# FENWICK SOLAR FARM

## Preliminary Environmental Information Report

## Volume I Chapter 9: Water Environment

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# 9. Water Environment

## 9.1 Introduction

9.1.1 This chapter presents the findings of a preliminary assessment of the likely significant effects on the water environment as a result of the Scheme. This includes consideration of surface water features (such as rivers, streams, ditches, and lakes) and groundwater (in terms of quality, flows, levels and resources), flood risk and demand for water resources. However, any impacts on ponds are assessed in **PEIR Volume I Chapter 8: Ecology**, which includes details of relevant protected species and aquatic ecology surveys. Where designated ecological sites are sensitive to changes in hydrology or water quality and are hydrologically linked (i.e. where they are 'water dependent') an assessment of the potential impact to them is also considered in this chapter.

9.1.2 Any effects of contaminated land on surface or groundwater are included within Preliminary Risk Assessments (PRAs) completed for the Solar PV Site and Grid Connection Corridor (**PEIR Volume III Appendices 14-3 to 14: 4**). This is also covered in **PEIR Volume I Chapter 14: Other Environmental Topics**.

9.1.3 For more details about the Scheme, please refer to **PEIR Volume I Chapter 2: The Scheme** of this PEIR.

9.1.4 This assessment is supported by the following appendices that are presented in **PEIR Volume III**:

a. **Appendix 9-1: Legislation, Policy and Guidance (Water Environment)**;

b. **Appendix 9-2: Water Framework Directive Screening and Scoping Report**;

c. **Appendix 9-3: Preliminary Flood Risk Assessment**; and

d. **Appendix 9-4: Preliminary Drainage Strategy**.

9.1.5 The chapter is also supported by the following figures that are presented in **PEIR Volume II**:

a. **Figure 9-1: Surface Water Features and their Attributes**;

b. **Figure 9-2: Groundwater Features and their Attributes**;

c. **Figure 9-3:** W**atercourses, and Flood Zones and Internal Drainage Boards**;

d. **Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Sea)**;

e. **Figure 9-5: Risk of Flooding from Surface Water**;

f. **Figure 9-6: Superficial Deposits**; and

g. **Figure 9-7: Bedrock Deposits**.

## 9.2 Study Area

9.2.1 For the purposes of this assessment, a general Study Area of 1 km around the Site Boundary has been considered in order to identify water features that are hydrologically connected to the Scheme and have the potential to be impacted by the activities associated with it. The 1 km Study Area is based on professional judgement, and is a generally accepted distance for a water environment Study Area. The Study Area around the Solar PV Site and the Grid Connection Corridor is shown in **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**. The Grid Connection Corridor includes some local roads which may be impacted by the Scheme.

9.2.2 Given that watercourses flow and water quality and flood risk impacts may propagate downstream, where relevant the assessment also considers a wider Study Area to as far downstream as a potential impact may influence the quality or quantity of water available for any water features. In this case, watercourses across the Study Area generally drain to the River Don, which is considered the final receiving water feature that could conceivably be significantly affected. This is located approximately 5.5 km east and downstream from the Solar PV Site and adjacent to the eastern boundary of the Grid Connection Corridor at the southern end of the route. This is shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**.

## 9.3 Legislation, Planning Policy and Guidance

9.3.1 Legislation, planning policy, and guidance relevant to this assessment and pertinent to the Scheme is outlined in this section, as shown in more detail in **PEIR Volume III Appendix 9-1: Legislation, Policy and Guidance (Water Environment)**. There are a number of regulations that are concerned solely with the transfer of powers to the United Kingdom Government to ensure that European Union legislation remains functional as intended but otherwise do not change the requirements of the legislation. These specific pieces of legislation are not detailed as they are not material to the outcome of this assessment.

### Legislation

9.3.2 Legislation to be considered includes:

a. Environment Act 2021 (Ref. 9-1);
b. Water Act 2014 (Ref. 9-2);
c. Flood and Water Management Act 2010 (Ref. 9-3);
d. Environmental Protection Act 1990 (Ref. 9-4);
e. Land Drainage Act 1991 (as amended) (Ref. 9-5);
f. Water Resources Act 1991 (as amended) (Ref. 9-6);
g. Salmon and Freshwater Fisheries Act 1975 (as amended) (Ref. 9-7);
h. Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations 2017 (Ref. 9-8);

i. Environmental Damage (Prevention and Remediation) Regulations 2017 (as amended) (Ref. 9-9);

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

k. Eels (England and Wales) Regulation 2009 (Ref. 9-12): gives powers to the regulators to implement recovery measures in all freshwater and estuarine waters in England and Wales and for which new developments that could impact eels should take into account;

l. Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 9-13);

m. Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref. 9-14);

n. Control of Substances Hazardous to Health (Amendment) Regulations 2004 (Ref. 9-15);

o. Anti-Pollution Works Regulations 1999 (Ref. 9-16);

p. The Water Framework Directive (WFD) (Standards and Classification) Directions 2015 (Ref. 9-17); and

q. The Building Regulations. Approved Document Part H: Drainage and Waste Disposal (2010) (Ref. 9-18).

### National Planning Policy

9.3.3 National planning policy and guidance to be considered includes:

a. Overarching National Policy Statement for Energy (EN-1) (November 2023) (Ref. 9-19);

b. National Policy Statement EN-3 (November 2023) (Ref. 9-20);

c. National Policy Statement EN-5 (November 2023) (Ref. 9-21);

d. National Planning Policy Framework (NPPF) (December 2023) (Ref. 9-22);

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

f. The UK Government's Future Water Strategy (2011) (Ref. 9-24): sets out a framework for water management in England.

### National Guidance

9.3.4 The National Planning Policy Guidance (NPPG) provides guidance for local planning authorities on assessing the significance of water environmental effects of proposed developments.

9.3.5 The NPPG includes guidance on Flood Risk and Coastal Change (Ref. 9-25) which recommends that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and should develop policies to manage flood risk from all sources taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs).

9.3.6 NPPG also includes guidance on renewable and low carbon energy (Ref. 9-26). This includes guidance to help local councils in developing policies for renewable and low carbon energy. A section on battery energy storage systems and the potential for fire risks is included.

9.3.7 The Environment Agency provides guidance on the approach to protection of groundwater in a number of position statements (Ref. 9-27). This includes Position Statement A (Risk Based Approach); Position Statement B (Protection of Water Intended for Human Consumption), Position Statement G (Discharge of Liquid Effluents into the Ground); and Position Statement N (Groundwater Resources and Abstraction).

## Regional Policy

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

9.3.9 The water bodies within the Study Area fall under the Humber RBMP (Ref. 9-28). The most recent RBMP for the Humber river basin districts were updated in October 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 WFD status of the water bodies in the area. More information on these is included in the baseline section of this chapter.

## Local Planning Policy

9.3.10 The following local planning policies are of relevance to the water environment.

### City of Doncaster Council

9.3.11 The following policies from the Doncaster Local Plan 2015-2035 (Ref. 9-29), adopted in September 2021 are of relevance to the water environment assessment:

a. Policy 1: Settlement Hierarchy (Strategic Policy), section 7 Flood Risk;
b. Policy 33: Landscape (Strategic Policy), Part D;
c. Policy 54: Pollution, Part D;
d. Policy 55: Contamination and Unstable Land, Part A;
e. Policy 56: Drainage;
f. Policy 57: Flood Risk Management Parts A-D; and
g. Policy 60: Protecting and Enhancing Doncaster’s Soil and Water Resources, Parts E and F.

## Guidance Documents

9.3.12 The following guidance is relevant to the water environment assessment.

### Connected by Water Action Plan (Ref. 9-30)

9.3.13 The Study Area is located within the boundary of the City of Doncaster metropolitan borough. The City of Doncaster Council and various stakeholders published the Connected by Water Action Plan in January 2023 (Ref. 9-30), which proposes actions covering flood risk such as the Doncaster Borough Wide Surface Water Alleviation Scheme.

### Yorkshire and Humber Business Plan 2020/2021 (Ref. 9-31)

9.3.14 The City of Doncaster Council is a member of the Yorkshire Leaders Board, and the Study Area is located within land included in the Yorkshire and Humber Business Plan 2020/21. The Yorkshire Leaders Board has identified flooding as a priority area in the Yorkshire and Humber Business Plan 2020/21 and published the Yorkshire and Humber Flood Resilience Forum 2022, which aims to support the integration of flood resilience into wider strategy and policy (Ref. 9-31).

### The Don Catchment Flood Management Plan (2020) (Ref. 9-32)

9.3.15 The Don Catchment Flood Management Plan (2010) (Ref. 9-32) that covers the Study Area considers all types of inland flooding and sets policies for managing flood risk within the catchment. The Study Area is located within sub-area 6 where the policy is: "*Areas of moderate to high flood risk where we can generally take further action to reduce flood risk*".

### Strategic Flood Risk Assessment (SFRA)

9.3.16 A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk.

9.3.17 The following Doncaster Metropolitan Borough Council Level 1 SFRA (November 2015) (Ref. 9-33) is available for the Study Area, which is located in the administrative area of the City of Doncaster Council and will be reviewed in full in the ES.

9.3.18 The Doncaster Metropolitan Borough Council SFRA (Ref. 9-33) states that the majority of fluvial flood risk in the Council area comes from the River Don and its tributaries to the north of Doncaster. The south east section of the Grid Connection Corridor is at risk of flooding from the River Don.

9.3.19 The Flood Zone mapping in the SFRA differentiates between Flood Zone 3a and Flood Zone 3b, which is functional floodplain. Definitions of the Flood Zones are provided in Section 9.7 of this chapter. Flood Zone 3b is based on the 5% annual probability of flooding or the 4% annual probability of flooding. The sections of the Site in Flood Zone 3b are located within the northern section of the PV Solar Site (functional floodplain of the River Went), and the south eastern section of the Grid Connection Corridor (functional floodplain of River Don).

## 9.4 Assumptions, Limitations and Uncertainties

9.4.1 At this stage site visits have been undertaken for the Solar PV Site, and site visits will be undertaken for water features within the Study Area of the Grid Connection Corridor before the ES stage. For this preliminary impact assessment, water features along the Grid Connection Corridor have been assigned a receptor importance based on desk top assessment only. A walkover survey of the land within the Grid Connection Corridor will inform the final impact assessment to be presented within the ES.

9.4.2 The assessment submitted with the ES will also be informed by further, more detailed, hydromorphological walkovers due to take place before the Development Consent Order (DCO) Application. This will include watercourses within the Grid Connection Corridor, or the character of watercourses will be determined up or downstream of the crossing locations if there are access restrictions or other issue with visibility. It is considered that visual inspection up or downstream on the crossing locations, together with desk study information, will provide a robust basis for the assessment. Site walkover will be when land access is confirmed. When surveys are undertaken, these will seek to ground truth and identify all of the surface water features on the Site, including visiting watercourses where they may be crossed (where practicable). However, there may be access and vegetation constraints that prevent full coverage of the Site. Seasonally dry and ephemeral watercourses, especially in locations close to the headwaters of a catchment are very difficult to identify in the field. For these small, minor water features, a best endeavours approach will be adopted.

9.4.3 This chapter forms a preliminary assessment which has been based on available information at the time of preparing the PEIR for the Scheme. A final assessment is being undertaken as part of the EIA and will be reported as a standalone chapter in the ES that will be submitted with the DCO Application.

9.4.4 The assessment assumes that the WFD reportable reaches of watercourses (but not necessarily including smaller tributaries with a WFD water bodies catchment) will be crossed using underground techniques that would pass beneath the hard bed of the watercourse by a minimum of 1.5 m so as not to disturb the channel or risk being exposed by future bed scour. Where a crossing of a watercourse is at least 1.5 m below the bed of a Main River, the cable crossing would be exempt from the requirement of attaining an Environmental Permit (Ref. 9-10) due to the activity being of low risk to the watercourse flow, providing all other conditions for the exemption can be met (e.g. the crossing needs to be at least 1.5 m below the bed of a Main River, and the same height needs to be maintained for at least 5 m beyond each bank).

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

9.4.6 For intrusive crossings of small watercourses, it is assumed that water flow would be maintained by temporarily damming the watercourse and either over pumping or fluming the flow through the works. Further details on the final crossing proposals for watercourses will be provided at ES stage and the relevant statutory stakeholders consulted.

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

9.4.8 The Solar PV Panels will be set back from all water features by 10 m (measured from the water's edge/channel extent under normal flow conditions) to create a buffer zone. This is slightly greater than the 9 m from the bank top the IDB has requested to take account of the uncertain distance of the bank top around the watercourse (which are generally steep).

9.4.9 The buffer from water features, together with the measures to be outlined within the Construction Environmental Management Plan (CEMP) (see **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**), will ensure all construction activities for the installation of Solar PV Panels and infrastructure would be offset from surface watercourses, other than where there is a need for crossing of a watercourse (such as for cabling installation or possible temporary access) or connection for surface water drainage (that may be for temporary works or for the operational Scheme). Any works to enhance watercourses would also require direct works to the channel and banks, although given the beneficial aim of these works, their small-scale and 'soft-engineering' nature, construction impacts would be minimal (e.g. bank scrapes or the creation of low flow berms). Overall, the inclusion of this buffer reduces the risk of any pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) where they are required.

9.4.10 The risk from surface water runoff to surface or groundwater features has been provisionally assessed qualitatively on the basis of design principles that will be presented in further detail in an outline drainage strategy at the ES stage, and delivery of this will be a Requirement of the DCO. As part of the final EIA to be presented within the ES and accompanying the DCO Application, the risk from surface water runoff from new hard standing (i.e. surfaces where diffuse urban pollutants may accumulate) to surface or groundwater features will be assessed according to the Simple Index Approach presented in the C753 The SuDS Manual (Ref. 9-34). This is presented in the Preliminary Drainage Strategy included in **PEIR Volume II Appendix 9-4: Preliminary Drainage Strategy**. It is expected on the basis of experience of other similar developments and professional judgement that the pollutant risk will not be very high from surface water runoff and so that only one or two layers of treatment would be required. It is also expected that there will be sufficient space within the Solar PV Site for a treatment solution following SuDS principles. However, there is also potential to use proprietary measures if there is a greater risk around certain infrastructure or there are localised constraints.

9.4.11 It is assumed at this stage from professional experience of other solar schemes, that the foundations required for the Field Stations in the Solar PV Site will be constructed using blocks or plinths with maximum excavation being assumed to be in the region of 1m for the plinths. There may be a requirement for some narrow piles depending on local geology.

9.4.12 The Solar PV Panels will be held above ground on narrow diameter piled legs, which may be 1.8-3 m in depth. This prevents sealing the ground with an impermeable surface and will allow any rainwater to infiltrate into the ground. In order to limit the potential for channelisation from rainfall dripping off the end of the Solar PV Panels, the areas between, under and surrounding the Solar PV Panels will be planted with native grassland. This planting will intercept and absorb rainfall running off the Solar PV Panels, preventing it from concentrating and potentially forming channels in the ground. The pollution risk from this runoff is minimal as Solar PV Panels do not contain any liquid (hazardous or not) that could contaminate rainwater. They may be cleaned on occasion, every two years, with the cleaning taking place with no added chemical cleaning agents, other than a biodegradable water softener. 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 or require any local abstraction.

9.4.13 Swales would be provided for draining the impermeable areas associated with the BESS Area and On-Site Substation, and would, ultimately drain to a nearby watercourse. With regards to the BESS Area, any fire water runoff would be contained within the lined impermeable swale using a penstock to ensure no firewater is released to groundwater or to surface water without prior testing. The swale will be sized to store surface water and fire water. There will be a volume of 300 $m^3$ to provide a water supply which can deliver no less than 1,900 litres per minute for at least 2 hours. In addition to this supply requirement, a 30% additional capacity has been applied for storage in the swale. Above ground storage tanks would be used to store water required for any firefighting. This water is assumed to be supplied from imported mains water. This will be confirmed at ES stage.

9.4.14 There would also be some perimeter swales to collect any exceedance surface water flows from the Solar PV Site which would discharge to watercourses.

9.4.15 Within the impact assessment, flood risk will be considered in terms of the potential for the Scheme to change existing flood risk (from all sources) and to impact on receptors that are determined based on the land uses present in the areas that a flood risk applies to, and their associated vulnerability class as defined in the NPPF and NPPG. The FRA will consider the suitability of the Site for a solar development. The Preliminary Flood Risk Assessment is included as **PEIR Volume III Appendix 9-3: Preliminary Flood Risk Assessment** to this report.

9.4.16 Specific requirements for any hydraulic modelling of watercourses are currently being agreed with the Environment Agency/LLFA to determine modelling requirements specifically regarding climate change scenarios and any modelling will be undertaken as part of the ES to inform the FRA and Surface Water Drainage Strategy. The Preliminary Flood Risk Assessment and Preliminary Drainage Strategy are included as **PEIR Volume III Appendix 9-3: Preliminary Flood Risk Assessment** and **PEIR Volume III Appendix 9-4: Preliminary Drainage Strategy** of this report, respectively.

9.4.17 The final FRA and Surface Water Drainage Strategy at ES stage will be based on desktop surveys, Site walkover, Site layout proposals and modelling outcomes where appropriate. Where available, topographical data will be used to support the FRA. In the absence of topographical data, LiDAR data will be used to inform the FRA and Surface Water Drainage Strategy. The use of LiDAR data is not a limitation to the conclusions provided in these documents to date as it is the best available topographic data for the Study Area, and it is considered sufficiently accurate for these purposes.

9.4.18 With regard to flood risk, temporary works will not be assessed unless they have the potential to adversely affect flood risk or impact the quality or form of water features. The temporary works where such risks are considered to have potential adverse effects on flood risk or the water environment (for example, excavations for the Grid Connection Corridor), will be identified and assessed within the FRA and impact assessment (within this chapter and then within the ES).

9.4.19 There will be welfare facilities associated with the Scheme for an anticipated one to two permanent (full time equivalent) members of staff, with some part time day attendance as required, during the operation and maintenance phase. Given the low daily occupancy only small volumes of foul drainage will be generated. At this point in time, it is not known how any wastewater from permanent welfare facilities will be managed. However, this is anticipated to consist of a self-contained independent non-mains cess pit sealed tank, or portaloos with no discharge to ground. These tanks would be regularly emptied under contract with a registered recycling and waste management contractor. As there would be no discharge of foul water to a watercourse, and no discharge to the public foul sewer is anticipated, no further assessment of foul waste from the Scheme is proposed. However, this will be reviewed at the ES stage when further detail is available.

## 9.5 Assessment Methodology

### Sources of Information

#### Desktop Survey

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

a. Online Ordnance Survey (OS) maps viewed to identify any surface water features within the Study Area (Ref. 9-35);
b. Online aerial photography (Ref. 9-36);
c. Part 1: Humber River Basin District River Management Plan (Ref. 9-28);
d. The Met Office website (Ref. 9-37);
e. National Rivers Flow Archive website (Ref. 9-38);
f. Environment Agency’s Catchment Data Explorer Tool (Ref. 9-39);
g. Environment Agency’s Water Quality Archive website (Ref. 9-40);
h. Environment Agency’s Fish and Ecology Data View (Ref. 9-41);
i. Multi-agency geographical information for the countryside (MAGIC) website (Ref. 9-42);

j. British Geological Survey (BGS) Borehole and Geology Mapping Geoindex website (Ref. 9-43);
k. The Cranfield University Soilscape website (Ref. 9-44);
l. Natural England Designated Site website (Ref. 9-45);
m. Gov.uk Online Interactive Maps (Ref. 9-46):
    i. Flood map for planning (rivers and sea).
    ii. Risk of flooding from surface water.
    iii. Risk of flooding from reservoirs.
    iv. Flood warning areas and risk.
n. City of Doncaster Council Private Water Supplies information; and
o. Environment Agency information on pollution incidents, and water activity permits.

9.5.2 The Preliminary FRA presented within **PEIR Volume III Appendix 9-3: Preliminary FRA** provides further details of relevant catchment and flood risk data, and flood risk desktop survey information.

### Field Survey

9.5.3 At this stage, the hydromorphological character for the Solar PV Site has been assessed from field survey walkover information on 27 July 2023 and 8 November 2023. For the survey walkovers completed in July, the antecedent weather conditions were dry, resulting in generally low flow conditions throughout. For the survey walkover in November, the antecedent weather conditions were rainfall, resulting in moderate flow conditions observed. The character of watercourses within the Grid Connection Corridor has been assessed from desk top assessment only at this stage. The geomorphology of the watercourses along the Grid Connection Corridor will be confirmed during field surveys undertaken at the ES stage. This will include site visits of all proposed watercourse crossings by the Grid Connection Corridor, or by access track crossing locations, whether they are proposed to be permanent or temporary.

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

### Source-Pathways-Receptor Approach

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

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

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

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

c. A pathway by which the two are linked.

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

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

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

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

#### Hydromorphology

9.5.11 At this stage, the hydromorphological character of the watercourses within the Solar PV Site has been assessed based on desk top and field survey information. Hydromorphological character of the watercourses within the Grid Connection Corridor has been assessed based on desk top survey of mapping and aerial photos and is considered a sufficiently robust assessment of the character of the watercourses at this stage. Further survey of the Grid Connection Corridor will be undertaken at the ES stage. This will include site visits of all watercourses to be crossed along the Grid Connection Corridor, by the cable or access tracks, either permanent or temporary.

9.5.12 Potential hydromorphological impacts for the Solar PV Site and the Grid Connection Corridor have been qualitatively appraised based on survey data and a desk study, and a review of the Scheme components that may affect the physical form of water features.

9.5.13 Consideration has also been given to how the Scheme is likely to impact upon the WFD objectives for the relevant watercourses within **PEIR Volume III Appendix 9-2: WFD Screening and Scoping Report**. Effects are described according to the method for determining effect significance set out in **PEIR Volume I Chapter 5: EIA Methodology**.

9.5.14 Further information on the hydromorphology of the watercourses is included within the baseline and as part of the WFD Screening Assessment that is presented within **PEIR Volume III Appendix 9-2: WFD Screening and Scoping Report**.

#### Flood Risk Assessment

9.5.15 A preliminary FRA is provided in **PEIR Volume III Appendix 9-3: Preliminary FRA** which assesses the current risk of flooding from all sources including fluvial, tidal, surface water, groundwater, sewer and artificial sources. Please refer to the Preliminary FRA for a full description of the flood risk baseline, which is also summarised in the baseline section of this PEIR chapter.

#### Drainage Strategy

9.5.16 For this PEIR, a Preliminary Surface Water Drainage Strategy has been prepared and is presented within **PEIR Volume III Appendix 9-4: Preliminary Surface water Drainage Strategy.** The drainage strategy provides initial drainage design details for new impermeable areas within the Solar PV Site which includes the BESS Area and On-Site Substation. The design includes attenuation features in the form of swales, which will aim to mimic the natural drainage regime as far as practicable. The assessment includes the estimation of surface water attenuation requirements.

#### Assessment of Surface Water Runoff for the Operation and Maintenance Phase

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

9.5.18 The appropriateness of design within the Preliminary Drainage Strategy has been assessed with reference to the Simple Index Assessment method described in the SuDS Manual (Ref. 9-34). This is included within the Preliminary Drainage Strategy within **PEIR Volume III Appendix 9-4:**

**Preliminary Drainage Strategy** and will be revisited at ES stage. 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 feature protected for drinking water, consider a more precautionary approach.

9.5.19 The SuDS Manual (Ref. 9-34) only provides a limited number of land use types and so those selected will be the most suitable for the components of the Scheme, based on professional judgement. Where more than one pollution hazard category applies to a component of the Scheme, the worst pollution hazard will be selected for the conveyance features.

### Water Framework Directive Assessment

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

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) taking into account the conservation objectives of any relevant Protected Areas.

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

a. Environment Agency Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity' (Ref. 9-47); and

b. The Planning Inspectorate Advice Note 18: The Water Framework Directive' (Ref. 9-48).

9.5.22 The assessment will be undertaken in three stages. The first stage is 'screening', the aim of which is to identify the Scheme components that could affect WFD status and 'screen out' aspects of the Scheme that do not require any further consideration. The second stage is 'scoping', whereby WFD receptors that are potentially at risk are identified and it is determined how the risk will be assessed. Finally, and if required, the third stage involves a full impact assessment and, potentially, consideration of the criteria for derogation of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 9-8), if required. The WFD regulations set out the conditions that must be met to justify derogation of compliance with WFD objectives.

9.5.23 Watercourses that do not have individual WFD classifications take the classification of the receiving water body. **PEIR Volume III Appendix 9-2:**

**WFD Screening and Scoping Report** presents the screening (Stage 1) and scoping (Stage 2) assessment. If necessary, a full impact assessment (Stage 3) will be conducted alongside the ES, if agreed during consultation with the Environment Agency.

### Matters Scoped out of the Assessment

9.5.24 Within **PEIR Volume III Appendix 1-1: EIA Scoping Report**, it was presented that the area is not within an area affected by Natural England nutrient management restrictions. Also, as the Scheme would reduce the runoff of nutrients into the surrounding watercourses, that nutrient neutrality can be scoped out of the assessment. Within the **PEIR Volume III Appendix 1-2: EIA Scoping Opinion**, the scoping out of nutrient neutrality was agreed by the Planning Inspectorate.

### Determining the Significance of Effects

9.5.25 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 (Ref. 9-50) adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The criteria that will be used to determine receptors importance is presented in Table 9-1. Further information on the general assessment methodology is included within **PEIR Volume I Chapter 5: EIA Methodology**.

9.5.26 Whilst other disciplines may consider ‘receptor sensitivity’, instead ‘receptor importance’ is considered when determining the significance of effects on the water environment. This is because, when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water 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.

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

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

b. The magnitude of potential and residual impact (classed as negligible, low, medium and high adverse/beneficial) is determined based on the criteria listed in Table 9-2 and the assessor's professional judgment. Embedded or standard mitigation measures are taken into account in the initial assessment, but any other mitigation is not considered until the assessment of residual effects.

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

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

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

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

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

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

9.5.30 At a spatial level, 'local' effects are those affecting the Scheme within the Site and neighbouring receptors within the Study Area, while effects upon receptors including and beyond the vicinity of the Study Area but within the same region of the country, are considered to be at a 'regional' level. Effects which affect different parts of the country, or England as a whole, are considered being at a 'national' level. Spatial importance is built into the criteria for determining importance as outlined in Table 9-1 and is therefore taken into account in the process of determination significance of effects.

9.5.31 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 Scheme with identified mitigation in place will then be reported. Effects of moderate or greater are considered significant.

**Table 9-1: Criteria to Determine Receptor Importance (Adapted from LA113) (Ref. 9-49)**

| Importance | General Criteria | Surface Water | Groundwater | Hydromorphology | Flood Risk |
|---|---|---|---|---|---|
| Very High | The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. | Salmonid fishery. Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0 $m^3/s$; site protected/designated under international or UK habitat legislation (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), WPZ, Ramsar site. Critical social or economic uses (e.g. public water supply and navigation). | Source Protection Zone (SPZ) 1; Principal aquifer providing a regionally important resource and/or supporting a site protected under international and UK legislation; Groundwater locally supports GWDTE; Water abstraction: >1,000 $m^3$/day. | Unmodified, pristine (or near to) conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type. | Essential Infrastructure or highly vulnerable development. |
| High | The receptor has low ability to absorb change without fundamentally altering its present character, is of high | Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0 $m^3/s$; | Principal Aquifer providing locally important source supporting rover ecosystem; SPZ2; Groundwater | 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 | More vulnerable development. |

| Importance | General Criteria | Surface Water | Groundwater | Hydromorphology | Flood Risk |
|---|---|---|---|---|---|
| | environmental value, or of national importance. | Major Cyprinid Fishery; Species protected under international or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction. | supports GWDTE; Water abstraction: 500- 1,000 $m^3$/day. | natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures. | |
| Medium | The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance. | Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small/limited population of protected species. Limited social or economic uses. | Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water abstraction: 50-499 $m^3$/day. | Shows signs of previous alteration and/or minor flow/water level regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category. | Less vulnerable development. |

| Importance | General Criteria | Surface Water | Groundwater | Hydromorphology | Flood Risk |
|---|---|---|---|---|---|
| Low | The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. | Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated in its own right. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses. | Generally Unproductive strata. Water abstraction: <50 $m^3$/day. | Substantially modified by past land use, previous engineering works or flow/water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category. | Water compatible development. |
| Negligible | The receptor is resistant to change and is of little environmental value. | Not applicable. | Not applicable. | Not applicable. | Not applicable. |

**Table 9-2: Magnitude of Impact Criteria (Adapted from LA113) (Ref. 9-49)**

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

| Magnitude of Impact | Description | Examples |
| --- | --- | --- |
| | | Contribution to reduction in water body WFD classification.<br>Damage to major structures through subsidence or similar effects or loss of minor structures.<br>**Flood Risk:**<br>Increase in peak flood level > 50 mm. |
| Low Adverse | Results in some measurable change in attribute's quality or vulnerability. | **Surface water:**<br>Minor effects on water supplies.<br>**Groundwater:**<br>Minor effects on an aquifer, GWDTEs, abstractions and structures.<br>**Flood Risk:**<br>Increase in peak flood level >10 mm. |
| Very Low Adverse/Beneficial | Results in impact on attribute, but of insufficient magnitude to affect the use or integrity. | **Surface/Groundwater:**<br>The Scheme is unlikely to affect the integrity of the water environment.<br>**Flood Risk:**<br>Negligible change to peak flood level (≤ +/- 10 mm). |
| Low Beneficial | Results in some beneficial impact on attribute or a reduced risk of negative impact occurring. | **Surface Water:**<br>Contribution to minor improvement in water quality, but insufficient to raise WFD classification.<br>**Groundwater:**<br>Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.<br>**Flood Risk:**<br>Creation of flood storage and decrease in peak flood level (>10 mm). |
| Medium Beneficial | Results in moderate improvement of attribute quality. | **Surface Water:**<br>Contribution to improvement in water body WFD classification.<br>**Groundwater:**<br>Contribution to improvement in water body WFD classification.<br>Improvement in water body catchment abstraction management strategy (CAMS) (or equivalent) classification.<br>Support to significant improvements in damaged GWDTE. |

| Magnitude of Impact | Description | Examples |
|---|---|---|
| | | **Flood Risk:**<br>Creation of flood storage and decrease in peak flood level (>50 mm). |
| High Beneficial | Results in major improvement of attribute quality | **Surface Water:**<br>Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse.<br>Improvement in water body WFD classification.<br>**Groundwater:**<br>Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.<br>**Flood Risk:**<br>Creation of flood storage and decrease in peak flood level (>100 mm). |
| No change | No loss or alteration of characteristics, features or elements; no observable impact in either direction. | |

**Table 9-3: Matrix for Assessment (Adapted from LA104) (Ref. 9-50)**

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

## 9.6 Stakeholder Engagement

9.6.1 A request scoping exercise was undertaken in spring 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**PEIR Volume III Appendix 1-1: EIA Scoping Report**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good practice and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on the Water Environment.

9.6.2 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**PEIR Volume III Appendix 1-2: EIA Scoping Opinion**).

9.6.3 A full review of all comments raised in the Scoping Opinion is provided in **PEIR Volume III Appendix 1-3: EIA Scoping Opinion Responses**. This also outlines how and where the Scoping Opinion comments have been addressed within this PEIR or will be addressed within the ES.

### Additional Consultation

9.6.4 In addition to the above consultation responses, additional meetings have been held with the Environment Agency, on 3 October 2023, and the Danvm IDB on 4 August 2023. The meeting with the Environment Agency was to confirm the availability of the River Went modelling data and request any survey data on the existing flood defences. The meeting with the IDB was to present the approach to drainage from the Solar PV Site, and gain agreement over the approach to watercourse crossings, and their requirement for a 9 m buffer from the bank top. A consultation meeting was also held with City of Doncaster Council on 9 June 2023. This presentation was to introduce the Scheme, the advantages of the location and benefits from the Scheme.

## 9.7 Baseline Conditions

### Existing Baseline: Solar PV Site

#### Topography, Climate and Land Use

9.7.1 The topography of the Site and its 1 km Study Area is relatively flat, with existing ground levels under 10 m Above Ordnance Datum (AOD) according to online OS mapping (Ref. 9-35). There are flood plains associated with:

a. The River Went, a Main River, flowing from west to the east, discharging into the River Don; and

b. Fenwick Common Drain, transforming into Fleet Drain, which discharges into the River Went at the north eastern border of the Site.

9.7.2 In addition, there are numerous other Ordinary Watercourses within the Study Area that fall under the jurisdiction of the LLFA, the City of Doncaster Council, or Danvm IDB. These watercourses drain surface water from the surrounding agricultural areas.

9.7.3 Based on the Meteorological Office website (Ref. 9-37), the nearest weather station is located in Robin Hood Doncaster Sheffield Airport, approximately 17 km southeast of Fenwick. Using data from this weather station, for the period 1991 to 2020, it is estimated that the Study Area experiences approximately 582 mm of rainfall per year, with it raining more than 1 mm on approximately 113 days per year, which are both low in the UK context. This is relevant to the whole Study Area.

9.7.4 The area is currently used mainly for agriculture, with a mosaic of predominantly mixed agricultural fields. There are several small villages, hamlets and farms located throughout the Study Area.

### Surface Water Features

9.7.5 The Scheme may interact directly with seven surface water features within the Solar PV Site. These are:

a. River Went;

b. Fenwick Common Drain;

c. Fleet Drain;

d. North tributary to Fleet Drain;

e. South Tributary to Fleet Drain;

f. Ell Wood and Fenwick Grange Drain; and

g. Clay Dike.

9.7.6 These watercourses flow eastwards to the River Don, located approximately 5.5 km downstream of the Solar PV Site. This is considered the ultimate receptor for any potential water quality impacts.

#### River Went

9.7.7 The River Went is the only Main River within the Study Areas of the Solar PV Site. 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, for which the Environment Agency is the regulating authority.

9.7.8 The River Went (which discharges to the River Don at Selby Road outside of the Study Area) forms the northern Site Boundary to the Solar PV Site. This is shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**.

9.7.9 In addition, there are numerous Ordinary Watercourses within the Study Area. Section 72 of the Land Drainage Act 1991 (as amended) (Ref. 9-5) defines an Ordinary Watercourse as "*a watercourse that does not form part of a Main River*", and a 'watercourse' as "*all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows*." The LLFA (i.e. the City of Doncaster Council) is the regulating authority for these, other than those that are IDB drains (where they are maintained by the Danvm IDB).

9.7.10 The River Went flows in an easterly direction, towards the confluence with the River Don (Main River) at Selby Road, outside of the Study Area. Multiple agricultural ditches drain into the River Went from the north and south, within the Solar PV Site and the 1 km Study Area.

9.7.11 The nearest gauging station on the River Went is located upstream of the Study Area (approximately 3.5 km) at Walden Stubbs (Ref. 9-38) (see **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**). The catchment area upstream is 83.7 km$^2$.The daily mean flow is 0.575 cubic metres per second ($m^3/s$), with a flow that is exceeded 95% of the time (Q95) of 0.164 $m^3/s$, or 164 litres per second (Ref. 9-38).Therefore, the flow in the area of the Site would be expected to be higher than the gauged flow. Sections of the River Went, particularly where it interacts with the Site and downstream of the 1 km Study Area appear to be overly straight and have likely been modified. Within the River Went European Bullhead, *Cottus gobio*, have been found upstream of the Solar PV Site. This is an Annex II species which requires protection. More information on the aquatic ecology can be found within **PEIR Volume I Chapter 8: Ecology**.

### Fenwick Common Drain

9.7.12 Fenwick Common Drain (Ordinary Watercourse) flows through the Solar PV Site, in an easterly and northeasterly direction, as shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**. It crosses the Solar PV Site Boundary between Haggs Lane and Lawn Lane and flows east for approximately 1 km before flowing north, around Bunfold Shaw towards its confluence with Fleet Drain. An estimate of the Q95 flow for Fenwick Common Drain and Fleet Drain catchment is included in the section below.

### Fleet Drain

9.7.13 Fleet Drain (Ordinary Watercourse) is located within the Solar PV Site and flows northeast then directly north towards its confluence with the River Went (west of Topham Ferry Lane) (see **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**). An unnamed drainage ditch, known as southern tributary to Fleet Drain, flows east past Riddings Farm and Fenwick Hall and into Fleet Drain at NGR SE 61224 16460. Similarly, further downstream, another unnamed drainage ditch, known as northern tributary to Fleet Drain, flows into Fleet Drain at NGR SE 61661 16938. Fleet Drain is an overly straight and heavily modified drain.

9.7.14 There are no gauging stations on Fenwick Common Drain or Fleet Drain. The catchment area for Fenwick Common Drain and Fleet Drain is estimated to be 8.7 $km^2$, which is approximately 10% of the area of River Went at the point of the gauging station described above. Assuming a similar catchment character a proportional method can be used to estimate the flow along Fleet Drain. With the area being estimated to be 10% of the area of the Walden Stubbs gauging station, the Q95 is estimated to be 10% of that flow, or 0.016 $m^3/s$ (i.e. 16 litres per second). However, this should only be used as a guide as it is hard to estimate the catchment area due to the impact of human modification on the drainage of the area.

### Ell Wood and Fenwick Grange Drain

9.7.15 Ell Wood and Fenwick Grange Drain (Ordinary Watercourse) flows in an easterly direction, along the south edge of the Solar PV Site beginning north of Moss at the southwest corner of the Solar PV Site, as shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**. This drain continues to flow east, north of Moseley House Farm towards Flashley Carr Lane. This drain flows to outside of the 1 km Study Area for the Solar PV Site into Flashley Carr Drain, leading to Braithwaite Town Drain and Bramwith Drain.

9.7.16 There are multiple other smaller unnamed agricultural ditches and drains located within the Solar PV Site, which drain to the surface water features noted above. Further detail on their characteristics is given in the Hydromorphology section later in this chapter.

#### Clay Dike

9.7.17 Clay Dike (Ordinary Watercourse) is located within the 1 km Study Area of the Solar PV Site, and is located to the southeast corner of the Solar PV Site. Clay Dike appears to flow east, away from the Solar PV Site towards Blackshaw Dike before eventually draining to the River Don. The Solar PV Site works do not take place within the catchment area of Clay Dyke as it is located 750 m south east of the Site Boundary, so this is scoped out of further assessment.

#### Ponds

9.7.18 Ponds that are not hydrologically linked to watercourses are included within **PEIR Volume I Chapter 8: Ecology**. Ponds south of the River Went near to Topham at NGR SE 62153 17114 and SE 61984 17121 are located to the west of the Solar PV Site, approximately 0.25 km and 0.075 km west, respectively. These are hydrologically linked to a tributary to Fleet Drain, but on the east side of the watercourse. The Solar PV Site is to the west of Fleet Drain so any impacts will not affect these pond features, so they are scoped out of further assessment.

### Hydromorphology

9.7.19 The Scheme interacts with six watercourses within the Solar PV Site. The River Don is noted as a receptor within the water quality section above, due to the pathway of flow from the catchment via watercourses to the River Don. However, as the River Don is located 5.5 km east and downstream of the Site, and the Solar PV Site does not interact with the channel of the River Don, this is not covered in this section. The baseline hydromorphological information on each watercourse is provided in Table 9-4, informed by desk study and site visits.

**Table 9-4: Hydromorphology**

| Waterbody | Baseline |
|---|---|
| River Went | The River Went within the Study Area is designated as the Went from Blowell Drain to the River Don WFD water body, which is classed as heavily modified for its hydromorphological designation. The Went throughout the Study Area has a small degree of sinuosity and is approximately 10 m wide. Some sections appear overly straight and have likely been modified, as shown in Plate 9-1 though any such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-57) shows no changes in the River Went's course since this date. Geology mapping shows the River Went to possess a wide corridor of alluvium deposits that indicate the extent to which the river may have previously meandered across the floodplain. Wider superficial deposits consist of glaciolacustrine clay and silt. The riparian zone is scrub with occasional trees, providing some buffer from surrounding arable fields. The soils within the area local to the river are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas (Ref. 9-44) of grassland and woodland, though arable and agriculture is the prevailing land use.  **Plate 9-1: River Went, looking Upstream (NGR SE 59017 17153)** |

| Waterbody | Baseline |
|---|---|
| Fenwick Common Drain | Fenwick Common Drain does not have a WFD classification, therefore takes the classification of its receiving water body, the River Went. Fenwick Common Drain Plate 9-2 is highly modified with a trapezoidal channel, which has moderate sinuosity through the Study Area, although straightened sections indicate historic modification. Such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-57) shows no changes in the course since this date. Superficial deposits local to the channel consist of glaciolacustrine clay and silt. The channel is over-deep with approximately 2 m bank height, with little flow in the channel (during visits). The channel has a narrow riparian habitat of grasses, scrub vegetation, and trees, providing a limited buffer from fines and nutrient ingress from adjacent fields. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.  **Plate 9-2: Fenwick Common Drain, looking upstream (NGR SE 59685 15780)** |

| Waterbody | Baseline |
|---|---|
| Fleet Drain | Fleet Drain does not have a WFD classification, therefore takes the classification of its receiving water body, the River Went. Fleet Drain (Plate 9-3) displays some natural sinuosity in places but is generally straight, over deep and disconnected from the adjacent floodplain. The over-deep and straightened character suggests that the channel has been historically modified. A narrow band of alluvium in the downstream extent of the Study Area suggests that the channel would previously have been connected to its floodplain. Elsewhere, superficial deposits consist of glaciolacustrine clay and silt. The channel is heavily silted, which is likely a result of the general lack of a buffer from agricultural run-off through most of the Study Area, although as can be seen in Plate 9-3, there are some localised areas which have a larger buffer habitat. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland Ref. 9-44, though arable and agriculture is the prevailing land use.  **Plate 9-3: Fleet Drain, looking downstream (NGR SE 60837 15853)** |
| North tributary of Fleet Drain | This unnamed tributary of Fleet Drain takes the classification of its receiving water body, the River Went. This channel is an artificially straight drainage channel. Through the majority of the Study Area the channel is dry or has no flow with water pooled and stagnant. The lack of flow observed in the channel may be explained due to the dry weather during the survey visit in summer. As shown in Plate 9-4, the banks are grassy with regularly spaced trees acting to engineer the |

| Waterbody | Baseline |
|---|---|
| | bank into its straightened planform. In the upstream extent there is evidence of cattle poaching of the banks, resulting in fine material entering the channel. Superficial deposits consist of glaciolacustrine clay and silt (Ref. 9-43). The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use. |

**Plate 9-4: North tributary of Fleet Drain, looking upstream (NGR SE 61505 17003)**

| Waterbody | Baseline |
| --- | --- |
| South tributary of Fleet Drain | This unnamed tributary of Fleet Drain takes the classification of its receiving water body, the River Went. This is an artificially straight drainage channel, which is over-deep and disconnected from its floodplain (Plate 9-5). Woody material in the channel acts to provide some flow and geomorphic diversity, although there was little flow present in the channel at the time of survey during a dry period in summer. Additionally, riparian habitat is provided by scrub vegetation, acting as a buffer to nutrients and fines from adjacent agricultural land use. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.  **Plate 9-5: South tributary of Fleet Drain, looking downstream (NGR SE 61104 16464)** |
| Ell Wood and Fenwick Grange Drain | Ell Wood and Fenwick Grange Drain, which flows along the southern edge of the Solar PV Site, does not have a WFD classification and therefore takes the classification of its receiving water body, the River Don. The watercourse has a straightened, trapezoidal channel as it flows through agricultural fields in the Study Area (Plate 9-6). The channel has likely been modified for agricultural drainage; however this would have taken place prior to OS mapping in the early 1900s (Ref. 9-57). Superficial deposits local to the channel consist of glaciolacustrine clay and silt. The channel generally has a buffer of scrub and grass vegetation, potentially limiting ingress of fines and nutrients from surrounding arable land. The soils within the area local to the |

| Waterbody | Baseline |
|---|---|
| | channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.  **Plate 9-6: Ell Wood and Fenwick Grange Drain, looking downstream** |

### WFD classification

9.7.20 The present (i.e. Cycle 3, 2022) WFD classifications of the surface water bodies underlying the Solar PV Site are given in Table 9-6, as identified through the WFD screening and scoping assessment included as **PEIR Volume III Appendix 9-2: Water Framework Directive (WFD) Screening and Scoping Report**.

9.7.21 There is also one groundwater body, the Aire and Don Sherwood Sandstone, which is discussed under the section entitled ‘Hydrogeology and Groundwater’.

**Table 9-5: WFD Classification (Cycle 3 data) for WFD Surface Water Bodies Underlying the Solar PV Site**

| Classification Item | Went from Blowell Drain to the River Don | Don from Mill Dyke to River Ouse |
|---|---|---|
| Water Body ID | GB104027064260 | GB104027064243 |
| Hydromorphological designation | Heavily modified | Artificial |
| Ecological | Moderate | Moderate |
| Biological quality elements | Poor | Poor |
| Physico-chemical quality elements | Moderate | Moderate |
| Hydromorphological supporting elements | Supports Good | Supports Good |
| Hydrological regime | Supports Good | Supports Good |
| Supporting elements (Surface Water) | Moderate | Moderate |
| Mitigation measures assessment | Moderate or less | Moderate or less |
| Specific pollutants | High | High |
| Chemical | Does not require assessment | Does not require assessment |
| Priority hazardous substances | Does not require assessment | Does not require assessment |
| Priority substances | Good | Fail |
| Other pollutants | Does not require assessment | Does not require assessment |

9.7.22 Reasons for not achieving good (RNAGs) for the Don from Mill Dyke to River Ouse Water Body include diffuse source pollution resulting from agriculture and transport, point source pollution from sewage discharge from the water industry and physical modification for agriculture and urban purposes.

9.7.23 RNAGs for the Went from Blowell Drain to the River Don Water Body include diffuse source pollution as a result of poor nutrient management from agriculture, point source pollution from domestic and water industry sewage discharge, and physical modification due to flood protection structures.

### Water Quality

9.7.24 This section sets out the baseline water quality conditions at the Site.

9.7.25 Water quality data for the River Went has been interrogated from the Environment Agency's Water Quality Archive website (Ref. 9-40). Within the Solar PV Site and associated Study Area, there is one water quality sampling location on the River Went, at Topham Ferry Bridge, shown in **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**. This monitoring location is located less than 100 m downstream of the Site. Further upstream (outside of the Study Area, approximately 3 km upstream of the Site) there is the Went at A19 Askern monitoring location, and further downstream (outside of the Study Area, approximately 5.5 km downstream of the Site) there is the Went at Sykehouse monitoring location.

9.7.26 The water quality within the River Went (averaged across all three sampling locations) is slightly alkaline to circum-neutral in nature with an average pH of 7.95 but falls within the WFD high classification. A 10th percentile dissolved oxygen saturation from all three sites of 71.02 % is within the High WFD classification (with 70% being high). There has been no monitoring of Biochemical Oxygen Demand (BOD) in the last few years of data. Ammonia levels are on average 0.12 mg/l, which is within the High WFD Classification (with 0.3 mg/l or less being High).

9.7.27 Nitrate and orthophosphate values are somewhat elevated in the River Went within the Solar PV Site, at Topham Ferry Bridge with average values of 8.9 mg/l nitrate and 0.47 mg/l orthophosphate and indicates probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourses.

### Water Resources

9.7.28 Within the Solar PV Site, there are no Drinking Water Protected Areas or Drinking Water Safeguard Areas. Approximately 900 m north of the Study Area for the Solar PV Site is the Great Heck and Pollington Drinking Water Safeguard Zone (Groundwater) (Water body ID GB40401G701000), although this will not be affected by the Scheme and therefore not considered any further.

9.7.29 These safeguard zones are catchment areas that influence the water quality for their respective Drinking Water Protected Area (DrWPA), which are at risk of failing the drinking water protection objectives. In this area, the water quality pressures are associated with risk of impacts from nitrate pollution. There are two areas of Source Protection Zone (SPZ) 1 and Zone 2 for public water supply abstractions located to the north of the Solar PV Site outside of the Study Area. The Study Area to the north of the Solar PV Site lies within the total catchment (SPZ 3) for these sources. This extends into the Solar PV Site at the SPZ 3 southern boundary for a distance of up to 200 m.

9.7.30 Groundwater SPZs are defined catchment zones centred on groundwater sources such as wells, boreholes and springs used for public drinking water supply (see **PEIR Volume II Figure 9-2: Groundwater Features and their Attributes**). 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 3 Zones; where Zone 1 is the Inner Protection Zone, Zone 2 is the Outer Protection Zone and Zone 3 is the Total catchment.

9.7.31 The Solar PV Site lies within four Nitrate Vulnerable Zones (NVZs) for both groundwater and surface water. NVZs are statutory designated areas as being at risk from agricultural nitrate pollution and includes about 55% of land in England. The NVZs are summarised below.

9.7.32 The groundwater NVZs consist of:

a. Selby NVZ (Number G108); and

b. Yorkshire Mag Limestone NVZ (Number G101).

9.7.33 The surface water NVZs consist of:

a. Went from Blowell Drain to the River Don NVZ (Number S299); and

b. Bramwith Drain from Source to River Don NVZ (Number S280).

9.7.34 At the time of writing information on pollution incidents, had been received from the Environment Agency, but was incomplete in terms of location. The pollution incident location data will be added to the baseline at a later stage and presented in the ES.

9.7.35 There are a number of water activity permits (discharge consents) within the Solar PV Site and wider Study Area. These are listed in the table below provided by the Environment Agency.

**Table 9-6: Discharge Consents Within the Solar PV Site and 1 km Study Area**

| Consent number | NGR | Discharge type |
|---|---|---|
| D1 | SE6283016960 | Wastewater Treatment Works |
| D2 | SE6250616302 | Farm |
| D3 | SE5900016300 | Domestic property |
| D4 | SE5903116259 | Farm |
| D5 | SE5928115963 | Domestic property |
| D6 | SE5928015960 | Domestic property |
| D7 | SE5850715752 | Domestic property |
| D8 | SE5849315735 | Domestic property |
| D9 | SE5815015150 | Farm |

9.7.36 Records provided by the City of Doncaster Council indicates that there are two private water supply abstraction boreholes within the 1 km Study Area. One (PWS1) of this is located approximately 600 m east of the Solar PV site (see **PEIR Volume II Figure 9-2: Groundwater Features and their Attributes**) is recorded as used for irrigation purposes (and so may not be an actual potable PWS). The second (PWS2) is located to the south in the Grid Connection Corridor and is described later in this chapter.

### Internal Drainage Boards

9.7.37 The Study Area is located within one IDB area, the Danvm Drainage Commissioners, part of the Yorkshire and Humber Drainage Boards. The

IDB serves communities between the River Don and the River Aire. The whole of the Solar PV Site and 1 km Study Area is within the area of this IDB.

### Aquatic Ecology and Nature Conservation Sites

9.7.38 This section describes the statutory sites designated for nature conservation that are relevant to the water environment assessment.

9.7.39 Statutory sites that are designated for nature conservation and are relevant to the water environment assessment were identified through a review of MAGIC (Ref. 9-42). The following are located within the Study Area, or within a few km downstream (considered in order of proximity to the Site):

a. The Humber Estuary Ramsar Site, SPA, SAC and SSSI is located approximately 16 km downstream of the Solar PV Site. Due to the high dilution within the River Don (which has a Q95 flow of 4.95 $m^3$/s (or 4950 litres per second at a site that is 8 km upstream of the Grid Connection Corridor), this is scoped out for further assessment. Full details of these ecological designations are provided within **PEIR Volume I Chapter 8: Ecology**; and

b. Went Ings Meadows SSSI is located outside of the 1 km Study Area for the water resources assessment. These are meadows a few metres above sea level subject to waterlogging and seasonal flooding. Traditional hay meadows have led to wet neutral grassland developing into tall fen vegetation. This is located approximately 3 km downstream from the Site within the catchment area of the River Went. The Went Ings Meadows SSSI appears to be linked to drains parallel to the River Went and is therefore scoped into further assessment as part of the River Went water feature (Ref. 9-45).

9.7.40 Information available from **PEIR Volume I Chapter 8: Ecology** includes information on local wildlife sites and protected aquatic species. The following non-statutory designated sites are located within the 1 km Study Area:

a. River Went Oxbow: candidate Local Wildlife Site (cLWS). This comprises the old course of the River Went now forms a loop south of the present canalised river. Approximately one-third to almost a half of this old course is now a dry, or only seasonally wet, depression choked by tall ruderal and scattered wetland vegetation and shaded throughout much of this western half by dense to scattered scrub and tree cover. This is located to the approximately 1.7 km west of the Solar PV Site, upstream on the River Went and is therefore scoped out of further assessment; and

b. Riddings Farm Form: cLWS. This is a small pond and wetland feature containing small populations of a scarce dropwort and good numbers of submerged species. This is located at Riddings Farm, within the central section of the Solar PV Site, but not within the Site Boundary. The pond is located offline to the southern tributary to Fleet Drain and is therefore scoped out of further assessment.

9.7.41 Two notable records of fish species are available in the 2 km aquatic ecology Study Area. European Bullhead, *Cottus gobio*, and European Eel, *Anguilla* *anguila*, were noted in 2017 and 2019 surveys respectively at Stubbs Grange on the River Went, approximately 2 km west of the village of Fenwick.

9.7.42 Records of Otter are available for the River Went. Further information can be found within **PEIR Volume 1 Chapter 8: Ecology**.

### Geology and Hydrogeology

9.7.43 The bedrock and superficial geology for the Study Area is identified by the BGS GeoIndex online mapping (Ref. 9-43). The Solar PV Site is wholly underlain by the Sherwood Sandstone Group (see **PEIR Volume II Figure 9-7: Bedrock Deposits**). The Sherwood Sandstone Group comprises yellow, red brown sandstones, part pebbly with conglomerates in the lower part.

9.7.44 An outcrop of the Roxby Formation is mapped along the western boundary of the 1 km Study Area around the Solar PV Site. The Roxby Group consists of Mudstones and Siltstones with layers of sandstone (see **PEIR Volume II Figure 9-7: Bedrock Deposits**).

9.7.45 Overlying the bedrock geology, there are several superficial strata identified. The majority of the Solar PV Site is underlain by the Hemingbrough Glaciolacustrine Formation comprising laminated clays, silts and sands. Pockets of Breighton Sand Formation (typically consisting of yellowish brown clayey silty sand) are present across the Solar PV Site. Alluvial deposits associated with the watercourses, in particular along the alignment of the River Went at the northern Site Boundary of the Solar PV Site (see **PEIR Volume II Figure 9-6: Superficial Deposits**).

9.7.46 A review of BGS borehole scans available online on the BGS GeoIndex website (Ref. 9-43) indicates that the superficial deposits at the Solar PV Site are up to 11 m thick underlain by the Sherwood Sandstone Group. The Solar PV Site is located within the Nottingham Coal Mining Report Area (Ref. 9-51) and there are several deep coal exploration boreholes recorded on the BGS GeoIndex website (Ref. 9-43).

9.7.47 The Soilscape Map viewer describes the soils beneath the Solar PV Site as slowly permeable seasonally wet, loamy and clayey soils with naturally high groundwater and poor drainage characteristics (Ref. 9-44).

9.7.48 The Sherwood Sandstone Group is classified by the Environment Agency as a Principal Aquifer and the Roxby Formation as a Secondary B Aquifer (Ref. 9-42).

9.7.49 The overlying alluvial deposits and permeable pockets of Breighton Sand Formation are designated as Secondary A aquifers. All other superficial deposits such as the Hemingbrough Glaciolacustrine Formation are designated unproductive aquifers, covering a large proportion of the Solar PV Site.

9.7.50 Principal aquifers are important rock units that have high permeability, meaning they usually provide a high level of water storage and transmission. They usually support water supply and/or river baseflow on a strategic scale.

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

9.7.52 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.

9.7.53 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.

9.7.54 Groundwater vulnerability for the Solar PV Site is generally low, however, there are small areas of medium/medium to high vulnerability where the Breighton Sand Formation and the alluvial deposits are mapped within the Solar PV Site and surrounding 1 km Study Area (Ref. 9-42).

9.7.55 The Solar PV Site lies within the Humber (WFD groundwater) Management Catchment. The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) which is within the Humber Management Catchment underlies the Solar PV Site (Ref. 9-39).

9.7.56 The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) has an overall classification of Poor (Cycle 3, 2019), with both quantitative and chemical elements being Poor. The limiting element within the quantitative status is the quantitative water balance. The limiting elements within the chemical status are the chemical drinking water protected area and the general chemical test. The reasons for not achieving good status are due to pressures from poor nutrient management predominantly from the agricultural industry. The water body has an overall objective of Poor by 2015, which it has met. The reasons for the Poor objective are due to disproportionate burdens.

9.7.57 There are a number of borehole scans available online on the BGS GeoIndex website and on the Environment Agency Hydrology Data Explorer (Ref. 9-43 and Ref. 9-52) across the Solar PV Site, however very few include groundwater level information as the majority are for deep coal exploration purposes. Recent groundwater level data in the underlying bedrock is discussed below.

**Table 9-7: Groundwater Level Information from BGS GeoIndex**

| Reference | Location | NGR | Depth (m) | Aquifer | Water struck (mbgl) | Rest Water Level (mbgl) |
|---|---|---|---|---|---|---|
| SE51SE5 | Lady Thorp Farm, Fenwick, located 1.5 km southwest of Fenwick | SE 581 148 | 45.72 | Sherwood Sandstone | Not recorded | 2.44 |

| Reference | Location | NGR | Depth (m) | Aquifer | Water struck (mbgl) | Rest Water Level (mbgl) |
|---|---|---|---|---|---|---|
| SE61NW6 | New Housing Site, Sykehouse, located 0.9 km east of Fenwick | SE 628 170 | 45.72 | Sherwood Sandstone | Not recorded | 2.82 |
| SE51NE5 | Went Farm, Fenwick, located 0.5 km west of Fenwick | SE 585 161 | 32.92 | Sherwood Sandstone | Not recorded | 2.44 |

9.7.58 Plate 9-7 presents more recent groundwater level data (between September 2017 and September 2023) for the Sherwood Sandstone Aquifer in the area received from the Environment Agency. The nearest observation borehole to the Solar PV Site data is at Lowgate Balne (NGR SE5914918024), approximately 800 m north of River Went. There are no nearby observation boreholes in the southern part of the Solar PV Site, within the 1 km Study Area.

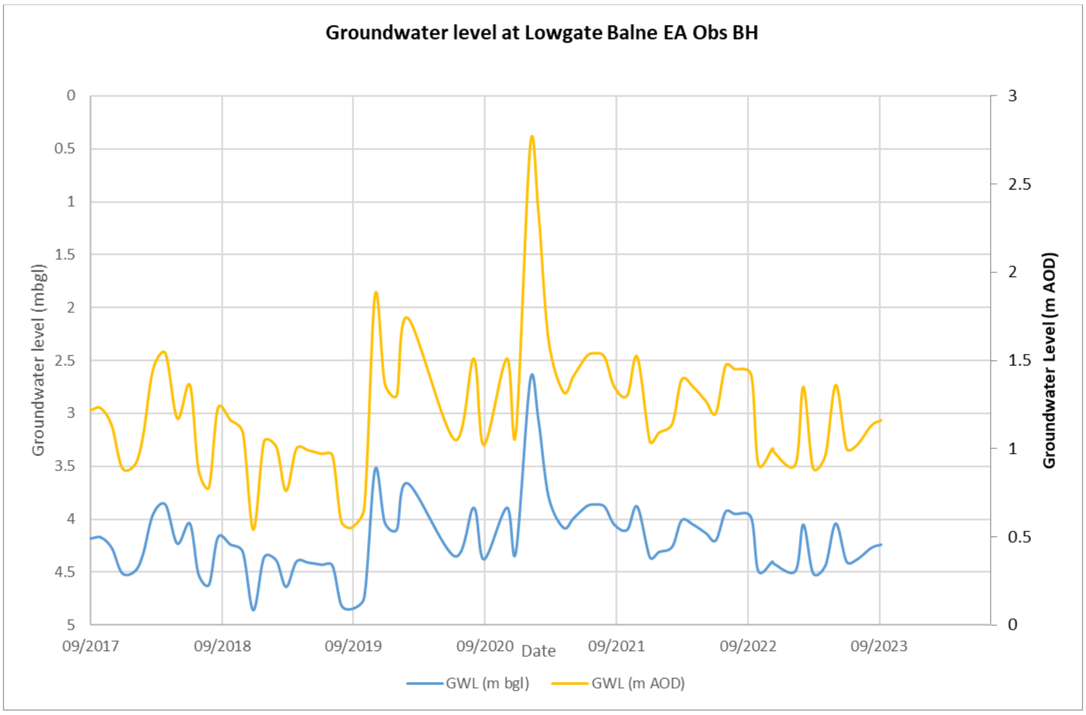
9.7.59 The available data shows that the groundwater level in the Sherwood Sandstone at Lowgate Balne to the north of the River Went varies between 2.7 m bgl (2.7 m AOD) and 4.9 m bgl (0.55 m AOD).

9.7.60 The data suggest that the groundwater in the Sherwood Sandstone likely provides baseflow to the nearby watercourses (i.e. the Rivers Went and the Don). Regionally, groundwater flows towards the River Don from the west (Ref. 9-53). Close to the River Don, the groundwater levels are locally influenced by the river due to the effects of the tides.

9.7.61 Locally, shallow groundwater will be present within the permeable superficial deposits across the area and in the vicinity of the River Went in the north of the Solar PV Site. Shallow groundwater may be encountered close to the drains, but this is not significant.

9.7.62 The majority of the Solar PV Site is underlain by Glaciolacustrine deposits consisting of clays and interbedded with pockets of Sand. Where these deposits are of low permeability, they are likely to confine the groundwater body within the Sandstone aquifer.

9.7.63 Pockets of shallow/perched groundwater is also likely to be encountered within the superficial Glaciolacustrine deposits. Where the superficial deposits are more cohesive, there will be less significant groundwater present.




## Plate 9-7: Sherwood Sandstone Groundwater level in nearest EA Observation borehole

## Flood Risk from all Sources

9.7.64 Section 14 of the NPPF (Ref. 9-22) and the 2022 Flood Risk and Coastal Change NPPG (Ref. 9-25) both advise how the planning process can take account of the risks associated with flooding. The main sources of flooding that are used to steer development at the planning stage are Main Rivers and the sea. The predicted flood risk from these sources is shown on the Environment Agency's Flood Map for Planning (Refer to **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas)**) which outlines three main zones of risk as follows:

a. Flood Zone 1: This zone comprises land assessed as having a less than 1 in 1,000 chance of river or sea flooding in any year (<0.1% annual exceedance probability (AEP));

c. Flood Zone 2: This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 chance of river flooding in any year (1% - 0.1% AEP), or between a 1 in 200 and 1 in 1,000 chance of sea flooding in any year (0.5% - 0.1% AEP);

d. Flood Zone 3a: This zone comprises land assessed as having a 1 in 100 year or greater chance of river flooding in any year (>1% AEP), or a 1 in 200 year or greater chance of flooding from the sea in any year (0.5% AEP); and

e. Flood Zone 3b 'functional floodplain': A sub-part of Zone 3, this zone comprises of land having an annual probability of 1 in 30 (greater than 3.3% AEP) of flooding, with existing flood risk management features and structures operating effectively, or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). This zone is not usually included within the EA Flood Map for Planning (Ref. 9-46) and is calculated where necessary during detailed hydraulic modelling.

9.7.65 Annex 3 of the NPPF outlines what development is suitable within each Flood Zone based upon the level of vulnerability of the development. The vulnerability classifications suggest the Scheme is considered to be 'Essential Infrastructure'.

9.7.66 In accordance with the NPPF, the construction of Essential Infrastructure is permitted in Flood Zones 1, 2 and an Exception Test is required for Flood Zones 3a and 3b. The Exception Test will be undertaken at the ES stage and included as part of the FRA. As well as fluvial and tidal flooding, it is also necessary to consider flood risk from all other sources, including surface water, groundwater, sewers and artificial sources.

9.7.67 Flood risk from all sources of flooding to the Solar PV Site is summarised in Table 9-8. Refer to **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas)** for mapping of tidal/fluvial flood risk and **PEIR Volume II Figure 9-5: Risk of Flooding from Surface Water** for mapping of surface water flood risk.

**Table 9-8: Summary of Flood Risk to the Solar PV Site**

| Flood Source | Risk Level | Comments |
|---|---|---|
| Fluvial | Low (south and east areas), high (north and west areas) | The Environment Agency's Flood Map for Planning (Ref. 9-46) shows that the majority of the south and west areas of the Solar PV Site are located within Flood Zone 1, including the BESS Area and On-Site Substation. The north and east areas of the Solar PV Site are located within Flood Zone 2 and Flood Zone 3 associated with the River Went and Fleet Drain. Areas of Flood Zone 3 within the Solar PV Site are shown to be in areas where there is a reduction in risk of flooding from rivers and the sea due to the presence of flood defences.<br>Some Field Stations will be located within the Flood Zone 2 extent and some Solar PV Panels will be located within the Flood Zone 3 extent. |
| Tidal | Low | The closest tidal source to the Solar PV Site is the River Don located to the south and east of the site and is tidally influenced, near to the Site. The River Don at its closest point is located approximately 3.6 km to the south of the Solar PV Site. The Humber Estuary is another tidal source in the surrounding area, the tidal limit of the Humber Estuary is located approximately 14 km to the north east of the Site. Due to the distance from the |

| Flood Source | Risk Level | Comments |
|---|---|---|
| | | tidal sources, the flood risk to the Solar PV Site from tidal flooding is considered to be low and is not considered further within this assessment. |
| Surface water | Very low (majority), low – high (localised areas) | The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Solar PV Site is located within an area of very low risk of surface water flooding. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller Ordinary Watercourses and/or local land drains. |
| Groundwater | Low | The Doncaster SFRA (Ref. 9-33) indicates that the Solar PV Site is located in an area where there is a <25% chance of groundwater emergence and is not considered further within this assessment. |
| Sewers | Very low | The Solar PV Site is located within a rural area where there is unlikely any existing connections to sewer networks. The Doncaster SFRA mapping shows no historic sewer flood incidents at the Solar PV Site and is not considered further within this assessment. |
| Artificial sources | Low | The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the north, east and southern areas of the Solar PV Site are located within an area at risk of flooding from reservoirs when there is also flooding from rivers. The consequences from reservoir failure can be severe, however, the Environment Agency note that this is a worst case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail.<br>The New Junction Canal Is located 1.8 m to the east of the Solar PV Site and is therefore unlikely to pose a risk. Artificial sources and is not considered further within this assessment. |

## Existing Baseline: Grid Connection Corridor

### Topography, Climate and Land Use

9.7.68 The topography of the Grid Connection Corridor (which includes the Existing National Grid Thorpe Marsh Substation) is mostly similar to that of the Solar PV Site as detailed above; existing ground levels are under 10 m AOD according to online OS mapping (Ref. 9-35). There are areas of slightly higher elevation at Bentley Community Woodland (31 m AOD) to the southwest of the Grid Connection Corridor, and at Thorpe Marsh Nature Reserve (11 to 14 m AOD). There are floodplains and flood storage areas associated with The River Don, flowing southwest to northeast, adjacent to the Grid Connection Corridor.

9.7.69 Within the Grid Connection Corridor there are floodplains associated with numerous Ordinary Watercourses and two Main Rivers, including:

a. The River Don;

b. Bramwith Drain; and

c. Thorpe Marsh Drain which discharges into the River Don on the southern part of the Study Area.

9.7.70 The climate and land use within the Grid Connection Corridor are the same as for the Solar PV Site, as described above.

### Surface Water Features

9.7.71 Within the Grid Connection Corridor, there are many surface water features including Main Rivers and Ordinary Watercourses. These are shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**.

#### River Don

9.7.72 The River Don (Main River) and River Don Navigation (Ordinary Watercourse) enter the Study Area from the south, and flow in a northerly direction. The River Don flows adjacent to the east side of the Grid Connection Corridor for approximately 2.5 km before crossing the River Don Navigation near Kirk Bramwith/Braithwaite area and continuing northeast. The River Don Navigation also flows northeast through the Study Area, past Kirk Bramwith towards the Aire and Calder Navigation.

9.7.73 The nearest gauging station on the River Don is located upstream of the Thorpe Marsh area (approximately 8 km) at Doncaster (see **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**). At this location the daily mean flow is 16.488 cubic metres per second ($m^3/s$), with a flow that is exceeded 95% of the time (Q95) of 4.95 $m^3/s$ (Ref. 9-38).Therefore, the flow in the area of the Site would be expected to be higher than the gauged flow. From Ordnance Survey mapping, the River Don Navigation is hydrologically separated from the River Don (although there may be some transfer of flows), and therefore is scoped out of further assessment. This will be confirmed during future site visits.

### Bramwith Drain

9.7.74 Bramwith Drain is an Ordinary Watercouse which rises approximately 1 km south of the village of Moss. It flows east and south along a straightened course towards the village of Braithwaite. It flows under the River Don Navigation, and into the River Don near Kirk Bramwith.

### Smallholme and Tilts Drain/Thorpe Marsh Drain

9.7.75 Smallholme and Tilts Drain (Main River) enters the Grid Connection Corridor in the south west, and flows west to east before it becomes Thorpe Marsh Drain (Main River). It then continues to flow across the Grid Connection Corridor into the River Don (located in the Grid Connection Corridor Study Area). Cockshaw Dike (Ordinary Watercouse) drains into the Smallholme and Tilts Drain within the Grid Connection Corridor.

### Ordinary Watercourses within Grid Connection Corridor

9.7.76 The following Ordinary Watercourses are located within the Grid Connection Corridor:

a. Wrancarr Drain is located centrally flowing west to east within the Grid Connection Corridor.

d. Mill Dike located centrally flows west to east into Wrancarr Drain.

e. Hawkehouse Green Dike flows west to east towards the north of the Grid Connection Corridor.

f. Engine Dike flows north within the Grid Connection Corridor and then northeast towards Kirk Bramwith, where it becomes Kirk Bramwith New Cut within the Grid Connection Corridor Study Area.

### Ordinary Watercourses within the Grid Connection Corridor 1 km Study Area

9.7.77 In addition, there are a number of watercourses located within the 1 km buffer of the Grid Connection Corridor:

a. Fur Water Drain located in the south is a tributary of the River Don;

b. Bentley and Arksey Common Drain located in the south flows east and north before draining to Thorpe Marsh Drain;

c. Side Cutting Drain located on the western side of the Grid Connection Corridor Study Area flows adjacent to the Transpennine Express railway line;

d. Green Dike located in the northeast flows west towards the Grid Connection Corridor, and becomes Clay Dike;

e. Flashley Carr Drain becomes Braithewaite Drain before flowing south into Wrancarr Drain; and

f. Carrs Drain located centrally flows west to east adjacent to Mill Dike until it flows into Wrancarr Drain.

### Ponds within the Grid Connection Corridor and 1 km Study Area

9.7.78 The ponds located within the Study Area, and within the Grid Connection Corridor itself are listed below, together with reasons why they are scoped out of further assessment in this chapter:

a. Pond south of Moss within Grid Connection Corridor Site Boundary: SE 60269 13789. No hydrological connections to surface watercourses, therefore scoped out of further assessment;

b. Linear pond/drainage feature south of Mill Dyke/Wrancarr Drain confluence: SE60392 12321. They are located just 30 m south of Wrancarr Drain. There is the potential for hydrological connectivity through groundwater within the superficial deposits. Therefore, this is scoped in to the assessment as is listed as a part of Wrancarr Drain receptor1;

c. Pond southeast of Trumfleet, SE 60506 11467 within Site Boundary, it is considered there would no hydrological connectivity as it is located 400 m east of Engine Dyke. Therefore, it is scoped out of further assessment;

d. Two surface water features, SE 60604 10084 located north of railway line. These show no hydrological connectivity with the surface watercourses, and are scoped out of the assessment. These appear to be industrial settlement ponds associated with Thorpe Marsh Power Station from Ordnance Survey mapping;

e. West of moss within Study area, SE 58652 14183. These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

f. West of Moss within Study Area, SE 58923 14190. These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

g. East of Moss within Study Area, SE 60970 13360, 200 m east of Flashley Carr Drain.These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

h. Four ponds to east and north of Thorpe in Balne, centred on SE 59890 10940. These have no hydrological connection to the local Engine Dyke and are therefore scoped out of the assessment;

i. Broad Ings, several ponds, and old oxbow of River Don centred on SE 60770 11210. As these are located south of River Don, there is no hydrological connectivity to area where the Scheme would be constructed/operated, thus these are scoped out of the assessment;

j. Linear side drain south of Thorpe Marsh Drain, SE59940 10510, potential hydraulic connection through superficial deposits. Therefore, this is scoped in to the assessment, and is assessed as part of the Thorpe Marsh Drain receptor;

k. River Don (old course), pond near Barnby Dun Bridge and linear feature south of Thorpe Marsh Bridge, centred on SE61110 09450. Esat of River Don, thus no hydrological connectivity. As these are located south of River Don, there is no hydrological connectivity to area where the

Scheme would be constructed/operated, thus these are scoped out of the assessment;

l. Pond south west of Thorpe Marsh Power Station, SE29970 08610. Ordnance survey mapping shows no hydrologic connectivity with surface watercourses. It is close to surface drains which discharge to Fur Water Drain. However, there are no works areas within the upstream catchment of the local watercourse, therefore, this is scoped out of further assessment.

### Hydromorphology

9.7.79 It is difficult to assess the specific hydromorphological condition of the receptor surface water bodies within the Grid Connection Corridor without field survey, which will not be undertaken until the ES stage when land access is available. However, the general character may be determined from desk study, aerial mapping, and professional judgement.

9.7.80 The catchment of the Bramwith Drain (which is a WFD designated water body entitled 'Bramwith Drain from Source to River Don') underlies much of the Grid Connection Corridor, with a series of drains running across the northern half of it. The water body is classified under the WFD as artificial for hydromorphological designation as the watercourses are embanked and artificial drainage channels. The channels are aligned along the boundaries of agricultural fields and so will collect runoff which they will drain to the River Don to the east, with no modification to their alignment for over a century. Soils are slowly permeable, seasonally wet, slightly acid, but base-rich, loamy, and clayey with impeded drainage and moderate fertility (Ref. 9-44). Towards the downstream end, where Bramwith Drain enters the River Don, there are superficial alluvium deposits (Ref. 9-43), but these are likely a result of the meandering nature of the River Don rather than the watercourses within the Study Area, which are instead associated with clay and silt.

9.7.81 Thorpe Marsh Drain is part of the WFD designated water body 'Ea Beck from the Skell to River Don' and forms the southern tip of the Grid Connection Corridor. Thorpe Marsh Drain flows northwards past the Existing National Grid Thorpe Marsh Substation to its confluence with the River Don. The channel is highly embanked, modified, and artificial and its hydromorphological designation is classed as 'heavily modified'. The channel appears unmoved from its pre 1900 alignment, which is between a series of agricultural fields. Soils within the water body are the same as stated earlier are a mix of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in the west and loamy and clayey floodplain soils with naturally high groundwater in the east (Ref. 9-44). Away from the alluvium corridor associated with the River Don, superficial geology deposits consist of clay and silt (Ref. 9-43).

### Table 9-9: WFD Classification (Cycle 3 data) for the WFD Surface Waer Bodies Underlying the Grid Connection Corridor

| Classification Item | Bramwith Drain from Source to River Don | EA Beck from the Skell to River Don (Thorpe Marsh Drain) |
|---|---|---|
| Water Body ID | GB104027063290 | GB104027057591 |
| Hydromorphological designation | Artificial | Heavily modified |
| Ecological | Moderate | Moderate |
| Biological quality elements | Good | Poor |
| Physico-chemical quality elements | Moderate | Moderate |
| Hydromorphological Supporting Elements | Supports Good | Supports Good |
| Hydrological Regime | High | Supports Good |
| Supporting elements (Surface Water) | Good | Moderate |
| Mitigation Measures Assessment | Good | Moderate or less |
| Specific Pollutants | Not given | High |
| Chemical | Fail | Fail |
| Priority hazardous substances | Fail | Fail |
| Priority substances | Good | Good |
| Other pollutants | Good | Good |

### Water Quality

9.7.82 This section sets out the baseline water quality conditions for water features along the Grid Connection Corridor. Water quality data for some watercourses is available within the Grid Connection Corridor and associated Study Area from the Environment Agency's Water Quality Archive website (Ref. 9-40). It is proposed that data from the sampling point locations identified in Table 9-9 and shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes** will be used and analysed further in the ES.

**Table 9-10: Water Quality Available Data for Watercourses Within the Grid Connection Corridor**

| Watercourse | Proxy for watercourse | Sampling point | ID | Comment | Summary |
|---|---|---|---|---|---|
| Thorpe Marsh Drain | Side Cutting Drain Smallholme and Tilts Drain | Ea Beck At Thorpe Marsh | NE493 00665 | Within Grid Connection Corridor | 243 samples taken between 2021 and 2000 |
| River Don | N/A | Don At Kirk Bramwith | E49301 600 | Within the Grid Connection Corridor Study Area | 268 samples taken between 2022 and 2000 |
| Bramwith Drain | Engine Dime Wrancarr Drain | Bramwith Drain at South Bramwith | NE-493002 94 | Within the Grid Connection Corridor Study Area | 191 samples taken between 2022 and 2000 |
| Mill Dike | Thistle Golt Carrs Drain | Mill Dike at Askern | NE-RSN01 96 | Within Grid Connection Corridor Study Area | 19 samples taken between 2023 and 2022 |

### Water Resources

9.7.83 There is one Drinking Water Safeguard Zone within the Grid Connection Corridor, the Armthorpe Drinking Water Safeguard Zone (Water body ID GB40401G301500), which is located approximately 1 km to the southeast of the Grid Connection Corridor within the Study Area. Given the distance from the Site and nature of the works, the Drinking Water Safeguard Zone is unlikely to be impacted by the Scheme and is therefore not considered any further.

9.7.84 The southeastern part of the Grid Connection Corridor including the Existing National Grid Thorpe Marsh Substation falls within the total catchment (SPZ 3) for three public water supply abstractions located to the southeast of the Study Area.

9.7.85 The Grid Connection Corridor lies within five NVZs for both groundwater and surface water. NVZs are statutory designated areas as being at risk from agricultural nitrate pollution and includes about 55% of land in England. The NVZs are summarised below.

9.7.86 The groundwater NVZs consist of:

a. Nottinghamshire NVZ (Number G40).

9.7.87 The surface water NVZs consist of:

a. Bramwith Drain from Source to River Don NVZ (Number S280);

b. Lower Don NVZ (Number S298);

c. EA Beck from Abbess Dyke to River Don NVZ (Number S279); and

d. Bentley Mill Stream Lower to River Don NVZ (Number S263).

9.7.88 Records provided by Doncaster Council indicates that there are two PWS abstraction boreholes within the 1 km of the Study Area. One (PWS2) is located approximately 300 m west of the Grid Connection Corridor (see **PEIR Volume II Figure 9-2: Groundwater Features and their Attributes**). This PWS is for domestic supply and agricultural uses. The second PWS borehole (PWS3) is for commercial use is located approximately 800 m south of the Study Area. Given the distance from the Site and nature of the works, the PWS3 is unlikely to be impacted by the Scheme, and is therefore not considered any further. An updated request for PWS will be made for the ES assessment stage.

9.7.89 At the time of writing no information on pollution incidents had been received from the Environment Agency. This information will be added to the baseline at a later stage and presented in the ES. There are a number of water activity permits (discharge consents) within the Grid Connection Corridor and wider Study Area. These are listed in the table below provided by the Environment Agency.

**Table 9-11: Discharge Consents Within the Grid Connection Corridor Study Area**

| Consent number | NGR | Discharge type |
|---|---|---|
| D10 | SE6061914522 | Domestic property |
| D11 | SE6076014400 | Domestic property |
| D12 | SE5985014350 | Farm |
| D13 | SE5959614294 | Domestic property |
| D14 | SE5972014290 | Other |
| D15 | SE5979014280 | Other |
| D16 | SE5955414272 | Domestic property |
| D17 | SE5958114266 | Domestic property |
| D18 | SE5960014000 | Domestic property |
| D19 | SE5998212482 | Farm |
| D20 | SE6105012050 | Farm |
| D21 | SE5990009900 | Substation |
| D22 | SE6145009280 | Pumping station |

| | | |
|---|---|---|
| D23 | SE5910009100 | Substation |

### Internal Drainage Boards

9.7.90 The Study Area for the Grid Connection Corridor is located within one IDB area, the Danvm Drainage Commissioners, part of the Yorkshire and Humber Drainage Boards. This is the same as for the Solar PV Site and is shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**.

### Aquatic Ecology and Nature Conservation Sites

9.7.91 There are no water dependent sites designated for nature conservation identified through a review of MAGIC (Ref. 9-42) within the 1 km Study Area for the Grid Connection Corridor.

9.7.92 There are no groundwater dependent terrestrial ecosystems (GWDTEs) within the Site or the 1 km Study Area considered for the water resources assessment. The nearest SSSI that are considered to be groundwater dependent are the Shirley Pool SSSI and the Owston Hay Meadows SSSI, located more than 1.7 km to the west of the Grid Connection Corridor and are therefore scoped out of any further assessment.

### Geology and Hydrogeology

9.7.93 The northern part of the Grid Connection Corridor is underlain by the Sherwood Sandstone Group, while the southern section is underlain by the Chester Formation, which is also part of the Sherwood Sandstone Group (see **PEIR Volume II Figure 9-7: Bedrock Deposits**). The Chester Formation is composed of sandstone and pebbly gravel. Similar to the Solar PV Site, the bedrock is overlain by superficial deposits comprising the Hemingbrough Glaciolacustrine Formation with pockets of Breighton Sand Formation. Alluvium deposits are also present along the River Don valley in the eastern part of the Grid Connection Corridor (see **PEIR Volume II Figure 9-6: Superficial Deposits**). The Grid Connection Corridor is also located within the Nottingham Coal Mining Report Area (Ref. 9-51) with several deep coal exploration boreholes recorded on the BGS GeoIndex website (Ref. 9-43).

9.7.94 The Soilscape Map viewer describes the soils beneath the Grid Connection Corridor as slowly permeable seasonally wet, loamy and clayey soils with naturally high groundwater and poor drainage characteristics (Ref. 9-44).

9.7.95 The Sherwood Sandstone Group and Chester Formation are both classified by the Environment Agency as a Principal Aquifer (Ref. 9-42).

9.7.96 The overlying alluvial deposits associated with the River Don are designated as a Secondary A aquifer. All other superficial deposits such as the Hemingbrough Glaciolacustrine Formation are designated unproductive aquifers, covering a large proportion of the Grid Connection Corridor. However, there are permeable layers of the Breighton Sand Formation that are also designated Secondary A aquifer.

9.7.97 Groundwater vulnerability for the Grid Connection Corridor is generally low, however, there are small areas of medium vulnerability where the Breighton

Sand Formation and the alluvial deposits associated with the River Don are areas of medium-high groundwater vulnerability (Ref. 9-42).

9.7.98 The Grid Connection Corridor lies within the Humber (WFD groundwater) Management Catchment (Ref. 9-39). The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) which is within the Humber Management Catchment underlies the Grid Connection Corridor (Ref. 9-39). The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) has an overall classification of poor (Cycle 3, 2019), with both quantitative and chemical elements being poor. The limiting element within the quantitative status is the quantitative water balance. The limiting elements within the chemical status are the chemical Drinking Water Protected Area and the general chemical test. The reasons for not achieving Good status are due to pressures from poor nutrient management predominantly from the agricultural industry. The water body has an overall objective of poor by 2015, which it has met. The reasons for the poor objective are due to pollution from domestic, industrial and agricultural sources, and a higher status may not be achievable without creating disproportionate burdens for particular sectors or parts of society.

9.7.99 There are a number of borehole scans available online on the BGS GeoIndex website and on the Environment Agency Hydrology Data Explorer (Ref. 9-43 and Ref. 9-52) within the Grid Connection Corridor. However, very few include groundwater level information as the majority are for deep coal exploration purposes. Records from selected boreholes located within the Grid Corridor are summarised in Table 9-12: Groundwater Level Information from BGS GeoIndex**.** BGS borehole SE51SE45 located at Elmstone Farm appears to be at the same location as the private water supply borehole PWS2 (see **PEIR Volume II Figure 9-2: Groundwater Features and their Attributes**).

**Table 9-12: Groundwater Level Information from BGS GeoIndex**

| Ref. | Location | NGR | Depth (m) | Aquifer | Water struck (mbgl) | Rest Water Level (mbgl) |
|---|---|---|---|---|---|---|
| SE60 NW10 | Thorpe Marsh, SE edge of Site Boundary | SE605 066 | 121 | Sherwood Sandstone | 2 | 2.9 |
| SE50 NE24 | Thorpe Marsh Power Station, south of railway line within the Site Boundary | SE599 098 | 80 | Sherwood Sandstone | No record | 7.31 |
| SE50 NE257 | | SE599 092 | 80 | Sherwood Sandstone | No record | 7.31 |
| SE51 SE45 | Elmstone Farm, Thorpe-In-Balne | SE598 108 | 50 | Sherwood Sandstone | 18.9 | 2.57 |
| SE61 SW6 | Thorpe-In-Balne Station | SE601 109 | 33.53 | Sherwood Sandstone | No record | 1.22 |

| | | | | | | |
|---|---|---|---|---|---|---|
| SE51 SE51 | Heyworth Lane, Moss, Askern, central part of Grid Connection Corridor | SE588 139 | 30 | Sherwood Sandstone | 13 | 4.9 |
| SE51 SE50 | Moss Road, Heyworth Lane, Askern, central part of Grid Connection Corridor | SE586 138 | 30 | Sherwood Sandstone | 13 | 4.75 |

9.7.100 Plate 9-8 presents recent groundwater level data between November 2010 and November 2020 from the nearest observation in the Sherwood Sandstone Aquifer in the vicinity of the Grid Connection Corridor. The data obtained from the Environment Agency records is from the Sandall Common Farm observation borehole (NGR SE62960698), approximately 1.3 km to the east of the Study Area and also east of the River Don. No observation boreholes to west of the river is available on this part of the Study Area.

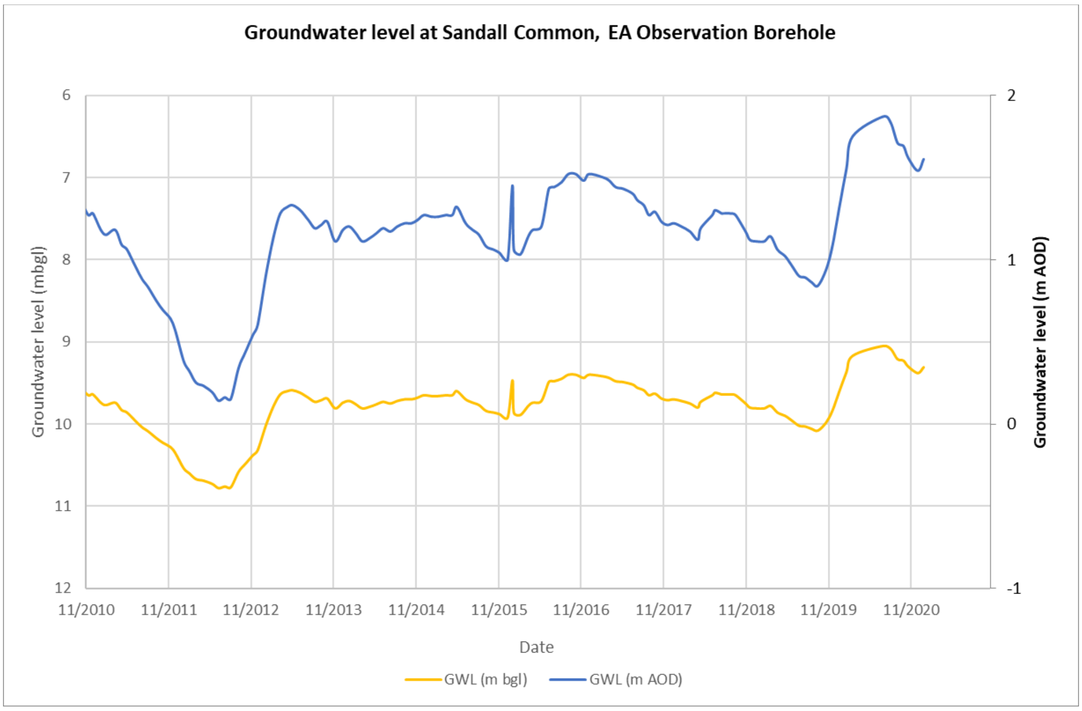
9.7.101 The available data shows that the groundwater level in the Sherwood Sandstone at this observation borehole showed limited fluctuation during the period with the levels varying between 9.1 m bgl (1.9 m AOD) to 10.8 m bgl (0.16 m AOD) during this period with the lower levels in the summer period. The groundwater level in the Sherwood Sandstone across the area is likely to be providing base flow to the River Don.

9.7.102 Locally shallow groundwater will be present within the permeable superficial deposits across the area and in the vicinity of the River Went in the north of the Solar PV Site. Shallow groundwater may be encountered close to the drains, but this is not significant.

9.7.103 The majority of the Grid Connection Corridor is underlain by Glaciolacustrine deposits consisting of clays and interbedded with pockets of Sand. Where these deposits are of low permeability, they are likely to confine the groundwater body within the Sandstone aquifer.

9.7.104 Pockets of shallow/perched groundwater is also likely to be encountered within the superficial Glaciolacustrine deposits. Where the superficial deposits are more cohesive, there will be less significant groundwater present.

9.7.105 Towards the River Don valley in the southeastern part of the Study Area underlain by the alluvial deposits, groundwater levels in the superficial deposits are expected to be shallower due to the interaction with the surface watercourse across the area.




### Plate 9-8: Observation Boreholes in the Sherwood Sandstone (m AOD)

### Flood Risk from All Sources

9.7.106 Flood risk from all sources of flooding to the Grid Connection Corridor is summarised in Table 9-13. Refer to **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas)** for mapping of tidal/fluvial flood risk and **PEIR Volume II Figure 9-5: Risk of Flooding from Surface Water** for mapping of surface water flood risk.

### Table 9-13: Summary of Flood Risk to the Grid Connection Corridor

| Flood Source | Risk Level | Comments |
|---|---|---|
| Fluvial | High | The Grid Connection Corridor is largely located within areas of Flood Zone 3 with smaller areas of Flood Zone 2 along its central section. Approximately 0.7 km of the Grid Connection Corridor is located within Flood Zone 1 towards its northern extent. The majority of the Flood Zone 3 area along the Grid Connection Corridor is not located within an area where the Environment Agency indicates that there is a reduction in risk of flooding from rivers and the sea due to the presence of flood defences. |
| Tidal | High | The closest tidal source to the Grid Connection Corridor is the River Don, which is located to the south and east of the Site and is tidally influenced near to the Site. The |

| Flood Source | Risk Level | Comments |
|---|---|---|
| | | Grid Connection Corridor runs parallel to the River Don at its southern extent. |
| Surface water | Very low (majority), low – high (localised areas) | The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Grid Connection Corridor is located within an area of very low risk. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller Ordinary Watercourses and/or local land drains. |
| Groundwater | Low (northern and middle section), high (southern section) | The Doncaster SFRA (Ref. 9-33) indicates that the northern stretch of the Grid Connection Corridor is located in an area where there is a >25% chance of groundwater emergence. The middle stretch of the Grid Connection Corridor is in an area where there is between >25% and >=50% chance of groundwater emergence. The southern stretch of the Grid Connection Corridor where it connects to the Existing National Grid Thorpe Marsh Substation is located in an area where there is a >=75% chance of groundwater emergence. |
| Sewers | Very low | The Grid Connection Corridor is located within a rural area and a search undertaken did not identify any Yorkshire Water sewerage assets. The Doncaster SFRA mapping shows no historic sewer flood incidents within the Grid Connection Corridor and is not considered further within this assessment. |
| Artificial sources | Negligible | The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Grid Connection Corridor is located within an area at risk of flooding from reservoirs when there is also flooding from rivers. Small areas of the Grid Connection Corridor are located within areas where there is a risk of flooding from reservoirs when river levels are normal. The consequences from reservoir failure can be severe, however, the Environment Agency note that this is a worst case prediction; |

| Flood Source | Risk Level | Comments |
|---|---|---|
| | | reservoirs are maintained to a very high standard and are extremely unlikely to fail. The Don Navigation Canal is located approximately 0.1 km to the east of the Grid Connection Corridor at its closest point. However, the canal levels are monitored and maintained by the Canal and Rivers Trust, therefore overtopping is unlikely. Artificial sources are not considered further within this assessment. |

## Future Baseline

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

### Surface Water and Hydromorphology

9.7.108 The Don from Mill Dyke to River Ouse WFD water body is currently at its target objective from 2015 (Moderate Ecological Status). The Went from Blowell Drain to the River Don, Ea Beck from the Skell to the River Don, Bramwith Drain from Source to River Don WFD water bodies have a target of Good by 2027. Therefore, there may be improvements in WFD designation between the time of writing and the construction and operation of the Scheme. However, the importance level of the water feature is based on, among other features having a WFD status and its flow, so an increase in WFD designation from Moderate to Good would not change the importance attributed to the water feature at this stage.

9.7.109 It is likely that through the action of new legislative requirements and ever more stringent planning policy and legislation, the health of the water environment will continue to improve post 2028. The Environment Act 2021 and the Levelling-Up and Regeneration Act 2023 include measures to tackle storm sewage discharges and set new requirements on phosphate removal from sewage treatment works, respectively, although the Applicant is unaware of any sewage treatment works or combined sewer overflows that discharge into River Went or other local watercourses, there are however, significant challenges such as adapting to a changing climate and pressures of population growth that could have a retarding effect. It is also difficult to forecast these changes with any certainty.

9.7.110 However, the current receptor importance criteria presented in Table 9-1 is largely based on the presence or not of various attributes (e.g. Drinking Water Protected Area, designated nature conservation site or WFD designation) and flow (i.e. the size of the watercourse). The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future baseline in the absence of the Scheme, as the principal reasons for differences in water body importance are unlikely to change. For this reason, the impact assessment within this chapter is undertaken against existing baseline conditions.

### Groundwater

9.7.111 The WFD groundwater body (Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) is at their target WFD objective of Poor Status. However, the chemical status of Good by 2027 has not been achieved as of Cycle 3. Therefore, there may be improvements in WFD designation between the time of writing and the construction of the Scheme. However, 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.

9.7.112 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

9.7.113 Climate change is predicted to alter both future tidal and fluvial flood risk and this will be taken into account in the full FRA at ES stage.

9.7.114 As the Scheme has a development lifetime of 40 years, the impact of climate change needs to be considered.

9.7.115 The Site is located within the Don and Rother Management Catchment. Climate change allowances relate to predicted percentage increase in peak river flows and peak rainfall that the Scheme design must consider.

9.7.116 Peak river flow allowances are based on WFD catchment areas. The Environment Agency Website ‘Climate change allowances for peak river flow in England’ has been consulted to confirm the revised climate change allowances for the catchment areas that cover the Study Area.

9.7.117 The Scheme is covered by the Don and Rother Management Catchment for peak river flow which has a ‘Higher Central’ allowance of 21% (2050s) (for Essential Infrastructure).

9.7.118 For peak rainfall intensity, the Scheme is covered by the management catchment as for peak river flow. Based on the assessed development lifetime of the Scheme being between 2061 and 2100, the central allowance for the 2070s epoch should be applied. This allowance is:

a. 3.3% AEP –25%.

b. 1% AEP – 25%

9.7.119 These peak rainfall allowances have been considered within the Preliminary Surface Water Drainage Strategy (**PEIR Volume III Appendix 9-3: Preliminary Surface Water Drainage Strategy**) for the lifetime of the development.

9.7.120 In line with the Environment Agency climate change guidance for Nationally Significant Infrastructure Projects (NSIPs), such as power stations and power lines, flood risk should also be assessed for a credible maximum climate change (extreme climate change) scenario. The Credible Maximum Scenario includes the following:

a. The H++ climate change allowances for sea level rise (not applicable for the Scheme);
b. The upper end allowance for peak river flow for the relevant management catchment (36% for Don and Rother Management Catchment);
c. The sensitivity test allowances for offshore wind speed and extreme wave height (not applicable for the Scheme); and
d. An additional 2 mm for each year on top of sea level rise allowances from 2017 for storm surge (not applicable for the Scheme).

9.7.121 The Credible Maximum Scenario sensitivity assessment will be undertaken as part of the full FRA at ES stage.

### Future Baseline (Decommissioning)

9.7.122 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.

9.7.123 Climate change has the potential to significantly impact on drainage and flood risk, for example through increased storm intensity and changes in future rainfall patterns. However, the design of the Scheme will incorporate the climate change projections required by the EA to ensure that potentially increased surface water flows are accounted for and managed across the lifetime of the Scheme. Therefore, it is assumed that there would be no significant adverse changes to current baseline conditions within the next 40 years, and so the impact assessment within this chapter is undertaken against existing baseline conditions.

### Importance of Receptors

9.7.124 Table 9-12 provides a summary of the water features that may be impacted by the Scheme (i.e. there is a source and a possible pathway) for both the Solar PV Site and the Grid Connection Corridor. A description of their attributes and provisional importance of the water feature as used in this preliminary environmental impact assessment is described. Importance is based on the criteria presented in Table 9-1.

9.7.125 Separate importance classifications are provided for water quality and morphological aspects of water features as it is not always appropriate to have the same rating (e.g. a water feature may be heavily modified or even artificial and thus have a low morphology importance, but the water quality may be high by virtue of supporting protected species or other important potable or socio-economic and recreational uses).

9.7.126 From a groundwater perspective, the Roxby Formation and Hemingbrough Glaciolacustrine Formation are unlikely to be impacted by the scheme and therefore are scoped out and not included in this table.

## Table 9-14: Provisional Importance of Receptors

| Water Feature | Provisional Importance |
|---|---|
| **Solar PV Site** | |
| River Don (Main River) | Very High importance for water quality on the basis of being a WFD designated watercourse, and with a Q95 flow of 4.95 $m^3$/s (8 km upstream of the Study Area. Water quality monitoring indicates that the watercourse is under pressure from agricultural pollution. Otter presence is recorded on the River Went which flows into the River Don. European Bullhead, Cottus gobio, and European Eel, Anguilla Anguilla, have been found on a tributary to the River Don so it is likely these are present in the River Don also. This watercourse is not used for navigation, as navigation use takes place along the separate River Don Navigation. |
| River Went (Main River) | Very High importance for water quality on the basis of being a WFD designated watercourse and with a Q95 flow of 0.164 $m^3$/s (3.5 km upstream of the Study Area). The Site is likely to be in hydrological continuity through groundwater connection in the alluvial deposits with the Went Ings Meadow SSSI. Water quality monitoring indicates that the watercourse is under pressure from agricultural pollution. Otter presence is recorded on the river in the vicinity of the Solar PV Site. European Bullhead, Cottus gobbio, and European Eel, Anguilla 9-57nguilla, have been found upstream of the Site, which are an Annex II species.<br>This watercourse is not used for navigation, as navigation use takes place along the separate River Don Navigation.<br>Low importance for morphology due to showing evidence of substantial modification, including channel straightening. |
| Fenwick Common Drain (Ordinary Watercourse) | Medium importance for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. This is a small watercourse which rises just 1 km west of the Site Boundary.<br>This watercourse is not used for navigation, as it is too small.<br>Low importance for morphology on the basis of showing evidence of modification including channel straightening, a trapezoidal planform and being over-deep. |
| Fleet Drain (Ordinary Watercourse), and its north | Medium importance for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s.<br>This watercourse is not used for navigation, as it is too small. |

| Water Feature | Provisional Importance |
|---|---|
| and south tributary | Low importance for morphology due to having a generally straight and over-deep channel, indicative of modification. With the tributaries being artificially straight channels. |
| Ell Wood and Fenwick Grange Drain (Ordinary Watercourse) | Medium importance for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s.<br>This watercourse is not used for navigation, as it is too small.<br>Low importance for morphology due to being a straightened and trapezoidal channel, indicative of modification. |
| Other unnamed drains (Ordinary Watercourses) | As artificial, generally ephemeral agricultural drains and ditches, these are considered Low importance water features for water quality and morphology. These watercourses are not used for navigation, as it is too small |
| Sherwood Sandstone Group | High importance based on being a Principal aquifer. Groundwater may support potable abstraction, and there is an area of SPZ3 which extends into the north of the Solar PV Site. |
| Private Water Supply Abstraction | Medium importance as used for agricultural purposes (irrigation) although the source of the abstraction is likely to be underlying Sherwood Sandstone aquifer. |
| Breighton Sand Formation | Medium importance based on being a Secondary A aquifer of limited lateral continuity. |
| Alluvium | Medium importance based on being a Secondary A aquifer of limited lateral continuity. |
| The Aire and Don Sherwood Sandstone WFD waterbody | High importance based on being a WFD waterbody (WFD ID: GB40401G701000). Although the water body has quantitative and qualitative elements classified as Poor, this will not limit the importance of the water body, as there is the potential for improvement in future years. |
| Flood risk importance | The Scheme developed is designated as Essential Infrastructure, and as such is Very High importance. Residential housing is located off-site which is classed as More Vulnerable and therefore High importance. |
| **Grid Connection Corridor** | |
| River Don (Main River) | Very High importance receptor as the Q95 is > 1 $m^3/s$, and the watercourse has a WFD designation. As a watercourse downstream of the River Went, the European Bullhead, Cottus gobio, European Eel, Anguilla Anguilla, and otter, Lutra lutra, are likely to be present in |

| Water Feature | Provisional Importance |
|---|---|
| | this watercourse also. It appears to be hydrologically linked to the New Junction Canal and the Stainforth and Keadby canal which are used for leisure purposes. |
| Ell Wood and Fenwick Grange Drain (Ordinary Watercourse) | Medium importance for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s.<br>Low importance for morphology due to being a straightened and trapezoidal channel, indicative of modification. |
| Bramwith Drain from Source to River Don (Ordinary Watercourse), and its tributaries from Moss Road and Heyworth Lane | High importance for water quality on the basis of being a WFD waterbody (Bramwith Drain from Source to River Don) and assumed to have a Q95 flow <0.001 $m^3$/s.<br>Low importance for morphology, due to be designated as artificial. |
| Mill Dike, Engine Dike and Wranncarr Drain (Ordinary Watercourses) | These are located within the Grid Connection and may be water features which are crossed by temporary access tracks of the grid connection corridor. Medium importance for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. As part of Wrancarr Drain, a linear water features 30 m south of the drain is included, as it may be hydrologically linked.<br>Low importance for morphology due to being heavily modified. |
| Thorpe Marsh Drain (Main River) | Very High importance for water quality: The is no flow gauging station on the channel, but at this stage it is assumed to have a Q95 > 1 $m^3$/s, based on it is large catchment, and 6 m wide channel. The channel to be crossed is the WFD monitored reach of the Ea Beck from the Skell to River Don Water body.<br>This includes the linear drain parallel to, and south, of Thorpe Marsh Drain which may have hydrological connectivity.<br>Low importance for morphology due to being heavily modified. |
| Unnamed channel south from Marsh Lane Bridge (Ordinary Watercourse) | Medium importance for water quality: This is an IDB maintained channel which will be crossed by the Grid Connection Corridor, which does not have a WFD classification.<br>Low importance for morphology due to being an artificial channel. |

| Water Feature | Provisional Importance |
|---|---|
| Sherwood Sandstone Group | High importance based on being a Principal aquifer. Groundwater may support potable abstraction. |
| Private Water Supply Abstraction | High importance as it is used for domestic supply as well as agricultural purposes (based on information provided by the City of Doncaster Council). It is considered that the source of the abstraction is likely to be underlying Sherwood Sandstone aquifer. |
| Breighton Sand Formation | Medium importance based on being a Secondary A aquifer of limited lateral continuity. |
| Alluvium | Medium importance based on being a Secondary A aquifer of limited lateral continuity. |
| The Aire and Don Sherwood Sandstone WFD water body | High importance based on being a WFD water body (WFD ID: GB40401G701000). Although the water body has quantitative and qualitative elements classified as Poor, this will not limit the importance of the water body, as there is the potential for improvement in future years. |
| Flood risk importance | The Existing National Grid Thorpe Marsh Substation in the Grid Connection Corridor is designated as Essential Infrastructure, and as such is Very High importance. |

## 9.8 Embedded Design Mitigation

9.8.1 This section contains the mitigation measures relevant to this chapter that are already incorporated into the Scheme design, as described in the **PEIR Volume I Chapter 2: The Scheme.** It forms part of the Framework CEMP (see **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**).

### Framework Construction Environmental Management Plan

9.8.2 A Framework CEMP is presented in **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan** and will accompany the ES. The Framework CEMP details the measures that would be undertaken during construction to mitigate temporary effects on the water environment. The Framework CEMP will set out the structure and content for the detailed CEMP, which will be completed once a contractor is appointed, following submission of the DCO Application. The detailed CEMP will be required to be developed in accordance with the Framework CEMP.

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

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

9.8.5 The Framework CEMP will set out the standard procedure for the Scheme and will describe the principles for the protection of the water environment during construction. The final 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 will be minimised by the adoption of the general mitigation measures outlined below, which will be described and secured in the WMP and CEMP.

### Grid Connection Corridor Watercourse Crossings

9.8.6 The high voltage Grid Connection Cables will be below ground, requiring trenching typically at a depth of around 1.4 m depth, but will need to vary and go deeper depending on crossings and detailed design. Underground non-intrusive, or trenchless, techniques (for example such as Horizontal Directional Drilling (HDD) may be used to install Grid Connection Cables beneath watercourses, and would be at a suitable depth to avoid impacting the channel or the bed, subject to design and ground conditions. Where underground techniques are not feasible, crossings will be installed using open-cut, or intrusive, techniques. In such cases, water flow would be maintained (e.g. by over-pumping or fluming around the works). It will be a requirement that the watercourses are reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from construction activity. Further details of the design and location of the crossings will be provided within the ES.

### Good Practice Guidance

9.8.7 The construction of the Scheme will be undertaken in accordance with good practice, including the relevant Guidance for Pollution Prevention (GPP) documents as described in this section. Where not disapplied through the DCO, there may be the need for a number of secondary permissions for temporary and potentially some permanent works affecting watercourses or groundwater. All temporary works will be carried out under the necessary consents/permits and that the contractor will comply with any conditions imposed by any relevant permission. Some of these secondary consents will be sought through the DCO.

9.8.8 The following GPPs have been released to date on the NetRegs website (Ref. 9-59) and are listed below. While these are not regulatory guidance in

England, where the UK government website outlines regulatory requirements, they remain a useful resource for good practice due to their clear and concise presentation. They are documented in the Framework 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 at 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. GPP 22: Dealing with spills; and
m. GPP 26: Safe storage – drums and intermediate bulk containers.

9.8.9 Where new GPPs are yet to be published, previous Pollution Prevention Guidance (PPGs), which were withdrawn on 14 December 2015, but not yet replaced, 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. 9-60); and
b. PPG18: Managing fire water and major spillages (Ref. 9-61).

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

a. British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works (Ref. 9-62);
b. British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites (Ref. 9-63);
c. C753 (2015) The SuDS Manual (second edition) (Ref. 9-34);
d. C811C (2023) Environmental good practice on site guide (fifth edition) (Ref. 9-64);

e. C648 (2006) Control of water pollution from linear construction projects, technical guidance (Ref. 9-65);

f. C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref. 9-66);

g. C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors (Ref. 9-67); and

h. C736F Containment systems for prevention of pollution (Ref. 9-68).

### Management of Construction Runoff

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

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. 9-67) and CIRIA report 'C648 Control of water pollution from linear construction sites' (Ref. 9-65). Measures may include use and maintenance of temporary lagoons, tanks, bunds and fabric silt fences etc . or silt screens as well as consideration of the type of plant used. This also may include the use of silt matts on the bed of watercourses, and baffles on any discharges to watercourses to avoid bed and bank erosion.

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 on and near the Site and ensuring that they are adequately protected using drain covers, sand or pea gravel bags (the latter being more appropriate in or near watercourses), earth bunds, geotextile silt fences, straw bales etc. or proprietary treatment (e.g. lamella clarifiers).

c. Mitigation measures (see below) will be implemented to control fine sediment laden runoff during wet weather. 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 20 m from watercourses on flat lying land. Where this is not practicable measures (such as silt fencing) to prevent sediment laden runoff draining to the watercourse without prior treatment will be provided as necessary. Furthermore, if it is to be stockpiled for longer than a two-week period, the material will either be covered with geotextile mats, seeded to promote vegetation growth, or other measure to prevent runoff containing excess fines draining to a watercourse untreated.

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 (potentially also including infiltration to ground) or to the nearest public sewer with sufficient capacity for treatment following discussions with Yorkshire Water, or else removed from Site for disposal at an appropriately licensed waste facility.

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

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.

j. The WMP (which will be produced post consent) will include details of pre, during and post-construction water quality monitoring. The specification of which will be determined at a later stage, but is likely to include a combination of visual observations and onsite monitoring to establish a baseline, which can rapidly be compared with during construction monitoring to establish there are no deleterious effects evident in the watercourses during construction.

## Location of Construction Compounds

9.8.12 The location of the construction compounds for the Solar PV Site have been located for operational reasons, but also avoiding being located close to the water features which have a higher importance. In this way the temporary compounds within field NW7 and SE2 are adjacent to a receptor of medium importance (southern tributary to Fleet Drain) and the main compound within SW10 is north of Ell Wood and Fenwick Grange Drain, a receptor of medium importance. The locating of the compounds will ensure there is a buffer of 10 m to watercourses.

9.8.13 The two construction compounds for the Grid Connection Corridor are not located near to surface watercourses.

## Management of Spillage Risk

9.8.14 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 included in **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan** 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, and the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 9-13).

Particular care will be taken with the delivery and use of concrete and cementitious substances as it is highly corrosive and alkaline;

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

c. Any plant, machinery or vehicles will be inspected before every use and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off-Site if possible or, if on-Site, only at designated areas within the site 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 on an impermeable surface which provides protection to underground strata and watercourses, and away from drains as far as reasonably practicable. A minimum distance of 20 m from watercourses for refuelling will be observed to minimise risk to watercourses (greater distances should be considered on very uneven land). 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. Oil booms to be deployed in watercourses where equipment is working in, over or adjacent of a watercourses and there is a risk of oil spillages occurring;

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 absorbent plant 'nappies' at all times and are to carry spill kits;

i. The WMP (which will be produced post consent) will include details for pollution prevention and will be prepared and included alongside the final CEMP. Spill kits and oil absorbent material will be carried by mobile plant and located at high risk locations across the Site and regularly 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 feature;

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

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

### Management of Flood Risk

9.8.16 The Framework CEMP will incorporate measures to prevent an increase in flood risk or pollution during the construction works, in addition to the provision of temporary settlement and drainage measures as detailed above.

9.8.17 Construction works undertaken adjacent to, beneath and within watercourses will comply with relevant guidance, including Environment Agency and Defra guidance (Ref. 9-1).

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

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.

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; and

e. The Main Construction Compound along with the northern most temporary Construction Compound will be located outside of areas of fluvial Flood Zones 2 and 3. The eastern most temporary Construction Compound is currently located in Flood Zones 2 and 3. Alternatives will be explored as the project is developed, or the temporary works will be designed in a way to ensure it is resilient to flooding, whilst also minimise flood risk impacts to third parties through any required mitigation.

9.8.19 The Contractor will produce an Emergency Response Plan following the grant of DCO 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. This could be provided by a text alert service;

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

f. If water is encountered during below ground construction, suitable dewatering methods will be used. Any groundwater dewatering required in excess of the exemption thresholds will be undertaken in line with the requirements of the Environment Agency (under the Water Resources Act 1991 as amended) (Ref. 9-14) and the Environmental Permitting Regulations (2016) (Ref. 9-10) and/or the provisions of the DCO; 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 Corridor: Management of Risk to Morphology of Watercourses

9.8.20 At the time of writing, WFD reportable reaches of water body catchments (i.e. Bramwith Drain from Source to River Don, and Thorpe Marsh Drain) are proposed to be crossed using non intrusive, or trenchless, techniques. The method of crossing the IDB maintained watercourses will be agreed during further consultation during detailed design stage. Other smaller watercourse crossings are likely to be crossed using intrusive techniques, and this is the reasonable worst case scenario assessed in this PEIR. However, final decisions on the watercourse crossing schedule will not be made until a later stage, at which point further consultation will be carried out with relevant statutory stakeholders.

9.8.21 In total, there are expected to be in the order of approximately nine watercourse crossings at the current stage in the design. These are shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes**, and from north to south are:

a. Ell Wood and Fenwick Grange Drain;

b. Tributary to Flashey Carr Drain (from Moss);

c. Tributary to Bramwith Drain;

d. Bramwith Drain;

e. Mill Dike;

f. Wrancarr Drain;

g. Engine Dike;

h. Thorpe Marsh Drain; and

i. A parallel unnamed IDB drain.

9.8.22 More detail on the approximate location of watercourse crossings, and the methodology for crossing will be available and assessed at the ES stage.

9.8.23 A pre-works morphology survey of the channel of each watercourse to be crossed will be undertaken prior to construction. The pre-works survey is to ensure that there is a formal record of the condition of each watercourse prior to commencement of works to install Grid Connection Cables. The survey is a precautionary measure so that if there are any unforeseen adverse impacts there is a record against which any remedial action can be determined. This would take place for an agreed distance up and downstream of the crossing location.

9.8.24 Where intrusive crossings are required water flow will 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.

9.8.25 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 – the method chosen according to what is appropriate in that location. watercourses will be reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from the construction activity.

9.8.26 Regular observations of the watercourses will be undertaken post-works during vegetation re-establishment of the banks, especially following wet weather, to ensure that no adverse impacts have occurred. These requirements will be described in the WMP.

## Design

9.8.27 Detailed information on Scheme design and infrastructure is provided in **PEIR Volume I Chapter 2: The Scheme**.

9.8.28 A large proportion of the Solar PV Site is located within Flood Zone 1, with the remaining areas within Flood Zone 2, with some areas within Flood Zone 3. Solar PV Panels and On-Site Cabling above ground will be a minimum of 300 mm above the modelled design flood level for a 1% (1 in 100) Annual Exceedance Probability (AEP) plus 21% allowance for climate change event. Mounting poles will generally be driven or screwed into the ground to a maximum depth of 3 m. The BESS Area and On-Site Substation will be located within Flood Zone 1. Some Field Stations will be located within Flood Zone 2. If these are located within Flood Zone 2, they will be located 300 mm above the modelled design flood level for a 1%AEP plus 21% allowance for climate change event to allow for resilience.

9.8.29 The Solar PV Panels will be offset from watercourses by 10 m. For smaller channels less than 3 m in width this would be measured from the centre line of the watercourse as on Ordnance Survey mapping. For channels greater than 3 m, this would be measured from the water's edge/channel extents under normal flow conditions. The buffer of 10 m is to account for site specific position of the bank top along IDB watercourses noting that the IDB require only a 9 m buffer from that point (bank top is variable but banks generally steep).

9.8.30 Indicative foundation depths associated with the development include maximum depths of up to a maximum of 3 m for piling and erection of the Solar PV Mounting Structures, typical trench depth of 0.6-0.8 m for low voltage cables, and 1.2 m depth for 33 kV cable, but will need to vary and go deeper depending on crossings.

## Drainage Strategy

9.8.31 A Preliminary Drainage Strategy has been prepared within **PEIR Volume III Appendix 9-4: Preliminary Drainage Strategy** and will be updated and submitted with the DCO Application. This Drainage Strategy will provide attenuation of surface water runoff from the Scheme, whilst minimising flood risk to the Site and surrounding areas. In accordance with planning policy guidance (as outlined in Section 9.3), runoff from the Scheme will be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. This will be secured through the inclusion of a detailed Drainage Strategy as a Requirement of the DCO.

9.8.32 Individual Solar PV Panels will be held above the ground surface on the Solar PV Mounting Structures (see **PEIR Volume I Chapter 2: The Scheme**). This prevents sealing the ground with an impermeable surface beneath the Solar PV Panels, allowing rainfall/runoff to infiltrate to ground throughout the Solar PV Site. As a result, it is considered that the Solar PV Site's impermeable area within Solar PV Panel areas will remain substantively consistent to its pre-development state. Despite not contributing towards the impermeable areas, in order to limit the potential for channelisation from rainfall dripping off the end of the 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.

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

## Drainage Outfalls

9.8.34 Where practicable, surface water will drain from the Scheme's swale based drainage system to local receiving watercourses via a new ditch, as this avoids the need to construct an engineered outfall. 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.

### Foul Drainage

9.8.35 During the operation and maintenance phase of the Scheme it is expected that there would be only a low volume of foul drainage generated (related to an anticipated one to two full time operational staff members and four days part time per month). This would be self-contained non-mains, cess pit sealed tank, or portaloos, with no discharge to ground. These would be regularly emptied under contract with a registered recycling and waste management contractor.

9.8.36 As there would be no discharge of foul water to a watercourse, no discharge to foul sewer is proposed. Thus, no further assessment of foul waste from the Scheme is proposed.

### Access Track Crossing of Watercourses

9.8.37 Access tracks will be constructed across the Solar PV Site, these are to access the Field Stations, the BESS Area, the On-Site Substation and the Operations and Maintenance Hub. These will typically be 3.5 m to 5 m wide compacted stone tracks with 1:2 gradient slopes on either side where required, with fire service access tracks being up to 8 m wide. The internal road layout will be designed to avoid drainage ditch and watercourse crossings wherever possible.

9.8.38 Existing watercourse crossing locations have been utilised to avoid the need for new crossing locations where practicable. The access track design round the Site utilises an existing culvert over the north tributary to Fleet Drain to cross from field NE6 to NE8. There are three areas labelled as Bridge Options where the access track will cross Fenwick Common Drain (two No.) and south tributary to Fleet Drain, west of Riddings Farm. The second Fenwick Common Drain Bridge Option is in the area of the confluence with Fleet Drain.

9.8.39 As part of the Scheme a section of culverted Fleet Drain will have the culvert removed. This current culvert is located on Fleet Drain east of Fenwick Hall.

9.8.40 More detail on the watercourse crossings by access tracks will be known and assessed at the ES stage.

### Operational Cleaning

9.8.41 It is assumed that the Solar PV Panels will be cleaned around once every two years, using clean water with no added chemical cleaning agents other than a biodegradable water softener.

9.8.42 The operator of the Scheme will be required to obtain water from a suitable source for ongoing requirements for panel cleaning. This may involve purchasing water when needed from a suitable third-party provider. Alternatively, where water is sourced from a local natural source, this would need to be in accordance with any abstraction licence from the Environment Agency (if the volumes to be abstracted are sufficiently high).

### Substation Operation

9.8.43 The operation of the on-site substation will include a backup generator in order to provide power in the event of an electrical failure for a restart if required. This will be a diesel generator and it is assumed to be required for a maximum of eight hours in any one year. The Framework OEMP will include methodology for maintenance and refuelling operations for the backup generator to ensure the prevention of spills, and leaks are prevented.

### Solar PV Panel Maintenance

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

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

9.8.46 The OEMP for the Scheme will be finalised prior to operation and would include a regular schedule for visual inspection and cleaning of the Solar PV Panels. The Solar PV Panels do not contain any liquid (hazardous or not). The Solar PV Panels are constructed in a robust manner and their components cannot be separated except with a considerable mechanical load. Therefore, no specific mitigation measures (in terms of the management of leaks) are required for the Solar PV Mounting Structures themselves during operation.

### Management of Fire Risk

9.8.47 The BESS Area requires fire water tanks for the emergency services to utilise to supress a fire, if one break out. In the unlikely event of a malfunction to one of the battery arrays, there is a range of integrated controls that will activate depending on the extent and severity of the event. In case the malfunction progresses to a catastrophic fire event and so long as there are no lives under threat, the fire brigade would ensure surrounding elements and structures (intact battery arrays nearby, other electrical equipment, trees etc.) are kept adequately wet and cool to prevent the fire from expanding any further but the battery infrastructure would be allowed to burn within the controlled area.

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

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

9.8.50 The swale will be controlled by a penstock valve that can be closed before fire suppression is carried out.

9.8.51 Consultation with the emergency services will be undertaken as part of the Applicant's pre-application work, and the Applicant has already been engaging with South Yorkshire Fire and Rescue Service to gain their input on the BESS Battery Container design. Further details regarding management of fire water will be outlined in the Drainage Strategy to be submitted with the DCO Application.

## Permits and Consents

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

a. Land drainage consent(s) under section 23 of the Land Drainage Act 1991 (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 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. 9-55) 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; and

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

9.8.53 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 20 $m^3$ 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 20 $m^3$ 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'.

## 9.9 Assessment of Likely Significant Effects

9.9.1 The Scheme as outlined in the **PEIR Volume I Chapter 2: The Scheme** has been considered in assessing the likely impacts and effects on the water environment, whilst considering the embedded mitigation described in Section 9.8. More information on the EIA methodology is included in **PEIR Volume I Chapter 5: EIA Methodology**.

### Construction (Assumed to be 2028 to 2030): Solar PV Site

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

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

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

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

d. Potential impact on 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 local flood risk due to deposition of silt, materials or other debris in drains, and ditches, and construction of the Solar PV Panels.

9.9.3 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 water feature specific assessment at this stage.

### Pollution of Surface Water Features

#### Construction of Solar PV Panels and Field Stations

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

9.9.5 Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering riverbeds and macrophytes, 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).

9.9.6 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.

9.9.7 As stated in the assumptions, some watercourses will be crossed by a non-intrusive or trenchless method. However, it is assumed at this stage that the smaller watercourses may be crossed using open cut techniques. This is a precautionary, reasonable worst-case approach and all crossing methods will be reviewed as the Scheme is developed in consultation with statutory consultees.

9.9.8 Access tracks will cross Fenwick Common Drain at two locations and the north tributary to Fleet Drain in one location. In addition, at this stage the locations, and potential need for, drainage outfalls is not known and so any water feature specific impacts related to outfalls will also be assessed within the ES with only a generic assessment provided in this chapter.

9.9.9 As shown on **PEIR Volume II Figure 9-1: Surface Water Features and their Attributes** the River Went borders the Solar PV Site to the north, with Fenwick Common Drain flowing into Fleet Drain through the Solar PV Site. For the **Very High** Importance River Went, it is considered that with the proposed embedded mitigation measures in place (including a 10 m buffer zone and standard construction mitigation measures) this would result in a **very low adverse** impact on the water features. This would result in a **minor adverse effect (not significant)** for the River Went. For the **medium** importance Fenwick Common Drain and Fleet Drain, a **very low** adverse impact would result in a **Negligible effect (not significant).**

9.9.10 Ell Wood and Fenwick Grange Drain borders the south of the Solar PV Site, adjacent to field SW12, the main construction compound, SW8 and SW7. There will be construction activities located within these fields. It is considered that with the proposed embedded mitigation in place (including a 10 m buffer zone and standard construction measures) this would result in a very low adverse impact on the **medium** importance drain. A **very low** adverse impact would result in a **Negligible effect (not significant).** There are also artificial unnamed drains located at some field boundaries within the Site. It is considered that with the proposed embedded mitigation in place (including a 10 m buffer zone and standard construction measures) this would result in a very low adverse impact on the low importance drains. A **very low** adverse impact would result in a **Negligible effect (not significant).**

### Construction Compound and Temporary Construction Compounds

9.9.11 There is one main Construction Compound and two temporary Construction Compounds. The main Construction Compound is located towards the southwest of the site, within area SW10, adjacent to the north of Ell Wood and Fenwick Grange Drain. The temporary compound within area NW7 is to the north of southern tributary to Fleet Drain. The temporary compound within SE2 is adjacent to the east of Fleet Drain, this is the smallest compound.

9.9.12 Within these compounds there is intended to be materials storage, carparking, and potential for refuelling activities. Within the embedded mitigation measures there is a requirement for a 10 m buffer from watercourses to ensure minimisation of risk to watercourses from any spills or leaks, together with ensuring any equipment or plan washing takes place in designated areas. It is considered that with the proposed embedded mitigation in place (including a 10 m buffer zone and standard construction measures) this would result in a **very low adverse** impact on the **medium importance** receptors (Ell Wood and Fenwick Grange Drain, Fleet Drain and Southern tributary to Fleet Drain). This results in a **negligible effect (not significant).**

### Internal Cabling

9.9.13 There will also be a requirement to cross water features for internal cabling connections. Within the Solar PV Site the Fenwick Common Drain and the northern and southern tributary to Fleet Drain are located. These will need to be crossed by internal cabling, which it has been assumed would be installed by an intrusive construction method.

9.9.14 Fenwick Common Drain is considered to be of **medium** importance for water quality, with the north and south tributary to Fleet Drain also considered to be of **medium** importance. As a worst case assessment, using the embedded mitigation, it is considered this may result in a **low adverse** impact to the receptors and would result in a **Minor Adverse effect** to Fenwick Comon Drain and the north and south tributary to Fleet Drain. (both **not significant**).

### Access

9.9.15 At the current stage of the design information on the need for temporary accesses across watercourses is not known. Thus, adopting a precautionary approach it has been assumed that crossings are required and that these may involve temporary culverting over the watercourses within the Solar PV Site. This represents a reasonable worst case assessment. There are currently three areas of crossings which are known as bridge options. There are three areas labelled as Bridge Options where the access track will cross Fenwick Common Drain (two No.) and south tributary to Fleet Drain, west of Riddings Farm. In addition, an approximately 10 m section of Fleet Drain is currently culverted and may be daylighted (whereby the culvert is removed and it is returned to an open drain) by the Scheme, which may require temporary over-pumping of the flow.

9.9.16 Within the Solar PV Site the receptors are considered to be **medium** (Fenwick Common Drain) and **medium** (south tributary to Fleet Drain) importance for water quality. If culverts are proposed this would result in temporary construction impacts within the channel, as they would need to be constructed online, but with the standard mitigation methods described earlier a **low adverse** magnitude of impact is predicted. The water pollution risk would result in a **Minor Adverse effect (not significant)** for Fenwick Common Drain and the south tributary to Fleet Drain (both **not significant**). However, in practice alternative options to culverts will be considered (or the least impacting culvert option with all possible embedded mitigation applied) and this will be investigated as the design of the Scheme is progressed.

9.9.17 A section of Fleet Drain is currently culverted, it is proposed as part of the Scheme to consider de-culverting this section of Fleet Drain. These works would require works within the channel, as noted above. With the embedded mitigation in place, including standard construction methodologies, it is considered this would have a **low adverse** magnitude of impact on Fleet Drain, a **medium** importance receptor. This results in a **Minor Adverse effect (not significant).**

### Outfalls

9.9.18 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. Although it is assumed that construction of any outfalls would be within a dry working area, their construction would result in some temporary disturbance to the bed and banks and the risk of chemical spillages, especially if pre-cast headwalls cannot be used requiring pouring of wet concrete close to water.

9.9.19 Within the Site the surface water receptors are of **medium** importance (Fenwick Common Drain, south and north tributary to Fleet Drain), this would result in a localised, short term and temporary **very low adverse** magnitude of impact, which would result in a **negligible adverse effect (not significant)**.

9.9.20 For the **Very High** Importance River Don, the downstream receptor of all the works above, it is considered that with the proposed embedded mitigation measures in place (including a 10 m buffer zone and standard construction mitigation measures), and the dilution available, this would result in a **very low adverse** impact on the River Don. This would result in a **minor adverse effect (not significant)** for the River Don.

## Temporary Impacts on the Hydromorphology of Watercourses

9.9.21 There will also be a requirement to cross water features for internal cabling connections. For Fenwick Common Drain (an IDB maintained watercourse), of morphologically low importance, and assuming as a worst case assessment at this stage that intrusive techniques would be used but with the embedded and standard mitigation described earlier, a short term, temporary **low** adverse magnitude of impact, resulting in a **negligible effect** (**not significant**). During the works for internal cabling crossings there may be localised flow disturbance or disruption to sediment transport processes. It is considered that with the embedded and standard mitigation described earlier this would be of **low** impact, on a **low** importance for morphology, resulting in a **negligible effect (not significant**).

9.9.22 For the south tributary to Fleet drain, a **low** morphology importance receptor, a short term temporary **low adverse** impact is predicted, which would result in a **negligible effect (not significant)**.

9.9.23 There is also the potential for open cut crossings of small ephemeral ditches, of **low** importance**.** It is considered that there is potential for **low** impact, resulting in a **negligible effect (not significant).**

9.9.24 Changes in hydromorphology that may be associated with new permanent surface water outfalls and access across watercourses are considered under the operation and maintenance phase.

9.9.25 There is potential for impact on hydromorphology from construction compounds to Ell Wood and Fenwick Grange Drain from the main compound in SW10; to south tributary of Fleet Drain from the temporary compound in NW7; and to Fleet Drain from the temporary compound in SE2. These are low importance for morphology receptors and impacts to hydromorphology will be mitigated through a 10 m buffer zone.

## Groundwater

### Risk of Pollution from Construction Works, and Construction Compounds

9.9.26 The low-voltage On-Site Cables to connect the Solar PV Mounting Structures to the inverters will require trenches of around 0.6-0.8 m depth for low voltage On-Site Cables, 1.2 m deep for 33 kV On-Site Cables and 1.4 m deep for 400 kV On-Site Cables with deeper excavation required in some areas. The higher voltage cables which are required to connect the transformers to the Field Stations may require trenches around 1.2 m deep (maximum). However, this may vary at different points along the On-Site Cables route where required. Other structures within the subsurface include the galvanised steel poles to support the Solar PV Mounting Structures. The depth of these poles will be 1.8-3 m depth depending on ground conditions. These poles are typically installed by driving them directly into the ground without the need for excavation for foundation purposes and avoids disturbing the surrounding ground. There may also be shallow excavations of up to 1 m or more (depending on geology and structural calculations) for concrete plinths, depending on the local geology associated with the hardstanding areas of the Site, for example for the Field Stations and BESS Battery Containers. The construction compounds (within area SW10, with two smaller ones in area NW7 and SE2) will be for above ground storage and management of the construction process. There is limited groundwater level data across the Site, however there is evidence that there may be shallow groundwater within superficial deposits less than 3 m below the ground surface at times. Therefore, groundwater in the superficial deposits may be encountered during construction.

9.9.27 Groundwater (piezometric level) in the Sherwood Sandstone Principal Aquifer is estimated to be at least 3 m below surface based on Environment Agency monitoring data and topographic elevation and confined by overlying clay deposits. Groundwater in the Sherwood Sandstone may be encountered if deeper foundations are required (e.g. piling) that are installed through the superficial deposits into the bedrock although the need for this appears unlikely at this stage.

9.9.28 Taking into account the scale of the construction works, and the thickness of the underlying superficial deposits (i.e. up to 11 m), the works are mainly likely to encounter shallow groundwater (within the superficial deposits) across the Solar PV Site. Therefore, the potential impact on the groundwater quality is generally low. The groundwater in the Sherwood Sandstone Principal Aquifer will be protected by the overlying predominantly low permeability superficial deposits.

9.9.29 Taking into account the embedded mitigation measures to be secured within the Framework CEMP, there is **no change** predicted on the groundwater quality below the Site due to the construction works, or the location of the three construction compounds. This results in a **neutral effect (not significant)** from the construction works, and Construction Compounds, on groundwater including within the Principal Aquifer (**high** importance), and the Secondary A aquifer (Breighton Sand Formation, the Alluvium, both **medium** importance).

9.9.30 Similarly, **no change** is predicted on the PWS abstraction of medium importance located approximately 600 m from the Solar PV Site due to the distance between the Site and the receptor. The source is used for agricultural purposes and is likely to be abstracting from the underlying Sandstone aquifer, therefore a **neutral effect (not significant)** is predicted.

### Impacts on Groundwater Flow

9.9.31 The shallow foundations required for the Solar PV Panel mounting will be regularly spaced and discontinuous. Similarly, the cable trenches are likely to be generally within 1.4 m of ground level. The piled foundations for the Solar PV Panels and cable trenching will generally be within the superficial deposits and not expected to extend into the underlying bedrock. Given the above and the predominantly low permeability nature of the superficial deposits underlying the Solar PV Site (i.e. the Glaciolacustrine deposits and the Alluvium), significant groundwater flows are not expected. Where pockets of the more permeable Breighton Sand Formation is present slightly higher groundwater flows may be encountered.

9.9.32 Overall, there are no impacts (**no change**) predicted on the groundwater flow in the underlying Sherwood Sandstone Principal Aquifer (**high importance**) and the PWS supply boreholes, resulting in **neutral** change **(not significant)**.

9.9.33 Taking into account the embedded mitigation measures as part of the CEMP, any impacts of the foundation and cable trenching works on the groundwater flows within the **medium importance** Secondary A superficial aquifer will be short term, very localised and temporary (**very low adverse impact**), resulting in a **negligible effect (not significant)**.

9.9.34 Cable routes beneath watercourses are anticipated to be below the water table over part of their routes as they pass through the Solar PV Site. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered likely to have minimal impact on groundwater flow in the superficial aquifers.

9.9.35 Where the groundwater in underlying Principal Aquifer is encountered by this activity, there may be localised, short term temporary impact on the groundwater flow within the aquifer. For both the Principal and Secondary A aquifers, this is predicted to have a **very low adverse impact** on groundwater flow. On the **high importance** Sherwood Sandstone Aquifer, this results in **minor effect (not significant).** For the **medium importance** groundwater features, (i.e. the Secondary A aquifer (Breighton Sand Formation and the Alluvium), this results in a **negligible effect (not significant)**.

9.9.36 Due to the short term, temporary nature of the proposed work, **no change** is predicted on the PWS (PWS1) that is within 600 m of the Solar PV Site, resulting in a **neutral effect** (not significant). No public water supply abstractions are identified within the Study Area.

### Groundwater Dewatering Impacts

9.9.37 Construction works to install internal cables beneath drains/streams using drilling or boring techniques may involve a temporary pit either side of the watercourse (>10 m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits along the length of the cable route. Maximum parameters for the pit dimensions will be outlined at the detailed design during Route Refinement Stage, though more information will be available for assessment at ES stage. As outlined above, there may be shallow groundwater in parts of the Solar PV Site, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques potentially including pumping, damming or shoring up the pits with sheet piling. Significant groundwater ingress is not anticipated as these works are expected to be within the thick superficial deposits (up to 11 m) which are largely of low permeability material.

9.9.38 As stated in the Embedded Mitigation Section 9.8 a temporary abstraction licence may be required from the Environment Agency when abstracting more than 20 $m^3$ of water per day. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April 2021) cannot be met. This document states that uncontaminated, clean water, is water that is wholly or mainly clear rainwater or infiltrated groundwater that has collected in the bottom of temporary excavations on an uncontaminated site (Ref. 9-54).

9.9.39 The pits would be backfilled with the original excavated material upon completion and will not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction, but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the Framework CEMP, there is the likelihood of a short term, temporary and localised **very low adverse** magnitude of impact on groundwater levels and flow. For the **medium importance** groundwater bodies in the Secondary A aquifers (i.e. the Breighton Sand Formation and Alluvium), this results in a **negligible effect (not significant)**.

9.9.40 No impacts on the underlying Principal Aquifer of **high importance** and the PWS abstraction approximately 600 m away (**no change**, resulting in a **neutral effect (not significant)**. No public water supply abstractions are identified within the Study Area.

### Flood Risk

9.9.41 Long term flood risk resulting from the Scheme within the Solar PV Site is not envisaged to impact fluvial, tidal, groundwater, sewers, or artificial risk levels of flooding within or surrounding the Solar PV Site. The increase in surface water runoff rates as a result of the with-Scheme scenario will be managed via sustainable drainage techniques proposed to mimic the pre-Scheme conditions detailed within the **PEIR Volume III Appendix 9-4: Preliminary Drainage Strategy**, resulting in no impact to flooding from surface water sources within or surrounding the Site.

9.9.42 A summary of the pre- and post- Scheme scenario flood risk levels for all sources within the Solar PV Site is provided in Table 9-15 below, details of which have been taken from Table 5-1 of the FRA (**PEIR Volume III Appendix 9-3: Preliminary FRA**).

**Table 9-15: Summary of Construction Phase Effects on Flood Risk for the Solar PV Site**

| Flood Risk Source | Pre-Scheme Flood Risk Level | Post-Scheme Flood Risk Level | Comments |
|---|---|---|---|
| Fluvial | Low to High | Low to High | Solar PV infrastructure within Flood Zones 2 and 3 will be raised above the modelled design flood level and are not expected to impact existing flood extents or mechanisms. The volume of floodplain storage lost as a result of panel mounts within Flood Zone 3 and provision of compensatory storage will be assessed as part of the full FRA to ensure flood risk is not increased elsewhere. The main construction compound and northern temporary construction compound have been sequentially located to be outside of fluvial flood risk. The eastern temporary construction compound will |

| Flood Risk Source | Pre-Scheme Flood Risk Level | Post-Scheme Flood Risk Level | Comments |
|---|---|---|---|
| | | | have appropriate mitigation methods implemented as will be detailed in the CEMP at the EIA stage. |
| Tidal | Low | Low | No change to flood risk level. |
| Surface Water | Very low to high | Very low to high | Increased surface water runoff is proposed to be managed to mimic the pre-Scheme conditions for up to and including the 1% AEP event plus climate change. |
| Groundwater | Low | Low | No change to flood risk level. |
| Sewers | Very low | Very low | No change to flood risk level. |
| Artificial Sources | Low | Low | No change to flood risk level. |

9.9.43 With the exception of the north and east areas of the Solar PV Site, the remaining area is considered to be at low risk from all sources of flooding. The FRA will assess these sources of flood risk in greater depths during the ES stage of the assessment.

9.9.44 As stated within Section 9.8 Embedded Mitigation, the Preliminary Surface Water Drainage Strategy would ensure that any alteration of surface water runoff as a result of the construction of the Scheme would be mitigated. The full Surface Water Drainage Strategy will be provided in the ES stage of assessment and will clarify how surface water runoff within the operational Solar PV Site will be mitigated. Construction activities would take place with a detailed CEMP and WMP in place to ensure no exacerbation of localised flooding from deposition of sediment in new drainage pathways and ditches.

9.9.45 The flood risk receptor is Very High, the essential infrastructure on the site. However, the impact on flooding during construction within the Solar PV Site is considered to result in a temporary **no change** impact, which would result in a **neutral effect**, that is considered **not significant**.

9.9.46 The change of land use within the Solar PV Site has the potential to result in a change of flood potential for fluvial and surface water sources to off-site receptors. It is considered there would be a **no change** impact, which would result in a **neutral effect** (not significant).

## Summary of Construction Phase Effects on the Water Environment for the Solar PV Site

9.9.47 Table 9-16 below provides a summary of the potential impacts and effects on the water environment during construction of the Solar PV Site on surface water, groundwater and hydromorphology environment. The summary of the pre and post potential effects of construction on flood risk receptors is summarised in Table 9-17.

**Table 9-16: Summary of Significance of Effects from Construction of the Solar PV Site**

| Receptor | Importance | Description of Impact | Magnitude of Impact | Effect |
|---|---|---|---|---|
| River Went | Very High | Potential pollution of surface water during construction of PV areas, fine sediments, any spillages of polluting substances from construction of solar array and associated infrastructure | Very Low adverse | Minor adverse (not significant) |
| Fenwick Common Drain/Fleet Drain | Medium | As above | Very low adverse | Negligible effect (not significant) |
| Ell Wood and Fenwick Grange Drain | Medium | As above | Very low adverse | Negligible effect (not significant) |
| Unnamed agricultural drains | Low | As above | Very low adverse | Negligible effect (not significant) |
| Fenwick Common Drain/north and south tributary to Fleet Drain | Medium | Internal cabling construction | Low adverse | Minor (not significant) |
| Fenwick Common Drain/south | Medium | Access tracks | Low adverse | Minor adverse (not significant) |

| Receptor | Importance | Description of Impact | Magnitude of Impact | Effect |
|---|---|---|---|---|
| tributary to Fleet Drain | | | | |
| Fenwick Common Drain/tributaries to Fleet Drain | Medium | Outfalls construction | Very low adverse | Negligible effect (not significant) |
| North and south Tributaries to Fleet Drain | Morphologically low | Disturbance to sediment transport processes during open cut internal cabling crossing | Low | Negligible effect (not significant) |
| North and south Tributaries to Fleet Drain | Morphologically low | Open cut crossing of watercourses for internal cabling using open cut techniques. | low adverse | Negligible (not significant) |
| Fenwick Common Drain | Morphologically low | Non-intrusive crossing of channel for internal cabling | No change | Neutral effect (not significant) |
| Small ephemeral ditches | Morphologically low | Open cut crossing of channels for internal cabling | low | Negligible (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | Pollution risk on groundwater quality during construction works | No change | Neutral (not significant) |

| Receptor | Importance | Description of Impact | Magnitude of Impact | Effect |
|---|---|---|---|---|
| Sherwood Sandstone (Principal Aquifer) | High | associated with the Solar PV site and cable route | No change | Neutral (not significant) |
| PWS abstraction (used for irrigation purpose) | Medium | | No change | Neutral (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | Construction works associated with the Solar PV site on groundwater flow | Very Low Adverse | Negligible (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | | No change | Neutral (not significant) |
| PWS abstraction (used for irrigation purpose) | Medium | | No change | Neutral (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | Cable route that may be below watercourses and potential impact on groundwater flow | Very Low Adverse | Negligible (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | | Very Low Adverse | Minor (not significant) |

| Receptor | Importance | Description of Impact | Magnitude of Impact | Effect |
|---|---|---|---|---|
| PWS abstraction (used for irrigation purpose) | Medium | | No change | Neutral (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | Groundwater dewatering impacts associated with excavating drill pits for installation of cables | Very Low Adverse | Negligible (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | | No change | Neutral (not significant) |
| PWS abstraction (used for irrigation purpose) | Medium | | No change | Neutral (not significant) |
| Essential Infrastructure | Very High | Temporary changes in fluvial and surface water sources during construction and decommissioning | No change | Neutral (not significant) |
| Residential Housing | High | Temporary changes in fluvial and surface water sources during construction and decommissioning | No change | Neutral (not significant) |

### Construction (assumed to be 2028 to 2030): Grid Connection Corridor

9.9.48 During construction of the Grid Connection Corridor the following adverse impacts may occur:

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

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

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

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

9.9.49 These are summarised in Table 9-19 at the end of this section, with discussion presented below in the following paragraphs. All of these potential impacts and effects will be re-assessed once further design information is available at the ES stage.

### Surface Water Features

9.9.50 The Grid Connection Corridor crosses the water features listed in the Grid Connection Corridor Surface Water Features section. Similar impacts are likely to occur from the construction of the Grid Connection Corridor as those discussed in the Construction (2028 to 2030) of the Solar PV Site.

9.9.51 For non-intrusive watercourse crossings, there is a small risk of ‘frac-out’ events (i.e. hydraulic fluid break out) from drilling under the watercourse if not appropriately mitigated for site specific conditions. A site-specific hydraulic fracture risk assessment will be produced prior to commencing works to define the mitigation required based on ground conditions. This requirement has been included within the **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan** and will minimise the risk of a ‘frac-out’ event. Water quality monitoring will also be undertaken prior to, during, and following on from the construction activity to ensure any spillages or other pollution is identified. This requirement is included within the Framework CEMP. These mitigation requirements will be outlined in a WMP (which will be produced post consent).

9.9.52 At the time of writing, it is not known exactly where access track crossings or crossings for Grid Connection Corridor Cables will be located, however as the watercourses are generally in an east-west orientation, and the Grid Connection Corridor is north-south orientation, the water features crossed will remain the same. The locations will be reviewed, and assessment undertaken at the ES stage. As stated in the assumptions, some watercourses will be crossed by non-intrusive methods such as HDD, with it assumed that other smaller watercourses would be crossed by open cut techniques (i.e. a precautionary approach has been adopted).

### Grid Connection Cable Crossings

9.9.53 With regard to the crossing of Bramwith Drain and Thorpe Marsh Drain by non-intrusive methods, there is considered to be negligible potential for impact from works to install a Grid Connection Cable beneath them given the mitigation measures in place, the distance of the launch/receiving pits from the banks. For the **high** importance Bramwith Drain and **very high** importance Thorpe Marsh Drain, a **very low** magnitude of impact results in a **minor adverse effect (not significant)**.

9.9.54 For intrusive open cut crossings for the Grid Connection Corridor, there is likely to be unavoidable short term, temporary adverse impacts on the channel morphology, riparian habitats, and the hydrological and sediment regimes during construction. However, given mitigation measures in place, including over-pumping or fluming of the flow, reinstatement as found and implementation of good practice measures, which will be outlined in the **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan** and WMP, these impacts would be a temporary and localised **low adverse** magnitude of impact in terms of water quality. As a worst case assessment, it has been assessed for potential for intrusive open cut methods for **medium** importance Ell Wood and Fenwick Grange Drain, Tributary to Flashey Carr Drain, Tributary to Mill Dike, Mill Dike, Engine Dike, Wrancarr Drain and unnamed channel south of Marsh Lane Bridge with the mitigation measures in place, it is considered it would be a **low adverse** impact. This would result in a **negligible effect (not significant**). Where intrusive open cut methods are used for lower importance receptors, for example agricultural ditches. A **low adverse** magnitude of impact on a **low** importance receptor would result in a **negligible adverse effect (not significant).**

9.9.55 Bramwith Drain as a WFD monitored watercourse, a **medium** importance receptor, the cable crossing would be made with non intrusive techniques. Therefore, it is considered that there would be a **very low** impact resulting in a **negligible effect (not significant**).

9.9.56 For the **Very High** Importance River Don, the downstream receptor of all the works above, it is considered that with the proposed embedded mitigation measures in place (including a 10 m buffer zone and standard construction mitigation measures), and the dilution available, this would result in a **very low adverse** impact on the River Don. This would result in a **minor adverse effect (not significant)** for the River Don.

### Access

9.9.57 There is potential for adverse impacts on surface water quality of water features during construction of temporary crossings (e.g. using culverts) for access. It is considered that the installation and removal of temporary crossings that may involve culverts for Site access would result in short term, temporary **very low adverse** magnitude of impact. At this stage, locations are not known so site specific assessment is not possible. For any crossings of **high** importance water feature, Bramwith Drain and **very high** importance, Thorpe Marsh drain), this would result in a **minor adverse effect (not significant).** For any **medium** importance receptors which need to be crossed (Ell Wood and Fenwick Grange Drain, Mill Dike, Wrancarr Drain and unnamed channel south of Marsh Lane Bridge), a **very low** adverse impact would result in a **negligible effect (not significant).** For the **low** importance agricultural ditches, a **very low adverse** magnitude of impact results in a **negligible effect (not significant).**

### Temporary Impacts on the Hydromorphology of Watercourses

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

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

9.9.60 Where non-intrusive methods for crossing Bramwith Drain and Thorpe Marsh Drain are used, it is considered there would be a **no change** magnitude of impact on their hydromorphology which on **low importance** water features for hydromorphology (Bramwith Drain and Thorpe Marsh Drain) results in a temporary **neutral adverse effect (not significant)**.

9.9.61 For the intrusive open cut crossings for the Grid Connection Corridor there is likely to be unavoidable short term, temporary adverse impacts on the channel morphology, their riparian habitats, and the hydrological and sediment regimes during construction. With the proposed mitigation measures, including reinstatement of the channel as found this would be a temporary and localised low adverse impact. A **low** adverse magnitude of impact, on a **low** importance receptor, would result in a **negligible effect (not significant).**

## Groundwater

### Risk of Pollution from Construction Works

9.9.62 As indicated in **PEIR Volume I Chapter 2: The Scheme** the low-voltage On-Site Cables to connect the Solar PV Mounting Structures to the inverters may require trenches of around 0.6-0.8 m deep. The higher voltage On-Site Cables which are required to connect the transformers to the on-site substations may require trenches up to 1.4 m deep for 400 kV On-Site Cables. However, this may vary at different points along the On-Site Cable route when required. Works that open excavations potentially create new pathways to groundwater and thus potential impacts will be assessed.

9.9.63 There is limited groundwater level data across the Grid Connection Corridor and 1 km Study Area, however it is likely that groundwater within the Alluvium is shallow at less than 3 m below the ground surface, therefore, shallow groundwater in the superficial deposits may be encountered during the construction works particularly in the vicinity of the River Don valley.

9.9.64 Where the HDD extends to deeper levels, up to the maximum depths of 10 m bgl, confined groundwater within the bedrock may be encountered. Taking into account the embedded mitigation measures to be secured within the Framework CEMP, the potential impact on groundwater quality during construction of the Grid Connection Corridor is considered to be short term and temporary.

9.9.65 Accordingly, **very low adverse** impact is predicted on the groundwater quality. This results in a **negligible effect (not significant)** on the **medium important** groundwater of the Secondary A aquifers (Breighton Sand Formation and the Alluvium). The impact results in **minor effects (not significant)** within the Principal Aquifer and PWS2, located approximately 300 m from the Grid Connection Corridor (both of **high importance**).

### Groundwater Flow Impacts

9.9.66 It is anticipated that the trenches required for the Grid Connection Corridor Cables will predominantly be within the superficial deposits, however where the HDD are deeper, this may encounter the bedrock of the Sherwood Sandstone and Chester Formation.

9.9.67 Generally, it is considered that the cable trenches will have minimal impact on groundwater flows, any impact will be temporary and short term. Therefore, taking into account the embedded mitigation measures **a very low adverse** impact is predicted on the groundwater flow in the groundwater receptors. This results in **minor effect (not significant)** on the Sherwood Sandstone Group Principal Aquifer and the PWS2 used for domestic supply, both of which are of **high importance**. **Negligible effect (not significant)** is predicted on the **medium importance** Secondary A aquifers (Alluvium and Breighton Sand Formation).

9.9.68 The Grid Connection Corridor is planned to cross a number of roads, watercourses and a rail line. The cable routes beneath watercourses are anticipated to be below the water table over part of their routes. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered to have minimal impact on groundwater flow in the superficial aquifers. Where the groundwater in underlying Principal Aquifer is encountered by this activity, there may be localised, short term temporary impact on the groundwater flow within the aquifer.

9.9.69 For the Principal and Secondary A aquifers and the PWS (PWS2), this is predicted to have a **very low adverse impact** on groundwater flow, which on the **high importance** Principal Aquifer and PWS2, this results in **minor effect (not significant).** For the **medium importance** Secondary A aquifer (Breighton Sand Formation and Alluvium), this results in a **negligible effect (not significant)**.

### Groundwater Dewatering Impacts

9.9.70 Construction works to install Grid Connection Cables beneath specified watercourses using drilling or boring techniques would involve a temporary pit either side of the watercourse (>10 m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits along the length of the Grid Connection Corridor. Maximum parameters for the pit dimensions will be outlined in the ES. As outlined above, there may be shallow groundwater in parts of the Grid Connection Corridor, 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.

9.9.71 A temporary abstraction licence may be required from the Environment Agency when abstracting more than 20 $m^3$ of water per day lasting less than 28 days. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April 2021) cannot be met (Ref. 9-54).The pits would be backfilled with the original excavated material upon completion and would not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction, but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the Framework CEMP, there is the likelihood of a short term, temporary **very low adverse impact** on groundwater levels and flow.

9.9.72 For the **medium importance** groundwater bodies in the Secondary A aquifers (Breighton Sand Formation and the Alluvium), this results in a **negligible effect (not significant)**. As these pits likely to be within the superficial deposits, **no impacts** are predicted on the underlying Principal Aquifer and PWS2 of **high importance** (**no change**, resulting in a **neutral effect**).

## Flood Risk

9.9.73 Long term flood risk resulting from the Scheme to and from the Grid Connection Corridor is considered to be as existing, as the infrastructure will be buried throughout the Grid Connection Corridor with no permanent above ground built development. A summary of the pre- and post- Scheme scenario flood risk levels for all sources within the Grid Connection Corridor is provided in Table 9-17 below.

**Table 9-17: Flood Risk Pre-Scheme to Post-Scheme Assessment**

| Flood Risk Source | Pre-Scheme Flood Risk Level | Post-Scheme Flood Risk Level | Comments |
|---|---|---|---|
| Fluvial | High | High | Grid Connection Corridor is via buried cables therefore unlikely to impact above ground fluvial sources. |
| Tidal | High | High | Grid Connection Corridor is via buried cables therefore unlikely impact above ground tidal sources. |
| Surface Water | Very low to high | Very low to high | Grid Connection Corridor is via buried cables therefore unlikely impact above ground surface water sources. |
| Groundwater | Low to high | Low to high | No change to flood risk level as only localised impacts to groundwater anticipated due to buried cable. |
| Sewers | Very low | Very low | No change to flood risk level. |
| Artificial Sources | Low | Low | No change to flood risk level. |

9.9.74 The Grid Connection is considered to be a medium to high risk of flooding from tidal/fluvial sources of flooding, and at low risk of flooding from all other sources of flooding. The Preliminary FRA provides an initial assessment of flood risk from all sources and is included in **PEIR Volume III Appendix 9-3: Preliminary FRA**. The FRA will assess all sources of flood risk in greater depth at the ES stage.

9.9.75 As stated within Section 9.8 Embedded Design Mitigation, the **PEIR Volume III Appendix 9-4: Preliminary Surface Water Drainage Strategy** would ensure that any alteration of surface water runoff as a result of the construction of the Scheme would be mitigated. The full Surface Water Drainage Strategy will be provided at the ES stage of assessment and will clarify how surface water runoff will be mitigated. The BESS Area and On-Site Substation would be located in Flood Zone 1.

9.9.76 Construction activities would take place with a detailed CEMP and WMP in place to ensure no exacerbation of localised flooding from deposition of sediment in new drainage pathways and ditches. Overall, the impact during construction within the Grid Connection Corridor on the essential infrastructure receptor, of very high importance, is considered to be a temporary **no change** magnitude of impact. This would result in a **neutral effect** (**not significant**).

9.9.77 The construction of the Grid Connection Corridor has the potential to result in a change of flood potential for fluvial, tidal surface water and groundwater sources to off-site receptors. It is considered there would be a **no change** magnitude of impact to off-site receptors. It which would result in a **neutral effect**, that is **not significant**.

### Table 9-18: Summary of Significance of Effect for the Construction of the Grid Connection Corridor

| Receptor | Importance | Description of Impact | Impact | Effect |
|---|---|---|---|---|
| Bramwith Drain | High | Cable crossing of Bramwith Drain using non intrusive technique | Very Low | Minor adverse (not significant) |
| Thorpe Marsh Drain | Very High | Cable crossing of Thorpe Marsh Drain using non intrusive technique | Very Low | Minor adverse (not significant) |
| Ell Wood and Fenwick Grange Drain, Mill Dike, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge | Medium | Potential for intrusive cable crossings as worst case | Low adverse | Negligible (not significant) |
| Any unnamed agricultural ditches | Low | Potential for intrusive cable crossings as worst case | Low adverse | Negligible (not significant) |
| River Don | Very High | Downstream receptor of any impact from the works above | Very low adverse | Minor adverse (not significant) |
| Bramwith Drain | High | Installation and removal of any temporary crossings | Very Low adverse | Minor adverse (not significant) |
| Thorpe Marsh Drain | Very High | Installation and removal of any temporary crossings | Very Low adverse | Minor adverse (not significant) |
| Ell Wood and Fenwick Grange Drain, Mill Dike, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge | Medium | Installation and removal of any temporary crossings | Very Low adverse | Negligible (not significant) |
| Any unnamed agricultural ditches | Low | Installation and removal of any temporary crossings | Very Low adverse | Negligible (not significant) |

| Receptor | Importance | Description of Impact | Impact | Effect |
|---|---|---|---|---|
| Bramwith Drain | High | Potential impact on Hydromorphology and sediment transport processes using non-intrusive crossings of cables | No change | Neutral (not significant) |
| Thorpe Marsh Drain | Very High | As above | No change | Neutral (not significant) |
| Ell Wood and Fenwick Grange Drain, Mill Dike, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge | Morphology Low | Potential impact on Hydromorphology and sediment transport processes using intrusive cable crossings | Low adverse | Negligible (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | Potential impact on groundwater quality | Very low adverse | Minor effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | | Very low adverse | Minor effect (not significant) |
| PWS abstraction (used for domestic and agricultural purposes) | High | | Very low adverse | Negligible effect (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | Groundwater level and flow | Very low adverse | Minor effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | | Very low adverse | Negligible effect (not significant) |
| PWS abstraction (used for domestic and agricultural purposes) | High | | Very low adverse | Minor effect (not significant) |

| Receptor | Importance | Description of Impact | Impact | Effect |
|---|---|---|---|---|
| Sherwood Sandstone (Principal Aquifer) | High | Groundwater dewatering impacts associated with excavating drill pits for installation of cables | No change | Neutral effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | | Very low adverse | Negligible effect (not significant) |
| PWS abstraction (used for domestic and agricultural purposes) | High | | No change | Neutral effect (not significant) |
| PWS abstraction (used for domestic and agricultural purposes) | High | | Very low adverse | Minor effect (not significant) |
| Essential Infrastructure | Very High | Temporary changes in flood risk to fluvial, tidal, surface water and groundwater during construction and decommissioning | No change | Neutral effect (not significant) |
| Residential Housing | High | Temporary changes in flood risk to fluvial, tidal, surface water and groundwater during construction and decommissioning | No change | Neutral effect (not significant) |

### Operation: Solar PV Site

9.9.78 During operation of the Solar PV Site the following adverse impacts may occur.

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

b. Potential impacts on groundwater resources: quality, flow and level and potential risk from firefighting at the BESS Area;

c. Potential impacts on the rate and volumes of surface water run-off entering local watercourses and increasing the risk of flooding; and

d. Potential for impact of foul drainage/water supply in the area due to the offices/maintenance facilities required as part of the Scheme.

9.9.79 These are summarised in Table 9-20 at the end of this Section, with discussion presented below in the following paragraphs. The operational Grid Connection Corridor has not been assessed as the whole cable will be installed beneath ground level with no impact on the water environment following completion of construction and reinstatement.

### Surface Water Features

#### Impacts from Diffuse Pollution

9.9.80 The provisional drainage arrangements propose to attenuate surface water runoff and contain chemical spillages from the Site once operational, whilst minimising flood risk to the Site and surrounding areas (see Embedded Mitigation Section). More detailed surface water drainage proposals will be presented in an update to the Preliminary Drainage Strategy that will be completed at the ES stage and submitted alongside the DCO Application. The operation of the Site will be managed in accordance with an Operational Environmental Management Plan (OEMP).

9.9.81 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 Area, On-Site Substation, Operations and Maintenance Hub, access tracks and car park.

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

9.9.83 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.

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

9.9.85 At this stage outfall locations have not been determined, it is anticipated that the area consists of low permeability ground and therefore will likely be discharged to a watercourse. Although, it is yet to be determined whether this could be achieved via a new ditch course or if an engineered outfall is required. These design matters are being considered and will be confirmed at the ES stage.

9.9.86 The SuDS Manual's Simple Index Approach (Ref. 9-34) will be revisited at the ES stage assessment. This will be used to demonstrate the suitability of the SuDS treatment trains within the design. This approach would take into account different land uses, including offices and access roads. It is likely that one or two treatment trains would be considered to provide significant mitigation.

9.9.87 The Solar PV Site would operate using good practice and comply with environmental legislation through the application of a Framework Landscape and Ecological Management Plan (Framework LEMP) that will be produced as part of the DCO Application, including appropriate maintenance of SuDS and other drainage infrastructure included within the Operational Environmental Management Plan. Overall, it is anticipated that with the embedded mitigation of an appropriate drainage strategy mimicking natural flow status there would be no material impact on existing surface water flow pathways from runoff from the Scheme. The inclusion of SuDS treatment train components would result in no impact to surface water quality from any site runoff.

9.9.88 Overall, given the implementation of a Drainage Strategy including SuDS provision, it is predicted at this stage that there would be a **No change** magnitude of impact to any receiving water feature from surface water runoff. Final outfall locations have not yet been determined, and so water feature specific assessment is not possible at this stage, but the following receptors are likely: the River Went, and Fenwick Common Drain, together with the north and south tributary to Fleet Drain (**of very high, medium and medium importance respectively**) or the **low importance** drainage ditches that are present in the area. For the **very high** importance River Went, and **medium** importance Fenwick Common Drain/north and south tributary to Fleet Drain, this would result in a **neutral effect (not significant**). For the low importance ditches this would be a **neutral effect (not significant)**.

### Pollution for Impact on Water Resources from Fire-Fighting Water at the BESS Area

9.9.89 If there is a fire within the BESS Area there is a risk that contaminated water may pollute nearby watercourses if it is not contained. As stated in the Embedded Mitigation Section, the operational Scheme design will include both fire water tanks and associated fire water containment. Any fire water will be stored on Site in tanks. In the event of a fire, any fire water runoff will be stored in lined swales surrounding the BESS Area. These swales will have an impermeable liner and the outfall from the swale will be controlled via a penstock to allow the containment of all stored fire water 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.

9.9.90 Overall, due to the lack of pathway from potential contaminated fire water to surface water features, it is considered there would be **no change** impact to surface water quality of the River Went or Fenwick Common Drain (**very high** and **medium** importance receptors respectively), resulting in a **neutral effect (not significant)** regardless of water feature importance.

### Potential Impacts on Hydrology

9.9.91 Once the Solar PV Site is operational, there is the potential for a change in surface water runoff or change in hydrology of the watercourses within the area. However, the drainage strategy will be designed so as to mimic the natural drainage conditions within the Site and ensure no impact on the flow in receiving surface water features. Therefore, it is considered there would be a **no change** impact on the surface water features in the area. These are of very **high (**River Went), and **medium** importance (Fenwick Common Drain and north and south tributary to Fleet Drain)). For all receptors, a no change impact results in a **neutral effect (not significant)**.

### Potential For Morphological Impacts to Watercourses

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

#### Access

9.9.93 At this stage in the design, the need for and location of permanent access tracks is not known. There is a commitment for no new culverts to be used for watercourse crossings. The need for and design, including any widening and strengthening work, of any permanent access across watercourses will be considered further as the design progresses and details provided in the ES.

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

9.9.95 Overall, as need and location are not known at this stage, a water features specific assessment is not possible. However, it is considered that, with mitigation, **low adverse** magnitude of impacts are likely, given the commitment for no new culverts being constructed. However, as the morphology receptors are assessed as being of **low** importance, this results in a potentially **negligible effect (not significant)**.

9.9.96 A section of culvert on Fleet Drain, downstream of Fenwick Common Drain, would be removed. This is located to the east of Fenwick Hall. The removal of a culverted section is considered to be a beneficial change, however, as it is a small section of culvert the magnitude of the impact of the benefit is limited. It is considered a medium beneficial impact. On the **low** importance for morphology, Fleet Drain, this result in a **minor beneficial effect (not significant).**

Outfalls

9.9.97 The Scheme may require new surface water outfalls for operational drainage. Locations will be determined at the ES stage following further development of the drainage strategy. Soft green ditch connections will be used where practicable, and the final location, position and orientation of any new outfall will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. If headwalls are required, appropriate micro-siting of the outfalls will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It is anticipated that agricultural drainage ditches would be impacted by outfalls from the Scheme.

9.9.98 Overall, the construction of new engineered outfalls would result in a localised, permanent **low adverse** impact, which on the Fenwick Common Drain, or north and south tributary to Fleet Drain receptors of **low** importance would result in a **negligible effect (not significant)**.

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

## Potential Impacts on Groundwater Resources

### Groundwater – Water Quality Impacts

9.9.100 During operation, there is the potential for impact to groundwater quality from any spillages of chemicals used onsite. However, the use of an Operational Environment Management Plan (OEMP) will ensure any potential for impact is minimised. Therefore, no significant risks to the groundwater receptors in terms of groundwater quality are anticipated during operation of the Scheme, provided that the operation is conducted in accordance with the Embedded Mitigation Section which will be secured in the DCO via the Framework OEMP, including adoption of best industry practice to manage the risk of chemical spillages. For the medium importance superficial groundwater aquifers (Breighton Sand Formation and alluvial deposits) this is considered to have a **very low adverse** impact therefore resulting in a **negligible effect (not significant)**. **No change** predicted on the Sandstone aquifer and of high importance and the PWS of medium importance due to the protection provided by the superficial deposits, resulting in a **neutral effect (not significant**).

### Groundwater – Flow and Level Impacts

9.9.101 The drainage design for the Scheme is not yet fully developed but it is anticipated that swales around the Solar PV Panels will collect runoff which is expected to partly infiltrate to the underlying aquifer, whilst the portion that does not have opportunity to infiltrate may be conveyed towards watercourses.

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

9.9.103 As such, there may be negligible localised changes in the spatial distribution and quantity of recharge of groundwater across the Site. It is considered there would be **very low adverse** impact on groundwater recharge, level and flow. For the **medium importance** superficial groundwater aquifers (Breighton Sand Formation and alluvial deposits), this results in a **negligible effect (not significant)**. **No change** is predicted on the Sandstone aquifer of **high importance** and the PWS (PWS1) of **medium importance** resulting in a **neutral effect (not significant**).

### Pollution Risk from Fire Fighting at the BESS Area

9.9.104 There is potential for the use of firefighting water in the event of a fire. As stated in Embedded Mitigation Section, the operational design will include both fire water tanks and associated fire water containment. Fire water will be stored on-site at the BESS Area. Associated with this will be a bunded impermeable lined area to allow the containment of all stored fire water if it becomes necessary to be used. In this way there would be no pathway whereby firewater can infiltrate to ground.

9.9.105 Therefore, due to the lack of pathway from potential fire water to ground or surface water features, it is considered there would be a **very low adverse** impact to groundwater quality in the superficial deposits. For the **medium** importance receptors (Secondary A aquifers), this results in a **negligible effect (not significant)**. No impact predicted on the Principal Aquifer of high importance and the PWS of medium importance.

### Flood Risk

9.9.106 Flood risk impacts and effects for flood risk are summarised in Table 9-19 for the operation and maintenance phase for the Solar PV site.

**Table 9-19: Summary of Operation and Maintenance Phase Impacts and Effects on Flood Risk for the Solar PV Site**

| Flood Risk Source | Pre-Scheme Flood Risk Level | Post-Scheme Flood Risk Level | Comments |
|---|---|---|---|
| Fluvial | Low to High | Low to High | Solar PV infrastructure within Flood Zones 2 and 3 will be raised above the modelled design flood level and are not expected to impact existing flood extents or mechanisms. |

| Flood Risk Source | Pre-Scheme Flood Risk Level | Post-Scheme Flood Risk Level | Comments |
|---|---|---|---|
| Tidal | Low | Low | No change to flood risk level. |
| Surface Water | Very low to high | Very low to high | Increased surface water runoff is proposed to be managed to mimic the pre-Scheme conditions for up to and including the 1% AEP event plus climate change. |
| Groundwater | Low | Low | No change to flood risk level. |
| Sewers | Very low | Very low | No change to flood risk level. |
| Artificial Sources | Low | Low | No change to flood risk level. |

9.9.107 During the operation and maintenance 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 has been prepared, included as **PEIR Volume III Appendix 9-4: Preliminary Drainage Strategy**. This is a method to assess water quality risk from different land uses so that sufficient treatment can be provided, preferably using SuDS. According to this risk assessment the proposed SuDS treatment train will provide adequate treatment of diffuse urban pollutants.

9.9.108 The drainage strategy includes SuDS provision; therefore, it is predicted at this stage that there would be a **No change** impact to any receiving water feature from surface water runoff. This results in a **Neutral effect (not significant)** whatever the level of importance of the receiving watercourse.

9.9.109 The flood risk receptor is Very High as essential infrastructure on the site. However, the impact on flooding during operation within the Solar PV Site is considered to result in a **no change** impact, which would result in a **neutral effect**, that is considered **not significant**.

9.9.110 The change of land use within the Solar PV Site has the potential to result in a change of flood potential for fluvial and surface water sources to off-site receptors. It is considered there would be a **no change** impact, which would result in a **neutral effect** (not significant).

### Summary of Operational Effects on the Water Environment for the Solar PV Site

9.9.111 Table 9-20 provides a summary of the potential impacts and effects on the water environment during operation from the Solar PV Site.

## Table 9-20: Summary of Significance of Effects from Operational Scheme

| Receptor | Importance | Description of Impact | Impact | Effect |
|---|---|---|---|---|
| River Went | Very High | Potential pollution impact from diffuse pollution within surface water runoff from the operational Site. | No change | Neutral (not significant) |
| Fenwick Common Drain/Fleet Drain | Medium | As above. | No change | Neutral (not significant) |
| River Went | Very High | Potential impact on water resources from any fire-fighting activities at the BESS Area. | No change | Neutral (not significant) |
| Fenwick Common Drain | Medium | As above. | No change | Neutral (not significant) |
| River Went | Very high | Potential impacts on hydrology in receiving watercourses. | No change | Neutral (not significant) |
| Fenwick Common Drain/north and south tributary to Fleet Drain | Medium | As above. | No change | Neutral (not significant) |
| Fleet Drain | Low morphology | De-culverting of a section of Fleet Drain east of Fenwick Hall. | Medium beneficial | Minor beneficial effect (not significant) |
| Fenwick Common Drain | Low morphology | Potential for hydromorphological impact to watercourses from access track crossings. | Low adverse | Negligible effect (not significant) |
| Fenwick Common Drain/unnamed watercourse | Low morphology | Potential for hydromophological impact from outfall locations. | Low adverse | Negligible effect (not significant) |

| Receptor | Importance | Description of Impact | Impact | Effect |
|---|---|---|---|---|
| Sherwood Sandstone (Principal Aquifer) | High | Potential impact on groundwater quality. | No change | Neutral effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | | Very low adverse | Negligible effect (not significant) |
| PWS abstraction (used for agricultural purposes) | Medium | | No change | Neutral effect (not significant) |
| Sherwood Sandstone (Principal Aquifer) | High | Groundwater level and flow. | No change | Neutral effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | | Very low adverse | Negligible effect (not significant) |
| PWS abstraction (used for agricultural purposes) | Medium | | No change | Neutral effect (not significant) |
| Breighton Sand and Alluvium (Secondary A Aquifers) | Medium | Pollution risk to groundwater from any fire-fighting at the BESS Area. | Very low adverse | Negligible effect (not significant) |
| Essential Infrastructure | Very High | Changes in flood risk to fluvial and surface water sources. | No change | Neutral effect (not significant) |
| Residential Housing | High | Changes in flood risk to fluvial and surface water sources. | No change | Neutral effect (not significant) |

### Decommissioning

9.9.112 Potential impacts from the decommissioning of the Solar PV 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) will be prepared prior to decommissioning to identify required measures to prevent pollution and flooding during this phase of the development.

9.9.113 The mode of cable decommissioning for the Grid Connection and Interconnecting Cables 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.

9.9.114 The pits will be sensitively located so as not to impact watercourses. Given that all cables will be a minimum of 1.5 m below the bed of watercourses, 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.

## 9.10 Additional Mitigation and Enhancements

### Additional Mitigation: Monitoring

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

9.10.2 It is important that during the operation of the Scheme there is regular inspection and maintenance of the drainage systems, proposed SuDS and watercourse crossings. This will be carried out in accordance with good practice guidance. The drainage system will be designed in accordance with current guidance to ensure that the potential for siltation and blockages is minimised under normal operation. If there is any evidence of excessive erosion or sedimentation associated with new structures further actions will be considered to remedy that impact in as sustainable a way as possible. This requirement would be included within the OEMP.

### Enhancements

9.10.3 The provision of enhancements to the water environment from the Scheme are being considered and, where relevant, further information will be provided in the ES.

## 9.11 Residual Effects and Conclusions

9.11.1 There are no likely significant effects resulting from the construction, operation of this Scheme. As no likely significant effects have been identified, no additional mitigation has been outlined at this stage.

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

9.11.3 There are considered to be no significant residual effects for surface water, groundwater or flood risk during the construction, operation and maintenance, and decommissioning phases of the Scheme. 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.

## 9.12 Cumulative Effects

9.12.1 This section assesses the potential effects of the Scheme in combination with the potential effects of other proposed and committed plans and projects including other developments (referred to as ‘cumulative developments’) within the surrounding area.

9.12.2 The cumulative developments to be considered in combination with the Scheme has been prepared and shared with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council and are listed in **PEIR Volume I Chapter 15: Cumulative Effects and Interactions** and presented in **PEIR Volume II Figure 15-3: Location of Short List Schemes**. The assessment has been made with reference to the methodology and guidance set out in **PEIR Volume I Chapter 5: Environmental Impact Assessment Methodology**.

9.12.3 This cumulative effect assessment identified, for each receptor, the areas where the predicted effects of the Scheme 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

9.12.4 There is potential for overlap between construction of this Scheme and impacts from adjacent schemes. Thus, there is the potential for short term, temporary construction related pollutants generated from both the Scheme and adjacent developments to impact on watercourses in the Study Area.

9.12.5 A Framework CEMP for this Scheme is presented in **PEIR Volume III Appendix 2-1: Framework Construction Environmental Management Plan**. This 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

Scheme, 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 expected to be **no significant cumulative effects** anticipated during construction on the basis of the above assessment.

9.12.6 Potential impacts from the decommissioning of this Scheme are considered to be similar in nature to those during construction, as some groundwater 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 accompany the DCO application.

9.12.7 From the short list of developments, there are three which are scoped out of further assessment, due to the cumulative developments being located within a different surface water catchment area, and therefore there being no surface water pathway for cumulative effects. For groundwater, the three scoped out on the basis of surface water catchment area, are also scoped out for groundwater as these are located at such a distance that it is considered there would be no cumulative impacts through groundwater interaction. These developments are 8-19/03034/FULM (Carbon Action Limited excavation of sand), 20/01774/TIPA (BH Energy Gap (Doncaster) Ltd construction of an energy recovery facility) and 21/02567/FULM (Enso Green Holdings Limited installation of solar farm).

9.12.8 Potential construction phase cumulative effects for the remaining six developments, as well as mitigation proposed and the overall significance of effects assessed are summarised in Table 9-21 below. Similar cumulative effects would be anticipated during decommissioning.

**Table 9-21: Significant Cumulative Effects Water Environment**

| Scheme ID | Scheme Name | Distance from the Site | Summary of Cumulative Effect |
|---|---|---|---|
| 2-23/00793/FULM | Thorpe Marsh Green Energy Hub Ltd | 0.1 km | 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.<br><br>Assuming the Thorpe Marsh Green development 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 this Scheme (not significant).** |

| Scheme ID | Scheme Name | Distance from the Site | Summary of Cumulative Effect |
|---|---|---|---|
| 5 and 6 220/01537/LBC and 22/01536/FUL | Demolition of Lily Hall, and erection of one dwelling | 0.2 km | 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.<br>Assuming the Lily Hall demolition development 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 this Scheme (not significant).** |
| 7 23/01746/FULM | Installation of 180 MW BESS | 0.5 km west of the Scheme, upstream within EA Beck from Skell to River Don catchment | This is located 545 m west of the Scheme, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects.<br>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.<br>Assuming the BESS development 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 this Scheme (not significant).** |

| Scheme ID | Scheme Name | Distance from the Site | Summary of Cumulative Effect |
|---|---|---|---|
| 12-23/01082/SCRE | Novus Renewable Services Limited screening opinion for 61.7 ha solar farm. | 1.7 km to the west, north of Arksey upstream, and within EA Beck from Skell to River Don catchment. | This is located 1.7 km west of the Scheme, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects.<br>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.<br>Assuming the Novus Renewables development would follow all legislative and regulatory requirements, and therefore appropriately mitigate effects, it is considered there would be **no change from the residual effects of this Scheme (not significant).** |
| 42-22/02088/FULM | Installation of 2.5 MW solar array. | 3.9 km west, near Carcroft village, upstream, and within EA Beck from Skell to River Don catchment. | This is located 3.9 km west of the Scheme, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects.<br>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.<br>Assuming the solar array development would follow all legislative and regulatory requirements, and therefore appropriately mitigate effects, it is considered there would |

| Scheme ID | Scheme Name | Distance from the Site | Summary of Cumulative Effect |
|---|---|---|---|
| | | | be **no change from the residual risk of this Scheme (not significant).** |

## Operation and Maintenance

9.12.9 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.

9.12.10 The Scheme 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 the 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 Scheme and any cumulative developments would not be anticipated to produce any significant effects. Therefore, the potential for operation and maintenance cumulative effects are scoped out of further assessment.

## 9.13 References

Ref. 9-1 His Majesty's Stationery Office (HMSO) (2021) Environment Act. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted [Accessed 21 December 2023].

Ref. 9-2 HMSO (2014) Water Act 2014. Available at: https://www.legislation.gov.uk/ukpga/2014/21/contents [Accessed 21 December 2023].

Ref. 9-3 HMSO (2010) Flood and Water Management Act 2010. Available at: https://www.legislation.gov.uk/ukpga/2010/29/contents [Accessed 21 December 2023].

Ref. 9-4 HMSO (1990) Environmental Protection Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed 21 December 2023].

Ref. 9-5 HMSO (1991) Land Drainage Act 1991. Available at: https://www.legislation.gov.uk/ukpga/1991/59/section/37 [Accessed 21 December 2023].

Ref. 9-6 HMSO (1991) Water Resources Act 1991. Available at: https://www.legislation.gov.uk/ukpga/1991/57/contents [Accessed 21 December 2023].

Ref. 9-7 HMSO (1975) Salmon and Freshwater Fisheries Act 1975. Available at: https://www.legislation.gov.uk/ukpga/1975/51/2010-01-12 [Accessed 21 December 2023].

Ref. 9-8 HMSO (2017) The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/407/2019-10-31 [Accessed 21 December 2023].

Ref. 9-9 HMSO (2017) The Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/1177/contents/made [Accessed 21 December 2023].

Ref. 9-10 HMSO (2016) The Environmental Permitting (England and Wales) Regulations 2016 Available at: https://www.legislation.gov.uk/uksi/2016/1154/regulation/12/2018-04-18 [Accessed 21 December 2023].

Ref. 9-11 HM Government (2023) Environmental Improvement Plan 2023. Available at: https://assets.publishing.service.gov.uk/media/64a6d9c1c531eb000c64fffa

/environmental-improvement-plan-2023.pdf [Accessed 21 December 2023].

Ref. 9-12 HMSO (2009) Eels (England and Wales) Regulation 2009. Available at: https://www.legislation.gov.uk/uksi/2009/3344/contents [Accessed 21 December 2023].

Ref. 9-13 HMSO (2001) Control of Pollution (Oil Storage) (England) Regulations 2001. Available at: https://www.legislation.gov.uk/uksi/2001/2954/contents [Accessed 21 December 2023].

Ref. 9-14 HMSO (2009) The Water Resources Act (Amendment) (England and Wales) Regulations 2009. Available at: https://www.legislation.gov.uk/uksi/2009/3104/contents [Accessed 21 December 2023].

Ref. 9-15 HMSO (2004) The Control of Substances Hazardous to Health (Amendment) Regulations 2004. Available at: https://www.legislation.gov.uk/uksi/2004/3386/contents [Accessed 21 December 2023].

Ref. 9-16 The Anti-Pollution Works Regulations 1999. Available at: https://www.legislation.gov.uk/uksi/1999/1006/introduction/made [Accessed 21 December 2023].

Ref. 9-17 HMSO (2015) The Water Framework Directive (Standards and Classification) Directions 2015. Available at: https://www.legislation.gov.uk/uksi/2003/3242/pdfs/uksiod_20033242_en_002.pdf [Accessed 21 December 2023].

Ref. 9-18 Ministry of Housing, Communities and Local Government (2010) The Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal. Available at: https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h [Accessed 21 December 2023].

Ref. 9-19 Department for Energy Security and Net Zero (DESNZ) (November 2023). Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/media/65a7864e96a5ec0013731a93/overarching-nps-for-energy-en1.pdf [Accessed 21 December 2023].

Ref. 9-20 DESNZ (November 2023) National Policy Statement for Renewable Energy (EN-3). Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf [Accessed 21 December 2023].

Ref. 9-21 DESNZ (November 2023). National Policy Statement for Electricity Networks (EN-5). Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf [Accessed 21 December 2023].

Ref. 9-22 Department for Levelling up, Housing and Communities (December 2023) National Planning Policy Framework. Available at:

https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 21 December 2023].

Ref. 9-23 HM Government (2018, updated in 2021) A Green Future: Our 25 Year Plan to Improve the Environment. Available at: https://assets.publishing.service.gov.uk/media/5ab3a67840f0b65bb584297e/25-year-environment-plan.pdf [Accessed 21 December 2023].

Ref. 9-24 Department for Environment, Food and Rural Affairs (2011) Future Water: The UK Government Water Strategy. Available at: https://assets.publishing.service.gov.uk/media/5a78a61c40f0b632476990fe/pb13562-future-water-080204.pdf [Accessed 21 December 2023].

Ref. 9-25 Gov.uk (2022) National Planning Practice Guidance: Flood Risk and Coastal Change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change [Accessed 21 December 2023].

Ref. 9-26 Gov.uk (2023) National Planning Practice Guidance: Renewable and Low Carbon Energy. Available at: https://www.gov.uk/guidance/renewable-and-low-carbon-energy [Accessed 21 December 2023].

Ref. 9-27 Environment Agency (2018) The Environment Agency's approach to groundwater protection Version 1.2. Available at: https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf [Accessed 21 December 2023].

Ref. 9-28 Gov.uk (2022) Humber River Basin District River Management Plan: updated 2022. Available at: https://www.gov.uk/guidance/humber-river-basin-district-river-management-plan-updated-2022 [Accessed 21 December 2023].

Ref. 9-29 Doncaster Council (adopted September 2021) Doncaster Local Plan 2015-2035. Available at: https://dmbcwebstolive01.blob.core.windows.net/media/Default/Planning/Documents/Local%20Plan/Submission/Doncaster%20Local%20Plan%20Adopted%2023%20Sept%202021.pdf [Accessed 21 December 2023].

Ref. 9-30 South Yorkshire Alliance (2023) Connected by Water Action Plan January 2023. Available at: https://connectedbywater.co.uk/files/action-plan.pdf [Accessed 21 December 2023].

Ref. 9-31 Yorkshire and Humber Councils (2021) Yorkshire and Humber Business Plan 2020/2021. Available at: https://www.yhcouncils.org.uk/wp-content/uploads/2021/07/Exec-Summary-YH-business-plan.pdf [Accessed 21 December 2023].

Ref. 9-32 Gov.uk (2010) Don Catchment Flood Management Plan. Available at: https://assets.publishing.service.gov.uk/media/5a7ce231ed915d36e95f03f

2/River_Don_Catchment_Flood_Management_Plan.pdf [Accessed 21 December 2023].

Ref. 9-33 BA Consulting (2015) 2015s2340 Doncaster MBC Level 1 Strategic Flood Risk Assessment. Final Report. November 2015. Available at: JBA Consulting (windows.net) [Accessed 21 December 2023].

Ref. 9-34 Construction Industry Research Information Association (CIRIA) (2016) Report C753 The SuDS Manual 2nd Edition.

Ref. 9-35 Ordnance Survey maps (2023). Available at: https://www.bing.com/maps?cp=51.506606%7E.126343&lvl=11.0&style=s. [Accessed 21 December 2023].

Ref. 9-36 Aerial Photographic maps (2023). Available at: https://www.bing.com/maps?cp=52.165266%7E-0.393514&lvl=12.4&style=h. [Accessed 21 December 2023].

Ref. 9-37 Met Office (2023), Robin Hood Doncaster Sheffield Airport. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcx21p9fr [Accessed 21 December 2023]

Ref. 9-38 National River Flow Archive (2023), Went at Walden Stubbs. Available at: https://nrfa.ceh.ac.uk/data/station/meanflow/27064 [Accessed 21 December 2023]

Ref. 9-39 Environment Agency (2023) Catchment Data Explorer website. Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed 21/12/2023]

Ref. 9-40 Environment Agency (2023) Water Quality Archive website. Available at https://environment.data.gov.uk/water-quality/view/landing [Accessed 21 December 2023]

Ref. 9-41 Environment Agency (2023) Fish and Ecology Data Viewer. Available at: https://environment.data.gov.uk/ecology/explorer/ [Accessed 21 December 2023]

Ref. 9-42 Defra (2023) Multi-Agency geographical information for the countryside (MAGIC) map. Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed 21 December 2023]

Ref. 9-43 British Geological Survey (2023); Geoindex viewer, Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed 21 December 2023]

Ref. 9-44 Cranfield Soils and Agrifood Institute (2023) Soilscapes Viewer. Available at: https://www.landis.org.uk/soilscapes/ [Accessed 21 December 2023]

Ref. 9-45 Natural England (2023) Designated Sites website. Available at https://designatedsites.naturalengland.org.uk/SiteSearch.aspx [Accessed 21 December 2023]

Ref. 9-46 Gov.uk (2023) Flood risk mapping. Available at: https://check-long-term-flood-risk.service.gov.uk/map?easting=441119&northing=329552&map=RiversOrSea [Accessed 21/12/2023]

Ref. 9-47 Environment Agency (2016) Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/522426/LIT_10445.pdf [Accessed 21 December 2023]

Ref. 9-48 The Planning Inspectorate (2017) Advice Note 18: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-18/ [Accessed 21 December 2023]

Ref. 9-49 National Highways (2020) Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment. Available at: https://www.standardsforhighways.co.uk/tses/attachments/d6388f5f-2694-4986-ac46-b17b62c21727?inline=true [Accessed 21 December 2023]

Ref. 9-50 National Highways (2020) DMRB LA 104 - Environmental Assessment and Monitoring. Available at: https://www.standardsforhighways.co.uk/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a [Accessed 21 December 2023]

Ref. 9-51 The Coal Authority (2023) Interactive Map Viewer. Available at: https://mapapps2.bgs.ac.uk/coalauthority/home.html [Accessed 21 December 2023]

Ref. 9-52 Environment Agency (2023), Hydrology Data Explorer. Available at: https://environment.data.gov.uk/hydrology/explore [Accessed 21 December 2023]

Ref. 9-53 British Geological Survey (2023); Hydrogeological map of Southern Yorkshire and adjoining areas. Available at: https://largeimages.bgs.ac.uk/iip/hydromaps.html?id=southern-yorkshire.jp2 [Accessed 21 December 2023]

Ref. 9-54 Environment Agency (2023) Regulatory Position Statement (RPS), updated 6th January 2023, Guidance: 'Temporary dewatering from excavations to surface water: RPS 261'. Available at: https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water [Accessed 21 December 2023]

Ref. 9-55 HMSO (1991) Water Industry Act, Available at: https://www.legislation.gov.uk/ukpga/1991/56/contents [Accessed 21 December 2023]

Ref. 9-56 Environment Agency (2023) Long Term Flood Risk Map. Available at: https://www.gov.uk/check-long-term-flood-risk [Accessed 21 December 2023]

Ref. 9-57 Environment Agency (2023) Flood Risk Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed 21 December 2023]

Ref. 9-58 National Library of Scotland (2023) Historic mapping. Available at: https://maps.nls.uk/ [Accessed 21 December 2023]

Ref. 9-59 NetRegs (2022) Environmental Guidance for Pollution Prevention [Online]. Available at: https://www.netregs.org.uk/media/1898/guidance-for-pollution-prevention-1-2022-update.pdf [Accessed 21 December 2023]

Ref. 9-60 Environment Agency (2011) Pollution Prevention Guidance. Safe storage – the safe operation of refuelling facilities: PPG7. Available at:

https://www.netregs.org.uk/media/1673/ppg-7.pdf [Accessed 21 December 2023]

Ref. 9-61 Environment Agency. Pollution Prevention Guidance (1991). Managing Fire Water and Major Spillages: PPG18. Available at: https://www.netregs.org.uk/media/1674/ppg-18.pdf [Accessed 21 December 2023]

Ref. 9-62 British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-earthworks?version=standard [Accessed 21 December 2023]

Ref. 9-63 British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-surface-water-management-for-development-sites?version=standard&tab=preview [Accessed 21 December 2023]

Ref. 9-64 CIRIA C811 (2023) Environmental good practice on site guide (fifth edition). Available at: https://www.ciria.org/ItemDetail?iProductCode=C811&Category=BOOK&WebsiteKey=17be687b-0441-4487-b752-43d52261e129 [Accessed 21 December 2023]

Ref. 9-65 CIRIA C648 (2006) Control of water pollution from linear construction projects, technical guidance. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C649&Category=BOOK [Accessed 21 December 2023]

Ref. 9-66 CIRIA C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C609B [Accessed 21 December 2023]

Ref. 9-67 CIRIA C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C532&Category=BOOK [Accessed 21 December 2023]

Ref. 9-68 CIRIA C736F (2014) Containment systems for prevention of pollution. Available at: https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS [Accessed 21 December 2023]

Ref. 9-69 Gov.uk (2022) Flood Risk Activities: environmental permits. Available at: Flood risk activities: environmental permits - GOV.UK (www.gov.uk) [Accessed 21 December 2023]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