cringle Brook to confluence with the Brant) WFD catchment. The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
63	EN010149	Springwell Solar Farm is a proposed new solar farm with	0	This cumulative development partially overlaps with the Proposed Development at its eastern extent for the grid

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		battery storage and supporting grid connection infrastructure in North Kesteven, Lincs		connection. The remainder of the development is located to the south and east of the Proposed Development, with two overlapping WFD catchments common to both schemes (Metheringham Beck and Dunston Beck WFD catchments). However, there are no watercourses in close proximity to the area of overlap between the two schemes. Nonetheless, there may be potential for cumulative pollution to groundwater from construction site runoff containing pollutants, for example from chemical spillages. Even so, assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
86	23/0584/EIASCR / 23/0390/EIASCO"	Erection of 400MW Battery Storage Development incorporating 324no. Containerised Battery Storage Units, 54no. transformer/inverter blocks and 8 back up auxiliary transformers, 4no. storage containers for spare parts etc, substation comprising 4-6no. switchgear units, a control room and a HV compound with 2 Step-up Transformers, associated access tracks, inverter, switchgear substations,	0	This development is located within the Proposed Development boundary. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		boundary treatments and CCTV - Request for Scoping Opinion		
89	PL/0055/23	To install a solar PV array development and associated infrastructure to generate electricity for the operation of Swinderby Quarry plant machinery and site offices.	500	This development appears to be located at the watershed between two WFD water bodies that also have the potential to be impacted by the Proposed Development and is located west of Witham St Hughs in the wider Study Area. These are the Fleet Lower Catchment (tributary of Trent) and Witham (confluence of Cringle Brook to confluence with the Brant) WFD catchments. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
95	PL/0087/23	For construction of the North Hykeham Relief Road (NHRR) between the A46 Hykeham Roundabout and the A15 Sleaford Road Roundabout at the end of the Lincoln Eastern Bypass, with junctions at South Hykeham Road, Brant Road and Grantham Road. The	0	The southern extent of the North Hykeham Relief Road (NHRR) would be located within the South Hykeham Catchwater WFD water body, approximately 750 m east of the Proposed Development. There is potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction.

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		Proposed Scheme will comprise 8km of dual all-purpose carriageway with a 70mph speed limit (120kph design speed) and associated structures, earthworks, drainage, street lighting, traffic signals, utility diversions and installations, pipeline diversion, temporary materials processing, landscaping, and highway features		Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
98	EIA/02/04	For variation of conditions 2, 28 and 29 under planning permission 14/0385/CCC - to enable a proposed revision of the restoration scheme and a change to the silt management arrangements approved at Whisby Quarry	599	Whisby Quarry is in close proximity to Pike Drain. There may be some potential for cumulative pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. However, the cumulative development is a restoration scheme and any adverse effects would be expected to be short term and in relation to the construction phase. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
99	EIA/03/24	For the installation of floating Solar PV arrays plus terrestrial based ancillary infrastructure	499	This development is located in the Boultham Catchwater Drain WFD catchment. The potential for cumulative potential pollution to local watercourses and/or

ID	Application reference	Cumulative Scheme description	Distance from the Proposed Development (m)	Summary of cumulative effect
		and equipment, cable route and access		groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**
101	24/0075/EIASCR	Erection of 240MW Battery Storage Development incorporating approximately 75no. inverter skids, approximately 75 no. battery skids, approximately 4no. switchrooms, DNO equipment compound, CCTV Security Cameras, internal access road and DNO access road Request for Screening Opinion	840	This development is located in the Metheringham Beck WFD catchment. There do not appear to be any watercourses that intersect both schemes. However, there remains potential for cumulative impact to groundwater from runoff or spillages. Assuming the Cumulative Scheme would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Proposed Development (not significant).**

Operation and Maintenance

9.10.11 Drainage strategies for all cumulative developments would be produced with reference to the relevant policies and guidance documents outlined in Section 9.2. It is assumed that flood risk assessments and appropriate drainage strategies are to be developed in line with good practice.

9.10.12 The Cumulative Schemes assessed in this chapter will similarly be designed to ensure no long-term deterioration in water quality or increase in flooding. Attenuation and treatment will be provided for runoff from each scheme prior to discharge to waterbodies or ground. As such, provided that all the mitigation measures are implemented for all schemes, then the cumulative impacts from the Proposed Development and any cumulative developments would not be anticipated to produce any significant effects during operation.

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