# Scotland England Green Link 2 - English Onshore Scheme

## Environmental Statement: Volume 2

## Chapter 11: Hydrology and Land Drainage

May 2022

For: National Grid Electricity Transmission

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# 11. Hydrology and Land Drainage

## 11.1 Introduction

This chapter of the Environmental Statement (ES) presents the results of baseline studies and the assessment of the potential impacts on hydrology and land drainage likely to arise as a result of the English Onshore Scheme. The chapter summarises the regulatory and policy framework related to hydrology and land drainage, the methodology followed for the assessment and provides an overview of the existing baseline conditions. The assessment has identified the likely significant impacts to arise during the construction or operational phases of the English Onshore Scheme and identifies any mitigation necessary to avoid or reduce these impacts where possible.

Aspects considered within this chapter relate to surface water resources, surface water quality, water dependent sites, fluvial geomorphology, drainage infrastructure and flood risk.

Hydrological impacts are interrelated with hydrogeology. Potential impacts on groundwater quality due to structures or drainage are assessed separately in **Chapter 10: Geology and Hydrogeology**, as are issues related to contaminated land.

In addition, hydrological impacts are also interrelated with biodiversity. Potential impacts to habitat and species within water dependent habitats are assessed separately in **Chapter 7: Ecology and Nature Conservation**. Whereas impacts to quantity and quality of water to and within these water dependent habitats are considered within this chapter.

The following figures have been prepared in support of the hydrology and land drainage assessment:

- **Figure 11-1**: Study Area; and
- **Figure 11-2**: Flood Zones;
- **Figure 11-3**: Risk of Flooding from Surface Water; and
- **Figure 11-4**: Reservoir Flood Extents.

This chapter should be read in conjunction with the following technical appendices, available in ES Volume 3:

- **Appendix 11A**: Water Framework Directive Compliance Assessment;
- **Appendix 11B**: Flood Risk Assessment;
- **Appendix 11C**: Hydraulic Modelling Technical Note; and
- **Appendix 11D**: List of Licensed Discharges.

## 11.2 Planning Policy and Applicable Legislation

### 11.2.1 Introduction

This section of the report sets out the relevant legislative and policy framework for hydrology and land drainage within the UK.

### 11.2.2 Legislation

The Environmental Statement has complied with the following legislation:

- Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018; make amendments within the environmental and planning related legislation that implement the Environmental Impact Assessment (EIA) Directives so these function effectively after the UK has left the European Union;
- The Environmental Permitting Regulations 2017 (as amended); provide a consolidated system of environmental permitting in England and Wales;

- Flood and Water Management Act 2010; created the Lead Local Flood Authority (LLFA) role which is the local government authority responsible for managing flood risk in their area;
- European Union (EU) Floods Directive (2007/60/EC), as enacted into domestic law by the Flood Risk Regulations 2009; established the publication of Preliminary Flood Risk Assessments (PFRA) and Flood Risk Management Plans (FRMP);
- Water Act 2003; a modification on the previous Water Act (1989) by amending the framework for abstraction licensing;
- EU Water Framework Directive (2000/60/EC) (WFD), as enacted into domestic law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003; commits member states to achieve good qualitative and quantitative status on all water bodies. This commits member states to achieve good qualitative and quantitative status on all water bodies. Since the UK left the EU, the EU Water Framework Directive has been revoked and replaced in England, Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Since December 2020, Water Framework Directive 2000/60/EC has been transposed into UK Law;
- Environment Act 1995; established a series of regulatory bodies including the Environment Agency (EA);
- Land Drainage Act 1991 and 1994; set requirements that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded;
- Habitats Directive 1992; ensures the conservation of a wide range of rare, threatened or endemic animal and plant species to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements;
- Water Resources Act 1991; set out the offence to cause or knowingly permit and poisonous, noxious or polluting material or any solid waste to enter any controlled water with the policing being the responsibility of the EA;
- Environment Protection Act 1990; introduced a system of integrated pollution control for disposal to land, water and air; and
- Control of Pollution Act 1974; provided a registration of carriers of controlled waste with an individual not permitted to knowingly deposit controlled waste.

## 11.2.3 National Policy

### National Planning Policy Framework, Planning Practice Guidance – Flood Risk and Coastal Change

The National Planning Policy Framework (NPPF) (Ref 11-1), latest update July 2021, sets out the UK government's planning policies for England and how these are expected to be applied. Flood risk has been assessed in line with the NPPF and relevant Planning Practice Guidance (PPG-FRCC) (Ref 11-2), latest update August 2021.

The NPPF states that a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving:

- sites of 1 hectare or more;
- land which has been identified by the EA as having critical drainage problems;
- land identified in a strategic flood risk assessment as being at increased flood risk in future; or
- land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

The NPPF also requires the assessment of climate change and how it could potentially affect future flood risk for the design lifetime of the development to be included in this ES to both better assess the future baseline condition as well as helping to minimise vulnerability and provide further resilience from flooding.

Impacts on water quality will also be assessed in line with the NPPF, which states that planning policies and decisions should contribute to and enhance the local environment by preventing new developments from contributing to unacceptable levels of water pollution. It states that development should, wherever possible, help to improve local environmental conditions such as and water quality, taking into account relevant information such as river basin management plans (RBMP).

### Overarching National Policy Statement for Energy (EN-1)

This National Policy Statement (NPS) (Ref 11-3) sets out the Government's policy for delivery of major energy infrastructure. Section 5.15 of this NPS covers water quality and recourses and states that '*Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent'.*

### Draft National Policy Statement for Electricity Networks Infrastructure (EN-5)

This NPS (Ref 11-4), taken together with EN-1 described above, provides the primary policy for decisions taken by the Secretary of State on applications it receives for electricity networks infrastructure. Section 2.6 of this NPS covers climate change adaption and resilience and states that *'As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, Applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to:*

- *flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change*
- *the effects of wind and storms on overhead lines*
- *higher average temperatures leading to increased transmission losses*
- *earth movement or subsidence caused by flooding or drought (for underground cables)'*

## 11.2.4 Local Policy

### East Riding Local Plan 2012-2029 (Adopted April 2016)

The East Riding Local Plan (Ref 11-5) is the current version of the local development plan (LDP) adopted in April 2016. It is a portfolio of planning documents that together provide the framework for managing development and addressing key planning issues in the East Riding. It states that any development must not cause deterioration of the WFD status of any water body, or prevent any water body from reaching 'good' ecological status, except where it can be shown that there is an overriding public interest that outweighs WFD requirements. Improvements to water bodies in the East Riding area are dependent upon reducing diffuse pollution from agriculture and discharges from sewage works and storm drains, as well as 're-naturalising' the 'heavily modified' nature of the area's watercourses.

Policies with particular reference and importance to hydrology and land drainage are:

Policy ENV6: Managing Environment Hazards

- "Environmental hazards, such as flood risk, coastal change, groundwater pollution and other forms of pollution, will be managed to ensure that development does not result in unacceptable consequences to its users, the wider community, and the environment.
- The risk of flooding to development will be managed by applying a Sequential Test to ensure that development is steered towards areas of lowest risk. Where development cannot be steered away from Flood Zone 3, the sub-delineation of Zone 3a, will be used to apply the Test, with preference given to reasonably available sites that are in the lower risk/hazard zones. Where necessary, development must also satisfy the Exception Test.
- If, following application of the Sequential Test, it has not been possible to develop in Flood Zone 1, a Sequential Approach will be taken to site layout and design, aiming to steer the most vulnerable uses towards the lowest risk parts of the site.
- Flood risk will be proactively managed by ensuring that new developments:

- limit surface water run-off to existing run-off rates on greenfield sites, and on previously developed land reduce existing run-off rates by a minimum of 30%, or to greenfield run-off rate and incorporate Sustainable Drainage Systems (SuDS) unless demonstrated to be inappropriate;
- do not increase flood risk within or beyond the site;
- do not culvert or otherwise build over watercourses, unless supported by the Risk Management Authority and are adequately set-back from all watercourses including culverted stretches;
- have a safe access/egress route from/to Flood Zone 1 and incorporate high levels of flood resistant and resilient design if located in a flood risk area; and
- Supporting proposals for sustainable flood risk management, including the creation of new and/or improved flood defences and water storage areas, provided they would not cause unacceptable adverse impacts and supporting the removal of existing culverted sections".

Further details are included in paragraphs 8.90 to 8.100 of the East Riding Local Plan.

Policy A2: Bridlington Coastal Sub Area

- The relevant environmental aspects of this policy state that plans, strategies and development decisions in the Bridlington Coastal sub area should:
  - *"Proactively manage the risk of flooding posed from the North Sea and the Gypsey Race catchment, including the risk of surface water and groundwater flooding, having regard to the relevant Strategic Flood Risk Assessment and flood risk management plans and strategies.*
  - *Ensure the integrity of the Burton Agnes, Haisthorpe and Mill Lane Ground Water Source Protection Zones are protected.*
  - *Manage improvements to the Gypsey Race where it would create economic, environmental and recreational opportunities, and does not adversely affect conservation initiatives or the quality of the natural environment."*

### Selby District Local Plan 2005 (Adopted February 2005)

The Selby District Local Plan (SDLP) (Ref 11-6) was formally adopted in February 2005. The SDLP develops and underpins many of the aims and objectives of the Council. It provides a comprehensive land-use framework for promoting, co-ordinating and controlling future development. This original SDLP policy of relevance to this chapter, 'ENV5 Development and Flood Risk', expired in February 2008.

### Selby District Core Strategy Local Plan (Adopted October 2013)

The SDLP is used in conjunction with the Selby District Core Strategy Local Plan (Ref 11-5), adopted in October 2013, which provided updates for development policies. Policies of relevance to hydrology and land drainage are:

Policy SP15 Sustainable Development and Climate Change

- *"Promoting Sustainable Development*

*In preparing its Site Allocations and Development Management Local Plans, to achieve sustainable development, the Council will:*

8. *Give preference to the re-use, best-use and adaption of existing buildings and the use of previously developed land where this is sustainably located and provided that it is not of high environmental value;*
9. *Achieve the most efficient use of land without comprising the quality of the local environment;*
10. *Ensure that development in areas of flood risk is avoided wherever possible through the application of the sequential test and exception test; and ensure that where development must be located within areas of flood risk that it can be made safe without increasing flood risk elsewhere;*

11. *Support sustainable flood management measures such as water storage areas and schemes promoted through local surface water management plans to provide protection from flooding; and biodiversity and amenity improvements".*

Policy SP18 Protecting and Enhancing the Environment

The section of this policy relevant to this assessment states that the high quality and local distinctiveness of the natural and manmade environment will be sustained by ensuring that new development protects water quality from all types of pollution.

### Selby District Council Local Plan Preferred Options Consultation 2021

The emerging Local Plan (Ref 11-8) is a vision and framework for future growth of the district, identifying where new housing, employment and other development could take place.

Preferred approaches with particular reference and importance to hydrology and land drainage are:

Preferred Approach NE7 – Protect and Enhance Waterways

*"This policy will allow the council to protect waterways and their environments including river banks and waterfrontages. This will be achieved for developments within, on top of, adjacent to or near to waterways, by:*

- *Taking account of the different existing or potential roles, characteristics and functions of the waterway such as sustainable transport for water borne freight; for recreation use for walking or cycling; and/or for value as a wildlife corridor;*
- *Taking into account the latest priorities and strategies for waterways;*
- *Safeguarding and improve environmental quality and amenity;*
- *Enhancing the local environment and access to and along waterway corridors;*
- *Taking into account the needs of all users; and*
- *Avoiding loss, damage or deterioration of waterways assets and ensure they are an integral part of the development".*

Preferred Approach SG11 – Flood Risk

- *"To enable communities to manage, be resilient and adapt to flood risk, the preferred approach is that development will only be supported where it can be demonstrated that:*
    - *The proposal does not increase the risk of flooding off-site; and*
    - *The site falls within FZ1 or where the site falls within FZ3b, only essential or critical infrastructure that cannot be relocated and water compatible uses that do not impede the functional flood plain, or adversely affect the ability or access to flood defences, or which increase the risk of flooding elsewhere will be allowed;*
    - *The site has been passed through a sequential test as set out in the NPPF; or where necessary the Exception Test has been applied.*
- *If the development is acceptable in principle in terms of flood risk the following will need to be applied where appropriate and practicable to design and layout of the scheme to make it acceptable in detail:*
    1. *Where the development is located in FZ2/3 and does not constitute minor development or a change of use, the sequential approach will be applied;*
    2. *The development is designed to a flood event with a magnitude of a 1% AEP event (fluvial) or 0.5% AEP (tidal) event plus climate change allowance and in the event of a local drainage system failure;*
    3. *The features that manage surface water make a positive contribution to reducing flood risk and that SuDS are incorporated with a management and maintenance plan for the lifetime of the development;*

4. *Floor levels are 300mm above the modelled 1% AEP (fluvial) 0.5% AEP (tidal event) plus climate change allowances and/or 300mm above adjacent highway levels or alternative measures must be investigated where required; and*
5. *Hard surfaces on developments should be permeable where unless proven not to be possible by site investigation; Watercourses are not culverted and any opportunity to remove culverts is taken;*

- *Where required by the NPPF proposals for development should include an FRA with this demonstrating the development is safe for its lifetime, include access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".*

Further information is provided in paragraphs 4.51 to 4.64 of the Local Plan.

- Water Quality – *"Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. Where development is adjacent or can impact a water body, the development should actively seek to enhance the water body in terms of its hydromorphology, biodiversity and water quality".*

#### The Humber River Basin Management Plan 2015

The study area is located within the Humber River Basin district which is covered by the Humber River Basin Management Plan. This river basin management plan (Ref 11-9) provides a framework for organisations, stakeholders and communities for protecting and enhancing the benefits provided by the water environment. This information will be used as a baseline for the assessment of impacts to designated water bodies.

#### Chalk Stream Restoration Strategy 2021

The study area is located in an area that contains chalk streams. The Catchment Based Approach Chalk Stream Restoration Group has published the Chalk Stream Restoration Strategy 2021. This restoration strategy (Ref 11-10) is designed as a road map to achieve restoration of good ecological health in the 283 chalk streams within the UK and the landscapes that support them. The restoration requirements outlined in this strategy include:

- Restoring natural flows;
- Improving water quality through reducing pollution; and
- Restoring the quality of the physical habitat.

# 11.3 Approach to Assessment

## 11.3.1 Introduction

This section describes the approach to the identification and assessment of impacts resulting from the construction and operation of the English Onshore Scheme on hydrology and land drainage.

## 11.3.2 Summary of Consultation

### 11.3.2.1 Scoping Opinion Review

Scoping opinions were received from relevant stakeholders between April and June 2021. **Table 11-1** summarises the comments raised in these scoping opinions in relation to hydrology and land drainage and outlines how these have been addressed in subsequent sections of this chapter of the ES. Copies of the scoping opinions are included in **Appendix 5B**.

**Table 11-1: Scoping Opinion (Hydrology and Land Drainage)**

| Consultee | Summary of comment | How and where addressed |
|---|---|---|
| Environment Agency (EA) | Provided confirmation on Flood Risk Assessment (FRA) requirement. Questioned further need for dewatering and asked for confirmation on assessment of coastline | The approach to assess flood risk and water quality is presented in |

| Consultee | Summary of comment | How and where addressed |
|---|---|---|
| | erosion at landfall. Confirmed authorities which would need to be part of further consultation in development, confirmed requirement of permits and consents for watercourse crossings, requested confirmation of watercourse crossing methods. Highlighted there may be further requirements for modelling, highlighted that climate change allowances will be updated soon and asked for confirmation on the scope of the FRA's extent. | the FRA (**Appendix 11B**) and summarised in this Chapter.<br>Crossing techniques have been discussed and some have been agreed with the relevant Local Planning Authority (LPA), Internal Drainage Boards (IDB) and the EA.<br>Updated Climate Change allowances (as updated October 2021) have been used in the assessment (Section 11.6) where relevant.<br>The risks associated with coastal erosion – both from the English Onshore Scheme to exacerbating erosion, and risk to the cable from exposure due to erosion – have been accounted for within the design by setting the landfall approximately 150 m from MHWS which is outside of the limit of the National Coastal Erosion Risk Mapping and also installing by HDD methods below the backshore and foreshore. |
| East Riding of Yorkshire (ERYC) Council | Confirmed that FRA will be required as development is >1 ha, considered that the development will be classed as 'Essential Infrastructure'. Stated that during construction, no materials should be stored in Flood Zone 2 or 3 without prior permission. Drainage details for the haulage road should be provided with any future applications. | An outline drainage design has been developed which includes the haul road. In addition, any necessary measures, principles or practices necessary to mitigate identified impacts have been included within Section 11.6 Potential Impacts section and FRA (**Appendix 11B**) which are in accordance with the NPPF. |
| Natural England | Identified the crossing at River Hull Headwaters Site of Special Scientific Interest (SSSI) as having the potential to have the greatest impact on designated sites. Horizontal drilling should be sufficiently offset from the riverbanks at this location. | The likely effects of the construction and operational phase of the English Onshore Scheme have been assessed within the EIA (Section 11.6). Mitigation measures, where avoidance of receptor was not possible, are included (Section 11.7) |
| North Yorkshire County Council (LLFA) | Stated that surface water flooding should be addressed through a FRA. Agreement should be obtained with the relevant Land Drainage Authority regarding how rivers, Internal Drain Board (IDB) watercourses and ordinary watercourse are to be crossed and obtain the relevant consents. | The planning application includes an FRA (**Appendix 11B**) addressing surface water flooding. |
| Selby Area Internal Drainage Board (IDB) | Stated current guidelines and advice for disposal of surface water:<br>via soakaways may be unsuitable due to ground conditions with percolation tests may needed to be required,<br>via mains sewers is acceptable given Water Authority can confirm existing system can accommodate additional flow,<br>via ordinary watercourse then IDB consent will be required and restricted to 1.4 l/s or greenfield runoff rate. | Drainage strategy has been developed in accordance with NPPF.<br>The approach to assess flood risk is presented in the FRA (**Appendix 11B**) and summarised in this Chapter (Section 11.3) |

| Consultee | Summary of comment | How and where addressed |
|---|---|---|
| Selby District Council | Highlighted the need for any subsequent planning application to include the use of the Sequential, and if required, Exception Test. | FRA (**Appendix 11B**) is in accordance with the NPPF. |
| Yorkshire Water | No comments provided in regard to scoping request though highlighted that developers must contact Yorkshire Water with regard to protecting sewerage and water infrastructure that is laid along the cable route. | Types of river crossings and the risk associated with existing sewage and drainage infrastructure has been assessed (Section 11.6) |

### 11.3.2.2 Additional Consultation

**Table 11-2** summarises additional consultation undertaken with relevant statutory and non-statutory consultees in relation to hydrology and land drainage for the Project and outlines how and where this has been addressed in subsequent sections of this chapter of the ES.

**Table 11-2: Additional Consultation (Hydrology and Land Drainage)**

| Consultee | Nature of additional consultation | How and where addressed |
|---|---|---|
| Environment Agency – various telephone and email communications | Correspondence to confirm the basis of the design of the English Onshore Scheme and discuss the EA's requirements and expectations of the planning application in particular reference to: the FRA associated with the permanent above ground infrastructure (the proposed converter station) including minimum site levels; and the crossing approach associate with the installation of the underground cable.<br>**Cable crossing methods**<br>EA noted that the watercourses through East Riding are subject to varying types of defenses and future management/ maintenance plans. This may include piling in some locations and therefore a buried electrical asset presents some restrictions. Therefore, the depth of the cable in vicinity to main river and potential defense locations should be agreed with the EA as part of the detailed design.<br>**Converter station FRA**<br>EA requirement for finished floor level to be at least 1:200 + appropriate climate change (CC) uplift Annual Exceedance Probability (AEP) from a tidal source of risk and 1:100 +CC AEP event from a fluvial source of risk, with flood plain compensation requirements (flood plain compensation only required up to the 1:200 +CC AEP (tidal) and 1:100 +CC AEP (fluvial); general requirement for level-for-level, volume-for-volume compensation; requirements may be relaxed where it can be demonstrated that no suitable land to compensate will be available and that not doing so will have negligible impact on flood levels, time of inundation and Hazard rating).<br>EA expressed a preference that the 2020 Humber model to be used in the assessment (as per the Drax BECCS project) and that breach modelling should be undertaken. | Summarised in the FRA and design drawings.<br>The crossing method will be using HDD for all EA maintained watercourses with detailed design to be led by the scheme contractor and to be agreed with the EA, IDB and LLFA as relevant as part of permitting requirements. This will include depth of finished conduit below bed level and include clearance or mitigation for future defence works by others.<br>Flood plain compensation is set out in the FRA including reporting on flood depth, time of inundation and hazard rating. |
| Ouse and Humber IDB | Supplied mapping with watercourses maintained by the Board on a permissive basis within the area of interest. Stated that a Land Drainage Consent from the Board would be required for construction inside a 9 m | IDB watercourses are identified and listed in this Chapter (Table 11.14, Table 11-18).<br>The crossing method will be using HDD for all IDB maintained |

| Consultee | Nature of additional consultation | How and where addressed |
|---|---|---|
| | maintenance buffer either side of watercourses as well as requiring that cable be laid a minimum of 1.5 m below bed level.<br>Launch and receptor pits should be located 9 m from each watercourse.<br>A discharge rate of 1.4l/s/ha with a minimum pass forward flow rate of 3.5l/s. | watercourses unless specific agreement is reached during the Land Drainage Consent process with the IDB to open cut. For the purpose of this assessment we have assumed a worst-case scenario that IDB maintained watercourses would be open cut.<br>The works contractor will apply for any necessary consents prior to commencement. |
| Danvm Drainage Commissioners | See above. | See above. |
| Beverley & North Holderness IDB | Supplied mapping with watercourses maintained by the Board within the area of interest. Stated that a Land Drainage Consent from the Board would be required for construction inside a 9 m maintenance buffer either side of watercourses. All proposed watercourse cable crossings, temporary haul road crossings, new land drainage outfalls and any temporary water extraction will all need a separate consent approval. Proposals to culvert, bridge, fill in or make a discharge to any watercourse will also require prior consent from the Board.<br>Stated that all proposed cable water crossings are preferably directionally drilled under each watercourse at a minimum depth of 1.2 m.<br>Launch and receptor pits should be located 9 m from each watercourse.<br>A discharge rate of 1.4l/s/ha with a minimum pass forward flow rate of 1l/s. | Where permits and consents are required, they will be obtained by the works contractor prior to commencement.<br>The design has been developed noting IDB requirements with continued engagement throughout.<br>The crossing method will be using HDD for all IDB maintained watercourses unless specific agreement is reached during the Land Drainage Consent process with the IDB to cut. For the purpose of this assessment we have assumed a worst-case scenario that IDB maintained watercourses would be open cut. |
| Selby IBD | Supplied mapping with watercourses maintained by the Board within the area of interest. Stated that a Land Drainage Consent from the Board would be required for construction inside a 7 m maintenance buffer either side of watercourses.<br>Provided flood risk data regarding two pumping stations within the vicinity of Drax.<br>Stated that all proposed cable water crossings are directionally drilled under each watercourse at a minimum depth of 1.2 m.<br>Launch and receptor pits should be located 7 m from each watercourse.<br>A discharge rate of 1.4l/s/ha but this is to be reviewed on a case-by-case basis. | Where permits and consents are required, they will be obtained by the works contractor prior to commencement.<br>The design has been developed noting IDB requirements with continued engagement throughout.<br>The crossing method will be using HDD for all IDB maintained watercourses Unless specific agreement is reached during the Land Drainage Consent process with the IDB to cut. For the purpose of this assessment we have assumed a wort-case scenario that IDB maintained watercourses would be open cut. |

## 11.3.3 Identification of Baseline Conditions

### 11.3.3.1 Desk Studies

The baseline is informed by collating data on known designated and non-statutory designated site receptors from the following sources:

- River Basin Management Plan Interactive Maps Catchment Data Explorer, EA (Ref 11-11);
- Main River Map, EA (Ref 11-12);

- Magic Maps, Defra (Ref 11-13);
- National River Flow Archive, UK Centre for Ecology & Hydrology (Ref 11-14);
- Internal Drainage Boards Map, Association of Drainage Authorities (Ref 11-15); and
- Defra Data Services Platform (Ref 11-16).

To identify the potential hydrology and land drainage receptors that may be affected by the English Onshore Scheme, data has also been collected for the study area (see section 11.4) from the following sources:

- Mill Dike (Market Weighton) EA Flood Mapping Study (2007) (Ref 11-17);
- Upper Humber Model 2018 (Ref 11-18);
- Humber Tributaries Model 2020 (Ref 11-19);
- Hull and Holderness Drain Flood Mapping Study 2007 (Ref 11-20);
- Flood Map for Planning, EA (Ref 11-21);
- Long Term Flood Risk Map, EA (Ref 11-22);
- Strategic Flood Risk Assessment (SFRA), East Riding of Yorkshire (Ref 11-23); and
- Strategic Flood Risk Assessment, Selby District Council (Ref 11-24).

The WFD Assessment (**Appendix 11A**) and the FRA (**Appendix 11B**) have informed the baseline description of the water environment and were based upon the collection of information from the wide variety of data sources summarised above. It has been assumed that the information contained in these sources is an accurate representation of the water environment within the study area and surrounding area. The baseline was supported by the collection of information during the walkover surveys.

#### 11.3.3.2 Field Studies

Walkover surveys were completed in Summer 2021. These included a geomorphological reconnaissance survey of the watercourses (where accessible) within the study area and of areas with high fluvial and surface water flood risk (according to the EA Flood Risk for Planning Map) located close to urban areas and surface watercourses. The surveys noted key baseline features and pressures including local topography, land drainage and existing infrastructure that informed receptor value. They also noted key features and pressures on watercourses including: riparian vegetation; morphological processes (such as erosion); morphological features (such as deposits); bed substrate; and bank composition.

Due to the number of watercourses crossed by the English Onshore Scheme, a proportionate approach to surveying was undertaken. As a result, not all water bodies were visited during site visits. Site walkovers were conducted for all watercourses considered to be high risk based on their sensitivity value, design, and potential for impact . These criteria were:

- morphological status and potential for significant hydromorphological impacts;
- national or international statutory designations;
- WFD status with susceptibility to pressures that could cause a decline;
- fish passage; and
- crossing design (locations where open cut methodology is prioritised over HDD).

### 11.3.4 Assessment Method

#### 11.3.4.1 Assessment Guidance

There is no specific guidance in relation to assessing the impact of electricity transmission links on water resources and hydrology. Therefore, the Design Manual for Roads and Bridges (DMRB) Sustainability and Environment LA 113 Road Drainage and the Water Environment (Ref 11-25) has been used where appropriate as it is considered to be the most appropriate methodology for assessing the effects of linear schemes. The assessment of impacts on hydrology and land drainage has been undertaken using a source-pathway-receptor model.

- Source – activities associated with construction and operation of the English Onshore Scheme;
- Pathway – the method or route by which the source could affect the receptor; and
- Receptor – people, property and infrastructure, or a hydrological feature.

As a result of a scoping assessment (completed March 2021), all receptors were scoped into the EIA. The assessment of impacts of the English Onshore Scheme on the water environment specifically considers impacts to the following attributes of the receptors:

- hydrology and flood risk;
- fluvial geomorphology;
- water quality; and
- water dependent biodiversity.

An FRA (**Appendix 11B**) has been undertaken to assess all sources of flooding that may present a risk to, or be impacted by, the English Onshore Scheme, this includes the proposed converter station and English Onshore Scheme the crossings of watercourses of the underground Direct Current (DC) cable route and associated temporary infrastructure. Sources of flood risk assessed include fluvial, tidal, pluvial, groundwater, sewers/drains, residual risk resulting from artificial structures (i.e. reservoirs, canals, defences) and future flood risk as a result of climate change. The FRA has been produced following guidance included in the NPPF, PPG-FRCC and available climate change data. The latter is based on the latest climate change allowances that were supplied by the EA in October 2021.

This chapter assesses any geomorphological changes that could occur as a result of the proposed works and the impacts of these on the WFD classification of the water features, based on a supporting WFD Compliance Assessment found in **Appendix 11A**.

#### 11.3.4.2 Assessment Criteria

Following a review of the baseline information, the magnitude of potential impacts and significance of effects has been determined based on:

- the importance of the receptor, taking into consideration its function, legal and policy framework, protection;
- the magnitude of the impact on the receptor or attribute of a particular receptor; and
- the influence of embedded and additional mitigation measures.

The prediction and evaluation of effects follows the requirements of the DMRB LA 113 assessment process with the exception of the use of the Highways England Water Risk Assessment Tool (HEWRAT). The HEWRAT assessment methodology is not appropriate for the English Onshore Scheme as it is a highways tool and therefore no traffic generated. Whilst the DMRB is not specific to the assessment of hydrology and flood risk of non-road schemes, it provides an accepted approach to the assessment of development impacts, particularly for linear projects. As such, potential impacts were qualitatively assessed using professional judgement.

#### 11.3.4.3 Sensitivity or Value of Receptors

The impacts have been investigated for both the construction and operational phases of the English Onshore Scheme using criteria outlined in Table **11-3** and **Table 11-4** which have been refined from the DMRB guidance to meet the specific needs of the English Onshore Scheme. The main refinements relate to the inclusion of criteria relating to geomorphological impacts, which are not specifically detailed in the DMRB guidance. Additionally, the criteria for assessing flood risk, specifically changes in flood depths, also deviates from the DMRB and has instead followed guidance which has been made in agreement with the EA. Other refinements include receptors taken from the EA flood risk vulnerability classification.

**Table 11-3: Sensitivity of Receptors**

| Sensitivity | Hydrology and flood risk, fluvial geomorphology and water quality[1] criteria |
|---|---|
| High | Attribute has a high quality and rarity on regional, national or international scale.<br><br>***Hydrology and Flood Risk*:** A water feature that poses flood risk or is subject to reservoir flood risk affecting adjacent populated areas including more than 100 residential properties, critical infrastructure or emergency services including Hospitals, Police, Fire, Ambulance and coastguard stations and any other emergency facilities providing shelter during emergency events such as floods, or critical "hub" utility stations that distribute services over large areas to many customers.<br>A water feature with hydrological importance to:<br>• sensitive and protected ecosystems of international status;<br>• critical economic and social uses (e.g. water supply, navigation, recreation, amenity).<br>A water feature or floodplain that provides critical flood alleviation benefits.<br>Hydraulically connected and unrestricted floodplain providing significant amounts of flood storage.<br><br>***Fluvial Geomorphology*:** A highly sensitive water feature must display very little or no signs of modification and not be subject to morphological pressures.<br>***Sediment Regime**:* The water feature is in complete natural equilibrium as a source, transfer or sink of sediment. There is no unnatural or externally forced erosion or deposition and the sediment regime may be critical to supporting protected or rare species by provision of spawning grounds or similar in a delicate ecosystem.<br>***Channel Morphology*:** The water feature has a natural range of morphological features including pools, riffles, sediment bars or braiding, a natural planform, naturally occurring woody debris dams with no signs of modification.<br>*Natural Fluvial Processes*: A water feature with geomorphology that produces variations in velocity and flow conditions beneficial to biodiversity and as such is highly vulnerable to changes to conditions that may reduce the quality of habitat.<br><br>***Water Quality*:** WFD overall status "High" or "Good" and none or limited anthropogenic pressures affecting the classification (i.e. not a heavily modified water body or similar).<br>Provides a Public drinking water supply.<br>A protected chalk stream.<br><br>***Water Dependent Biodiversity:*** Water feature and /or surrounding floodplain / riparian zone is protected / designated under European Commission (EU) or UK habitat legislation: Special Area of Conservation (SAC), Special Protection Area (SPA), Special Site of Scientific Interest (SSSI), Water Protection Zones (WPZ), Ramsar site, salmonid water / species protected by EC legislation.<br>The water feature is an EU Designated salmonid / cyprinid fishery.<br>Water quality complies with Environmental Quality Standards (EQS).<br>Water feature widely used for recreation, directly related to its quality (e.g. swimming, salmon fishery). |
| Medium | Attribute has a high quality and rarity on a local scale.<br><br>***Hydrology and Flood Risk***: A water feature that poses flood risk or is subject to reservoir flood risk affecting adjacent populated areas including between 10 and 100 residential or industrial properties. Critical social infrastructure or emergency services are not affected, however, highly vulnerable risk receptors may be at risk including public buildings such as schools, leisure centres and libraries. Vulnerable utility stations that are not deemed critical.<br>A water feature with hydrological importance to:<br>• i) sensitive and protected ecosystems of national designation;<br>• ii) locally important economic and social uses (e.g. water supply, navigation, recreation, amenity).<br>A water feature or floodplain providing significant flood alleviation benefits.<br>Partially hydraulically connected or partially constrained floodplain providing significant amounts of flood storage. |

[1] Inclusive of biodiversity, water abstraction and discharge

| Sensitivity | Hydrology and flood risk, fluvial geomorphology and water quality[1] criteria |
|---|---|
| | ***Fluvial Geomorphology*:** A water feature with some signs of modification and subject to some morphological pressures. This may be heavily modified but managed as a High status morphological regime.<br>***Sediment Regime*:** The water feature is sensitive and in natural equilibrium (or managed) as a source, transfer or sink of sediment. There is no significant unnatural or externally forced erosion or deposition and the sediment regime may be critical to supporting protected or rare species by provision of spawning grounds or similar in a delicate ecosystem.<br>***Channel Morphology*:** The water feature has a natural range of morphological features including pools, riffles, sediment bars or braiding, a natural planform, naturally occurring woody debris dams with little or no modification.<br>***Natural Fluvial Processes*:** A water feature with geomorphology that produces variations in velocity and flow conditions beneficial to biodiversity and as such is highly vulnerable to changes to conditions that may reduce the quality of habitat.<br><br>***Water Quality*:** WFD overall status "Moderate". Water quality complies with EQS. Provides a private drinking water supply.<br><br>*Water Dependent Biodiversity*: Supports water dependent non-statutory designated sites. |
| Low | Attribute has a medium quality and rarity on a local scale.<br><br>***Hydrology and Flood Risk*:** A water feature that poses flood risk or is subject to reservoir flood risk affecting adjacent populated areas including <10 industrial properties or to less populated areas without any critical social infrastructure units such as hospitals, schools, safe shelters and / or utilisable agricultural fields. Less vulnerable risk receptors may be at risk including general industry, employment, mineral extraction sites or waste disposal sites.<br>Floodplain may be hydraulically disconnected and only functions as flood storage during events greater that 1% AEP.<br><br>***Fluvial Geomorphology*:** A water feature that is heavily modified and subject to morphological pressures with active restoration attempts.<br>***Sediment Regime*:** The water feature shows signs of modification and appears to have some natural equilibrium. Erosion and / or deposition may be externally forced and the sediment regime may be importance to some local species or habitats.<br>***Channel Morphology*:** Variety of morphological features is limited and active features such as gravel bars are rare.<br>***Natural Fluvial Processes*:** Fluvial processes are limited and heavily influenced by modifications or anthropogenic processes. Water feature deemed to be vulnerable to changes in its vicinity.<br><br>***Water Quality*:** WFD overall status "Poor". Likely to exhibit a measurable degradation in water quality as a result of anthropogenic factors.<br>Water feature not widely used for recreation, or recreation use not directly related to water quality, although water supply may be for agricultural or industrial use.<br><br>***Water Dependent Biodiversity*:** No species of conservation concern. Surface water fed standing water bodies. |
| Negligible | Attribute has a low quality and rarity on a local scale.<br><br>***Hydrology and Flood Risk*:** Water feature either poses no risk to properties or infrastructure or is in area with water compatible infrastructure such as water and sewage transmission sites or docks, marinas and wharves. It may pass through uncultivated agricultural land not posing any threat to access and egress from commercial or domestic activity. A water feature with minimal hydrological importance to sensitive or protected ecosystems.<br>Floodplain may be completely hydraulically disconnected providing no flood storage.<br><br>***Fluvial Geomorphology*:** A water feature that is heavily modified and incapable of naturally reaching a natural equilibrium without active restoration attempts.<br>***Sediment regime*:** The water feature exhibits a completely unnatural sediment regime, meaning zones of storage and transfer are significantly influenced by anthropogenic |

| Sensitivity | Hydrology and flood risk, fluvial geomorphology and water quality[1] criteria |
|---|---|
| | pressures. It is highly unlikely that the water feature supports species sensitive to suspended sediment and turbidity.<br>***Channel Morphology*:** Morphological diversity is absent, flow is uniform as are the banks and anthropogenic modification is extremely likely such as channelization, bank protection or culverting. It is likely stable in this state and incapable of developing morphological features.<br>***Natural Fluvial Processes*:** Fluvial processes are limited and heavily influenced by modifications or anthropogenic processes. Water feature unlikely to be influenced by changes in the immediate surrounding environment.<br><br>***Water Quality*:** WFD overall status "Bad". Highly likely to be affected by anthropogenic factors. Heavily engineered or artificially modified. Not used for recreation purposes.<br><br>***Water Dependent Biodiversity*:** Limited biodiversity; no species of Conservation concern. Receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability. |

### 11.3.4.4 Magnitude of Change

Potential effects can be either beneficial or adverse, depending upon the criteria within **Table 11-4**.

**Table 11-4: Criteria Used to Determine the Magnitude of Change on Water Environment Attributes**

| Magnitude | Typical Examples |
|---|---|
| High Adverse | Results in loss of attribute and / or quality and integrity of the attribute.<br><br>**Hydrology and Flood Risk:** Major changes to flow regime (low, mean and / or high flows – at the site, upstream and / or downstream).<br>An alteration to a catchment area in excess of a 25% reduction or increase.<br>Significant increase in the extent of areas or number of properties at risk from flooding by the 1% or greater Annual Exceedance Probability (AEP) (100-year) flow.<br>An increase in peak flood level during a 1% AEP (100-year) event of >750 mm.<br><br>**Fluvial Geomorphology:** More than four new water feature crossings or structures (including outfalls) required, significantly increasing the extent of water feature modification which has the potential to resulting in the following changes:<br>**Sediment Regime:** Major change to the natural equilibrium through modification, significantly changing the natural function of the water feature (sediment source, sink or transfer zone).<br>This may arise from a major increase in amount of fine sediment and turbidity.<br>**Channel Morphology:** Major impacts on channel morphology through the removal of a wide range of morphological features and / or replacing a large extent of the natural bed and/or banks with artificial material. Major channel realignment significantly altering the natural channel planform and bank profiles typically in the loss of sinuosity, increased channel gradient and higher stream powers. This poses erosion risk problems due to the higher stream energy. Major realignment impacts on natural channel processes, which has knock-on effects on sediment regime, flow diversity and depositional features.<br>**Natural Fluvial Processes:** Major interruption to fluvial processes such as channel planform evolution or erosion and deposition.<br><br>**Water Quality**: Major shift away from the baseline conditions. Equivalent to downgrading two WFD classes, e.g. from Good to Poor, or any change that downgrades a site in quality status.<br>Loss or extensive change to a fishery or a designated nature conservation site.<br>Loss of regionally important public water supply.<br><br>**Water Dependent Biodiversity:** Major alteration to drainage regime within habitat<br>Permanent physical barrier.<br>Major run off or spillage leading to additional water quality reduction (as above). |

| Magnitude | Typical Examples |
|---|---|
| Medium Adverse | Results in effect on integrity of attribute, or loss of part of attribute.<br><br>**Hydrology and Flood Risk:** Moderate shift away from baseline conditions and moderate changes to the flow regime.<br>An alteration to a catchment area in excess of 10% but less than 25%.<br>An increase in peak flood level (for a 1% AEP event) >500 mm resulting in an increased risk of flooding to >100 residential properties or an increase of >50 mm resulting in an increased risk of flooding to 1-100 residential properties.<br><br>**Fluvial Geomorphology:** One to three additional water feature crossings or structures (including outfalls) required, increasing the extent of water feature modification which has the potential to result in the following changes:<br>**Sediment Regime:** Moderate change to the natural equilibrium through modification, partially changing the natural function of the water feature (sediment source, sink or transfer zone).<br>This may arise from a moderate increase in amount of fine sediment and turbidity.<br>**Channel Morphology:** Moderate impact on channel morphology through the removal of a range of morphological features and / or replacing a medium extent of the natural bed and/or banks with artificial material. Channel realignment resulting in a moderate change in channel planform and bank profiles typically resulting in some loss of sinuosity, increased channel gradient and higher stream powers. Erosion risk may increase as a result of the increased gradient and stream power. The realignment would partially change natural channel processes, including sediment regime, flow diversity and depositional features.<br>**Natural Fluvial Processes:** Moderate interruption to fluvial processes such as channel planform evolution or erosion.<br><br>**Water Quality:** Moderate shift from the baseline conditions that may be long-term or temporary. Equivalent to downgrading one WFD class, e.g. from Moderate to Poor. Partial loss in productivity of a fishery.<br>Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies.<br><br>**Water Dependent Biodiversity:** Moderate alteration to drainage/hydrology regime within or to the habitat.<br>Temporary (long term) physical barrier.<br>Run off or spillage leading to additional water quality reduction (as above). |
| Low Adverse | Results in some measurable change in attributes quality or vulnerability.<br><br>**Hydrology and Flood Risk:** Slight changes to the flow regime.<br>An alteration to a catchment area in excess of 1% but less than 10%.<br>An increase in peak flood level (for a 1% AEP event) >250 mm resulting in an increased risk of flooding to fewer than 10 industrial properties.<br><br>**Fluvial Geomorphology:** Upgrade to, or extension of, existing water feature crossing or structure or construction of proposed route in close proximity to water feature. This has the potential to result in:<br>**Sediment Regime:** Minor change to the natural equilibrium through modification, locally changing the natural function of the water feature (sediment source, sink or transfer zone).<br>This may arise from a slight increase in amount of fine sediment and turbidity.<br>**Channel Morphology:** Limited impact on channel morphology, through removal of some morphological features and / or replacing a small extent of the natural bed and/or banks with artificial material. Minor realignments, typically localised around structures such as culverts and bridges having limited impact on channel planform, gradient, bank profiles and channel processes.<br>**Natural Fluvial Processes:** Slight change in fluvial processes operating in the river; any change is likely to be highly localised. |

| Magnitude | Typical Examples |
|---|---|
| | **Water Quality:** Minor shift away from the baseline conditions. Impact on WFD attribute resulting in reduction in sub-classification but no reduction in overall classification.<br>Minor effects on water supplies.<br>**Water Dependent Biodiversity:** Minor alteration to drainage/hydrology regime within or to the habitat.<br>Temporary physical barrier.<br>Run off or spillage leading to water quality reduction (as above). |
| Negligible | The English Onshore Scheme is unlikely to affect the integrity of the water environment.<br><br>**Hydrology and Flood Risk:** Negligible changes to the flow regime (i.e. changes that are within the monitoring errors).<br>An alteration to a catchment area of less than 1% reduction or increase in area.<br>Negligible change in peak flood level (for a 1% AEP event) <±10 mm.<br><br>**Fluvial Geomorphology:** No direct engineering impact but potential indirect impact due to proximity of the water feature to the English Onshore Scheme.<br>**Sediment Regime:** Negligible change to the natural equilibrium. Negligible amount of sediment released into the water feature, with no noticeable change to the turbidity or bed substrate.<br>**Channel Morphology:** No significant impact on channel morphology in the local vicinity of the English Onshore Scheme.<br>**Natural Fluvial Processes:** No change in fluvial processes operating in the river; any change is likely to be highly localised.<br><br>**Water Quality:** No perceptible changes to water quality and no change within the WFD classification scheme.<br><br>**Water Dependent Biodiversity:** No perceptible changes to water quality or quantity to or at the habitat. |
| Low Beneficial | Results in some beneficial effect on attribute or a reduced risk of negative effect occurring.<br><br>**Hydrology and Flood Risk:** Minor improvement over baseline conditions. It would involve a reduction in peak flood level (for a 1% AEP event) >250 mm.<br><br>**Fluvial Geomorphology:** Slight improvement of the river channel from baseline conditions as a consequence of the works. Note: beneficial impacts would only arise on impacted/modified/artificial water features. The greatest improvement would occur on water features that have a uniform morphology, acting as a transfer (larger water features) or sink (minor water features with limited flow and overgrown vegetation) of sediment and no signs of active fluvial processes.<br>**Sediment Regime: S**light improvement towards natural equilibrium, which is returning the function of the water feature (sediment source, sink or transfer of sediment) to a natural one.<br>**Channel Morphology:** Limited improvement to morphological diversity.<br>**Natural Fluvial Processes**: Slight change to fluvial processes which results in improved river forms and habitats.<br><br>**Water Quality**: Minor improvement over baseline conditions.<br><br>**Water Dependent Biodiversity**: Minor improvement to water quality and quantity within the habitat over baseline conditions. |
| Medium Beneficial | Results in moderate improvement of attribute quality.<br><br>**Hydrology and Flood Risk:** A measurable improvement over baseline conditions involving a reduction in peak flood level (for a 1% AEP event) >500 mm. |

| Magnitude | Typical Examples |
|---|---|
| | **Fluvial Geomorphology:** Moderate improvement to a water feature as a result of the works through means of restoration or mitigation.<br>**Sediment Regime:** Moderate improvement towards natural equilibrium, which is returning the function of the water feature (sediment source, sink or transfer of sediment) to a natural one.<br>**Channel Morphology:** Moderate improvement to morphological diversity.<br>**Natural Fluvial Processes:** Moderate change to fluvial processes which results in improved river forms and habitats.<br><br>**Water Quality:** A moderate improvement over baseline conditions, which may result in the upgrade of quality status in line with the requirements of the WFD.<br><br>**Water Dependent Biodiversity:** Minor improvement to water quality and quantity within the habitat over baseline conditions. |
| High Beneficial | Results in major improvement of attribute quality.<br><br>**Hydrology and Flood Risk:** Major improvement over baseline conditions. The reduction in peak flood level (for a 1% AEP event) of >750 mm.<br><br>**Fluvial Geomorphology:** Significant improvement to a water feature as a result of substantial restoration or mitigation. This could provide a major improvement from baseline conditions.<br>**Sediment Regime:** Major improvement towards natural equilibrium, returning the function of the water feature (sediment source, sink or transfer of sediment) to a natural one.<br>**Channel Morphology:** Major improvement to morphological diversity.<br>**Natural Fluvial Processes:** Major change to fluvial processes which results in improved river forms and habitats.<br><br>**Water Quality:** Major improvement over baseline conditions, whereby the removal or likelihood of removal of existing pressures, results in a water feature which meets WFD targets.<br>Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse.<br><br>**Water Dependent Biodiversity:** Major improvement to water quality and quantity within the habitat over baseline conditions.<br>Removal of physical barriers. |

### 11.3.4.5 Assessing of the Significance of Effects

The significance of potential effects has been determined taking into account the sensitivity of the attributes of each receptor and the magnitude of each impact.

The significance of the effect is determined as per the matrix in **Table 11-5**. For the purposes of this assessment any effect that is **Major** or **Moderate** is considered to be significant. Any effect that is **Minor** or **Negligible** is not significant.

**Table 11-5: Matrix Used to Determine the Significance of Potential Effects**

| Sensitivity of Receptor | Magnitude of Change | | | |
|---|---|---|---|---|
| | Negligible | Low | Medium | High |
| **Negligible** | Negligible | Negligible | Negligible | **Negligible/Minor** |
| **Low** | Negligible | Negligible | Minor | **Moderate** |
| **Medium** | Negligible | Minor | Moderate | **Major** |
| **High** | **Negligible/Minor** | **Moderate** | **Major** | **Major** |

It should also be noted that for impacts associated with low probability major impact events, such as flooding or major spillage, the application of the above assessment methodology could suggest an artificially high significance of the effect on the water environment. Therefore, for qualitative assessments, the output of the assessment has been reviewed using professional judgement, and where considered appropriate, the assessed significance has been reduced to reflect the low probability of occurrence. This is in line with the recommendations within the DMRB.

The mitigation hierarchy, alongside best practice, has been applied to develop measures to mitigate against the potential temporary and permanent impacts of the English Onshore Scheme. Workshops with environmental specialists and engineers have been undertaken to review the DC cable route alignment, converter station design and identify the best possible cable installation methods.

#### 11.3.4.6 Cumulative Effects

The cumulative effect of the English Onshore Scheme in conjunction with other proposed developments in the vicinity of the scheme, and the combined effects of impacts on the surface water dependent statutory designated sites, surface water dependent non-statutory designated sites, and standing water bodies have been assessed. This has been done qualitatively through consideration of any proposed developments with planning consent secured or those identified in the LDP that could have impacts on the local flood risk, water quality, fluvial geomorphology, or aquatic ecology. In addition to this, the planning conditions assigned to any of the proposed developments have also been considered.

### 11.3.5 Limitations and Assumptions

It has been assumed that publicly available data from the sources listed in Section 11.3.3.1 are an accurate representation of the water environment of the English Onshore Scheme and surrounding area.

The surveys provide a snapshot of the water features and processes occurring at one point in time. However, conditions which vary seasonally (such as vegetation growth, land use, and water levels) can affect fluvial processes and changes to the morphology of the channel. The predominant sediment regime and stability of the water feature was inferred from the features observed. Where bank material was found to be obscured due to vegetation growth and limited access, observations were made at upstream and downstream locations and nearby tributaries to help indicate the boundary conditions.

Due to the number of watercourses crossed by the English Onshore Scheme, a proportionate approach to surveying was undertaken as described in Section 11.3.3.2.

Several water bodies included in this assessment have been categorised under the WFD by the EA. Detailed information available from the EA is summarised in the WFD Compliance Assessment report (**Appendix 11A**) and referred to within this assessment. In addition, information obtained in walkover surveys, surrounding land use and downstream designations have also been taken into account during the assessment. It has been assumed that the information contained in this source is an accurate representation of the water environment within the study area and surrounding area.

The assessments made on flood risk have been based on data from the EA, the ERYC SFRA and Yorkshire Water. There are a number of smaller watercourses within the study area which are small ungauged catchments. Water quality and flood estimation for these is less certain than for larger gauged catchments with long flow records.

An FRA has been provided in **Appendix 11B**. It has been assumed that the information which underpins this FRA such as that provided by the Environment Agency is an accurate representation of the water environment within the Study Area and surrounding area.

The hydrological and land drainage assessment has been based on open cut cable installation being utilised through the majority of the route extending through agricultural land. Trenchless installation methods (likely to be HDD) have been assessed at locations where these are committed, and where there is the potential for watercourse crossings to be HDD or open cut the assessment has assumed the worst case scenario and these have been assessed as open cut crossings. This is as per the design and crossing schedule as described in Chapter 3: Description of the English Onshore Scheme. The proposed Drax converter station will be the only above ground permanent infrastructure for the English Onshore Scheme.

As per the design details outlined in **Chapter 3: Description of the English Onshore Scheme** at the landfall at Fraisthorpe, the transition joint pit (TJP) has been set back approximately 145 m from the current coastline, to account for the predicted retreat of the coastline from ongoing erosion. Trenchless installation (likely to be HDD) at the landfall has been committed to by the English Onshore Scheme beneath the headland and out to a breakout location within the nearshore marine environment to avoid direct disturbance to the existing coastline, prevent cable exposure and potential future damage and also avoid exacerbating current coastal erosion. The depth of the DC cables installed from the TJP will be subject to further ground investigation and engineering surveys undertaken by the appointed Contractor and subject to agreement with ERYC and the MMO and where necessary can be a condition of approval of consent. As such the potential impact to coastal erosion, and secondary or indirect impacts to watercourses have been scoped out of this assessment.

It has been assumed that geogrid material will be placed on top of gravel material/unbound granular material that comprises the proposed roads to ensure that there is no movement of material that may then be deposited in other watercourses or the floodplain as a result of a flooding event.

## 11.4 Study Area

For the proposed landfall and cable route, the assessment considers the potential for direct hydrological impacts to be within 250 m of the planning application boundary of the English Onshore Scheme (referred to as the direct impact area). Impacts to surface water resource and flood risk receptors crossed by the English Onshore Scheme could result in indirect hydrological effects to other surface water resource and flood risk receptors upstream and/or downstream of the local hydrological area of influence. Therefore, a wider study area is required to identify potentially sensitive high-value receptors beyond the site boundary.

Indirect hydrological impacts associated with the English Onshore Scheme are considered to be negligible to water resource receptors (water bodies and water dependent habitats) located over 2 km away from the English Onshore Scheme. Due to the dilution and in-channel processing that will occur within 2 km, it is difficult to categorically determine the source of impacts to water resources and hydrology beyond this distance. It is considered that 2 km is a sufficient study area for these receptors, taking into account the nature of the development and the rural location of the English Onshore Scheme.

Indirect hydrological impacts associated with the English Onshore Scheme are considered to be negligible to people, property and infrastructure receptors (including flood risk, water supply and discharge) located over 5 km from the English Onshore Scheme. Although the English Onshore Scheme will cross predominantly rural land, there are urban and developed areas close by. As such, 5 km is considered to be a sufficient study area as beyond this it will be difficult to determine the source of impacts. In addition, potential effects are likely to have dissipated through channel storage or dilution. Therefore, only people, property and infrastructure receptors within the 5 km buffer have been assessed.

In summary, the study area (see **Figure 11-1**) for this chapter has considered:

- direct hydrological impacts to receptors within 250m of the English Onshore Scheme (the direct impact area);
- indirect hydrological impacts to water bodies and water dependent habitats within 2 km of the English Onshore Scheme (the 2 km study area); and
- indirect hydrological impacts to people, property and infrastructure within 5 km of the English Onshore Scheme (the 5 km study area).