HELIOS RENEWABLE ENERGY PROJECT

Preliminary Environmental Information Report

Volume 2: Main Text and Figures

Chapter 9: Water Environment

October 2023

9. Water Environment

9.1. Introduction

9.1.1. This chapter of the PEIR reports on the preliminary assessment of the likely significant effects of the Proposed Development on the environment with respect to water environment that has been undertaken.

9.1.2. This assessment is supported by a Flood Risk Assessment ('FRA') which contains an outline surface water drainage strategy and preliminary flood mitigation measures for the Proposed Development. The FRA is provided at Appendix 9.1 of this PEIR.

9.2. Planning Policy Context

Legislative Context

9.2.1. This section summaries legislation that is directly relevant to surface water drainage, surface water quality and flood risk, which have been acknowledged in the preparation of this PEIR chapter. Please note that this is not exhaustive and focuses on the key pieces of legislation. The sustainable use and management of water resources is the key driver behind the legislation detailed below.

Water Framework Directive

9.2.2. The Water Framework Directive 2000/60/EC ('WFD') set the target for all waters, both surface and groundwater, to achieve 'Good' status by 2027. Good status refers to ecological and chemical status for surface waters and both chemical and quantitative status for groundwaters. The WFD has been transposed in UK legislation as part of The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and the overarching aims apply following the UK's exit from the European Union.

Flood and Water Management Act 2010

9.2.3. The Flood and Water Management Act ('FWMA 2010 Act') includes provision for the management of risks in connection with flooding. The FWMA 2010 Act created Lead Local Flood Authorities ('LLFAs') at the Unitary Authority and County Council level. The LLFA is responsible for managing the risk of all 'local floods'. In this instance,

the LLFA is North Yorkshire Council ('NYC').

Water Resources Act 1991

9.2.4. The WRA 1991 Act sets out the regulatory controls and restrictions that provide protection to the water environment through controls on abstraction, impounding and discharges as well as identifying water quality and drought. It ensures that any works that potentially impact a 'Main River' need to be consented by the Environment Agency ('EA').

Land Drainage Act 1991

9.2.5. The LDA 1991 Act places the responsibility for the maintenance of ordinary watercourses on the riparian landowners.

9.2.6. The amended LDA 1991 Act ensures that any channel works cannot be undertaken without prior authorisation from the LLFA or (where relevant) the Internal Drainage Board ('IDB').

National Planning Policy

Designated National Policy Statements

9.2.7. The Overarching National Policy Statement ('NPS') for Energy (EN-1)[1] (July 2011) ('NPS EN-1') recognises the need for applications to be supported by a FRA in accordance with the guidance contained within national planning policy (formerly Planning Policy Statement 25 ('PPS25')[2] and its Practice Guide[3]). The FRA should also make appropriate arrangements to manage surface water including appropriate use of Sustainable Drainage Systems ('SuDS'). It confirms the Sequential and Exception Tests that need to be satisfied for developments in Flood Zone 3 such as in the case of the Proposed Development.

9.2.8. The EA's Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and show the extent of the natural floodplain and the additional extent of an extreme flood. The probability of flooding of the different flood zones is summarised below:

[1] Department of Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1).
[2] Communities and Local Government (2010) Planning Policy Statement 25: Development and Flood Risk
[3] Communities and Local Government (2009) Planning Policy Statement 25: Development and Flood Risk Practice Guide

- Flood Zone 1 defined as land with a low probability of flooding, having a less than 0.1% (1 in 1000) annual probability of river or sea flooding.
- Flood Zone 2 Medium Probability is defined as land having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1000) annual probability of sea flooding.
- Table 1 of the government's flood risk and coastal change guidance divides Flood Zone 3 into Zone 3a High Probability and Zone 3b The Functional Floodplain. Flood Zone 3a is defined as a 'high probability' zone assessed as having a 1% (1 in 100) or greater annual probability of river flooding (>1%) in any year or having a 0.5% (1 in 200) or greater annual probability of sea flooding. Flood Zone 3b is defined as where water from rivers or the sea has to flow or be stored in times of flood and is not separately distinguished from Zone 3a on the Flood Map for Planning and is identified in the Strategic Flood Risk Assessment ('SFRA').

9.2.9. Section 4.8 in NPS EN-1 set out policy on climate change adaptation over the lifetime of a development. The policy notes the need for the applicant to take into account the potential impacts of climate change and design appropriate mitigation or adaptation measures. It identifies the need to assess 'maximum credible scenarios' for critical infrastructure and paragraph 4.8.9 states:

> *'Where energy infrastructure has safety critical elements (for example parts of new fossil fuel power stations or some electricity sub-station), the applicant should apply the high emissions scenario (high impact, low likelihood) to those elements. Although the likelihood of this scenario is thought to be low, it is appropriate to take a more risk-averse approach with elements of infrastructure which are critical to the safety of its operation.'*

9.2.10. NPS for Electricity Networks Infrastructure (EN-5) [4] (July 2011) requires development to assess the vulnerability and resilience of the development to climate change and the risk climate change poses to flooding. The increased risk of flooding would be covered in a FRA.

Revised (Draft) National Policy Statements

9.2.11. In March 2023, the Government published a suite of draft revised energy NPSs (EN-

4 Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy (EN-3)

1 to EN-5) for consultation.

9.2.12. The Revised (Draft) Overarching National Policy Statement for Energy (EN-1)[5] (March 2023) ('Revised (Draft) NPS EN-1') notes that the policy on climate change adaptation in Section 4.9 applies. Paragraph 4.9.11 states:

> *'Applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario.'*

9.2.13. The Revised (Draft) NPS EN-1 (March 2023) recognises the need for applications to be supported by a FRA in accordance with the guidance contained Planning Practice Guidance Flood Risk and Coastal Change section[6] which accompanies the National Planning Policy Framework[7] ('NPPF') and the requirement for appropriate arrangements to manage surface water including appropriate use of SuDS. It confirms the Sequential and Exception Tests need to be satisfied for developments in accordance with the NPPF and its Guidance. In general terms with respect to flood risk paragraph 5.8.12 states:

> *'Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques.'*

9.2.14. The Revised (Draft) NPS for Renewable Energy Infrastructure (EN-3)[8] (March 2023) ('Revised (Draft) NPS EN-3') sets out the policy on solar photovoltaic ('PV') schemes >50 MW in England. It identifies the indicative impacts of solar schemes which could require assessment. With respect to flood risk and drainage, paragraphs 3.10.75 – 3.10.79 state:

> *'Where a Flood Risk Assessment has been carried out this must be submitted alongside the applicant's ES. This will need to consider the impact*

5 Department for Energy Security and Net Zero (2023) Overarching NPS for Energy (EN-1)

6 Department for Levelling Up, Housing and Communities (2022) Guidance Flood risk and coastal change. Available from: https://www.gov.uk/guidance/flood-risk-and-coastal-change (Accessed on 22.05.23).

7 Department for Levelling Up, Housing and Communities (2021) National Planning Policy Framework. Available from: https://www.gov.uk/guidance/national-planning-policy-framework (Accessed on 22.05.23).

8 Department for Energy Security and Net Zero (2023) National Policy Statement for Renewable Energy Infrastructure (EN-3)

of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.

Where access tracks need to be provided, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS), such as swales and infiltration trenches, should be used to control any run-off where recommended.

Given the temporary nature of solar PV farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses.

Culverting existing watercourses/drainage ditches should be avoided.

Where culverting for access is unavoidable, applicants should demonstrate that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period.'

9.2.15. The Revised (Draft) NPS EN-3 sets out matters that could be relevant for the Secretary of State's decision making. With respect to flood risk and drainage, paragraph 3.10.145 states:

'Water management is a critical component of site design for ground mount solar plants. Where previous management of the site has involved intensive agricultural practice, solar sites can deliver significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management.'

National Planning Policy Framework

9.2.16. The NPPF sets out the Government's planning policies for England and how these should be applied. Policy on planning and flood risk in the NPPF is dealt with at paragraphs 159-169 in chapter 14 'Meeting the challenge of climate change, flooding and coastal change'. Chapter 14 was first published on 27th March 2012 and last updated on 20th July 2021. It highlights the need to avoid inappropriate development areas at risk of flooding and making development safe from flooding without increasing flood risk elsewhere.

Flood Risk and Coastal Change Planning Practice Guidance

9.2.17. The Flood Risk and Coastal Change Planning Practice Guidance[9] to the NPPF was published in March 2014 and updated August 2022 and sets detailed requirements to fulfil the overarching policies set out in the NPPF.

Non-Statutory Technical Standards for Sustainable Drainage Systems[10]

9.2.18. The Department for Environment, Food and Rural Affairs ('DEFRA') 2015 document sets out non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems including peak flow and volume control and management of flood risk within developments.

Local Planning Policy

9.2.19. The Proposed Development is located within the administrative area of NYC. It should be noted that as of 1st April 2023, North Yorkshire County Council ('NYCC') and seven district councils, including Selby District Council ('SDC'), comprise a new unitary authority known as North Yorkshire Council ('NYC'). Local planning policy still makes reference to the former Selby District Council.

9.2.20. There are a number of adopted local plans that form the development plan for the former Selby district which include the Selby District Core Strategy Local Plan (2013)[11] and Selby District Local Plan (2005)[12].

9.2.21. The Selby District Core Strategy Local Plan was adopted in October 2013 and contains Policy SP15 'Sustainable Development and Climate Change' relevant to the Proposed Development. Policy SP15 'Sustainable Development and Climate Change' promotes development to avoid areas of flood risk and where development must be located within areas of flood risk that it can be made safe without increasing flood risk elsewhere through the application of the Sequential Test and Exception Test. The policy also supports sustainable flood management measures and sustainable drainage systems.

9.2.22. The Selby District Local Plan was adopted in February 2005 and contains 'saved'

[9] DCLG, Department of Communities and Local Government (2016), 'Planning Practice Guidance' Available at: http://planningguidance.planningportal.gov.uk/
[10] DEFRA, Department for the Environment, Food and Rural Affairs (2015) Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems.
[11] Selby District Council (2013) Selby District Core Strategy Local Plan
[12] Selby District Council (2005) Selby District Local Plan

policies relevant to this assessment. Policies ENV5 'Development in Flood Risk Areas' and ENV12 'River and Stream Corridors' are relevant to this assessment.

9.2.23. Policy ENV5 'Development in Flood Risk Areas' notes that new utilities infrastructure development in undeveloped flood plains where an alternative lower risk location is not available, and for which associated compensatory flood storage measures are provided will be permitted. It also notes all proposals in areas subject to a risk of flooding must be accompanied by a flood risk assessment appropriate to the scale and nature of the development.

9.2.24. Policy ENV12 'River and Stream Corridors' states:

> *'Proposals for development likely to harm the natural features of or access to river, stream and canal corridors will not be permitted unless the importance of the development outweighs these interests, and adequate compensatory measures are provided.'*

9.2.25. A new Selby Local Plan[13] is currently being prepared. The latest stage of the process was the publication of proposed submission documents for public consultation which was concluded in October 2022. The Local Plan publication version consultation 2022 contains emerging Policy SG9 'Design' and Policy SG11 'Flood Risk' which is relevant to this assessment.

9.2.26. Emerging Policy SG9 'Design' encourages the appropriate use of multi-functional green infrastructure and SuDS.

9.2.27. Emerging Policy SG11 'Flood Risk' supports development that avoids area of flood risk through the application of the Sequential Test and Exception Test and the proposed development does not increase flooding off site. The policy sets criteria to make development acceptable in flood risk areas which includes the sequential approach to the site layout, relevant flood resilience construction methods, retention of existing vegetation, use of SuDS and permeable surfaces and exploring opportunities to remove watercourse culverts in addition to obtaining the relevant land drainage and byelaw consents.

[13] Selby District Council (2022) Local Plan Publication Version Consultation 2022.

9.3. Assessment Methodology

9.3.1. The methodology of this chapter has drawn on the more detailed methodology provided in the FRA (refer to Appendix 9.1). The FRA assesses the flood risk to and from the Site, and from all sources including:

- Tidal (flooding from the sea);
- Fluvial (flooding from watercourses);
- Pluvial (direct rainfall and surface water flooding);
- Groundwater;
- Overwhelmed Sewers and Drainage Systems; and
- Artificial Sources.

9.3.2. The FRA demonstrates how flood risk will be managed now and over the Proposed Development's lifetime, taking climate change into account and with regard to the vulnerability of its users.

9.3.3. A site-specific flood model is being commissioned to determine the assessment of the design flood, and credible maximum scenario sensitivity test and will inform the Environmental Statement ('ES') to be submitted in support of the DCO application. At this stage, the scope of the site-specific flood model has yet to be agreed with the EA and is subject to ongoing consultation. The mitigation measures will be refined and finalised following the results of the site-specific flood modelling and the FRA will be updated to inform the ES.

9.3.4. An outline Drainage Strategy (including the application of SuDS) is contained within the FRA along with information on the future operation and maintenance of the proposed on-Site drainage system.

9.3.5. The spatial scope of this assessment focuses on the Site and watercourses within, and in the vicinity of the Site, in the context of the interlinked wider hydrological system. This includes drainage ditches and ordinary watercourses within the drainage catchment of the Site, which ultimately drain to the River Aire and River Ouse.

9.3.6. The baseline hydrology (surface water), flood hazards, and environmental quality of the Site and its immediate vicinity have been established on the basis of a desktop

study. A site walkover is scheduled to be completed following the agreement of the scope of the site-specific flood model.

9.3.7. The following sources of information have been reviewed to establish the baseline conditions:

- Figure 3.2 Parameter Plan of Chapter 3 Site and Development Description of the PEIR;
- Site specific FRA (contained in Appendix 9.1);
- Ordnance Survey 1:25,000 scale maps;
- Topographical Survey[14];
- British Geological Survey© NERC (2023) online mapping[15];
- EA website and online mapping[16];
- Natural England's MAGIC online mapping[17];
- Cranfield Soil and AgriFood Institute online mapping[18];
- EA Catchment Flood Management Plans[19&20]
- Level 1 Strategic Flood Risk Assessment[21];
- EA strategic flood model outputs[22&23];
- Aegaea Flood Model Scoping Document[24]; and
- EA Catchment Data Explorer[25].

9.3.8. To assess the significance of the effects of the Proposed Development on the water environment a set of threshold criteria have been established based on the

[14] Above Surveying Ltd (2022) Topographical Survey Drawing reference: 'Drax Linework ("CAD") Rev 1.0'

[15] British Geological Survey (2023) Geology Viewer. Available from: geologyviewer.bgs.ac.uk. (Accessed on 25.05.23)

[16] Environment Agency (2023) Check your long term flood risk. Available from: https://check-long-term-flood-risk.service.gov.uk/map (accessed on 25.05.23)

[17] Natural England (2023) MAGIC Map. Available from: https://magic.defra.gov.uk/MagicMap.aspx (accessed on 25.05.23)

[18] Cranfield University (2023) Soilscapes Map. Available from: https://www.landis.org.uk/soilscapes/ (accessed on 25.05.23).

[19] Environment Agency (2010) Ouse Catchment Flood Management Plan Summary Report December 2010.

[20] Environment Agency (2010) Aire Catchment Flood Management Plan Summary Report December 2010.

[21] AECOM (2022) Selby District Level 1 Strategic Flood Risk Assessment.

[22] JBA Consulting (2018) Upper Humber Flood Risk Mapping Study Final Report

[23] JBA Consulting (2017) Upper Humber – Additional Breach Modelling.

[24] Aegaea (2023) Flood Model Scoping Document

[25] Environment Agency (2023) Catchment Data Explorer. Available from: https://environment.data.gov.uk/catchment-planning (accessed on 31.05.23)

interaction between the sensitivity, importance and/or value of the receptor and the magnitude or severity of the change. The threshold criteria have been determined based on planning policy and legislation; industry best practice; and professional judgement.

9.3.9. The criteria to assess the magnitude of the effects are set out in Table 9.1 and are derived from the spatial scale, permanence and severity of the effects.

Table 9.1: Methodology for Assessing Magnitude

Magnitude of Impact	Criteria for assessing impact
High	Long term or permanent changes to the hydrology (flood risk, flow characteristics of watercourses or groundwater resource, and habitat quality) or water quality: ▪ Increase/decrease whole catchment risk of flooding; ▪ Significant loss/addition of floodplain storage; ▪ Severe permanent deterioration/improvement of water quality, habitat quality or flow characteristics of a watercourse at a local to regional scale; and ▪ Significant permanent reduction of ground water resources.
Medium	Material short to medium term local changes to hydrology, water quality or groundwater resource: ▪ Increase/decrease in flood risk affecting the Site and its immediate vicinity (sub-catchment); ▪ Minor loss/addition of floodplain storage; ▪ Moderate changes to the habitat quality or flow characteristics of a watercourse; and ▪ Severe temporary reduction or moderate local scale improvement in the quality of surface water or groundwater resources.
Low	Measurable but immaterial changes to hydrology, water quality or groundwater resource: ▪ Minor increase/decrease in flood risk to the Site; ▪ Minor changes to habitat quality or flow characteristics of a watercourse; and ▪ Minor local scale reduction (reversible with time) or improvement in the quality of surface water or groundwater resources.
Very Low	No appreciable effect on hydrology or water quality.

9.3.10. The criteria to assess the value/ sensitivity of the receptor are set out in Table 9.2 and are derived from legislative controls, designated status, number of individual receptors, characteristics (such as rarity or condition of the receptor) and the ability of the receptor to tolerate and adjust to change.

Table 9.2: Methodology for Determining Sensitivity

Sensitivity	Examples of Receptor
High	▪ National or Internationally Designated Area e.g. Site of Special Scientific Interest ('SSSI'), Special Areas of Conservation ('SAC'), Special Protection Area ('SPA'), Ramsar Site, or National Nature Reserve; ▪ Nationally or internationally protected species; ▪ Local residents (personal and property); ▪ Functional Floodplain or flood storage area (Flood Zone 3b); ▪ Watercourse, waterbody, or wetland with 'High' quality; and ▪ Groundwater body comprising of Principal Aquifer and within a Source Protection Zone.
Medium	▪ Non statutory site of regional or local importance e.g. Local Nature Reserve ('LNR'); ▪ An area at risk of flooding (Flood Zone 2 and 3a or equivalent) and areas benefiting from flood defences (protected areas); ▪ Watercourses, Waterbody or wetland with 'Good' or 'Moderate' quality; and ▪ Groundwater body comprising Secondary Aquifer.
Low	▪ An area with a low probability of flooding (Flood Zone 1); and ▪ Unclassified Main Rivers and ordinary watercourses.
Very Low	▪ Watercourse, waterbody or wetland with 'Poor' or 'Bad' quality or a Heavily Modified Waterbody (including drainage ditches).

9.3.11. The significance of environmental effects is judged in accordance with the methodology set out in Chapter 2 EIA Methodology of the PEIR. The scale is derived from the interaction between the receptor sensitivity and the magnitude of the effects, as detailed in the matrix set out in Table 9.3 below. The effects are judged to be direct, indirect, reversible, irreversible, cumulative, short, medium, long-term, permanent, beneficial and adverse. The likelihood of occurrence is also a consideration. Major and moderate effects are considered significant.

Table 9.3: Effect Significance Matrix

Magnitude	Sensitivity			
	High	Medium	Low	Very Low
High	Major Adverse / Beneficial	Major Adverse / Beneficial	Moderate Adverse / Beneficial	Minor Adverse / Beneficial
Medium	Major Adverse /	Moderate Adverse /	Minor Adverse /	Negligible

Magnitude	Sensitivity			
	High	Medium	Low	Very Low
	Beneficial	Beneficial	Beneficial	
Low	Moderate Adverse / Beneficial	Minor Adverse / Beneficial	Negligible	Negligible
Very Low	Minor Adverse / Beneficial	Negligible	Negligible	Negligible

Consultation

9.3.12. Tables 9.4, 9.5, 9.6, 9.7 and 9.8 below set out the information sought and consultation undertaken to inform this chapter. Consultation with the LLFA, IDB, EA, and Natural England is ongoing. Aegaea are appointed to progress flood modelling and Table 9.6 below includes consultation with the EA regarding the scope of the flood modelling. A copy of the correspondence with the LLFA, IDB and EA is reproduced in Appendices 9.2, 9.3 and 9.4.

9.3.13. An EIA Scoping Report (Appendix 2.1 of the PEIR) was submitted to the Planning Inspectorate in June 2022 and the Planning Inspectorate's ('PINS') EIA Scoping Opinion adopted in July 2022 (Appendix 2.2 of the PEIR). It should be noted that Neo Environmental previously advised on the preparation of the EIA Scoping Report. Relevant extracts of the EIA Scoping response comments from consultees and PINS' Scoping Opinion comments are summarised in the tables below.

Table 9.4: LLFA Consultation Summary

Consultee	Type and Date	Summary of Consultation	Response to Consultee
LLFA	Email 12th April 2023 16th April 2023	The Applicant utilised the NYC online correspondence form to request contact details of the LLFA following the formation of the NYC unitary authority. The LLFA responded to provide contact details.	'Solar Farm Surface Water Drainage Strategy Principles' document is to be issued to LLFA. Section 5.0 of the FRA (Appendix 9.1) contains proposed surface water management measures.

Table 9.5: IDB Consultation Summary

Consultee	Type and Date	Summary of Consultation	Response to Consultee
IDB	Email 31st January 2023 20th February 2023 12th April 2023	The Applicant emailed the IDB to request information including IDB watercourses in GIS format and water management activities on the Site. No response to the enquiry has been received.	Paragraph 9.5.16 – 9.5.18 in section 9.5 'Likely Significant Effects' of this chapter and paragraphs 4.133 - 4.139 of the FRA (Appendix 9.1) contain details on watercourse retention and watercourse crossings.

Table 9.6: EA Consultation Summary

Consultee	Type and Date	Summary of Consultation	Response to Consultee
EA	Response to Scoping Opinion 4th July 2022	▪ The EA provided a response to the Applicant's request for a Scoping Opinion. ▪ The assessment of hydrology and flood risk has progressed since the EIA Scoping Report has been prepared as informed by the EA strategic flood models and other data sources. ▪ Matters raised by the EA that are still relevant include: ▪ Raising equipment taking into account flood hazards associated with breach and overtopping of flood defences once the effects of climate change are taken into account. ▪ Identification of sensitive groundwater receptors (Principal Aquifer and Source Protection Zone 3). ▪ Requirement for a	Details of design mitigation including equipment levels are contained in this chapter (paragraphs 9.5.2 – 9.5.19) and supporting FRA (Appendix 9.1, paragraphs 4.97 – 4.141). The effect of the Proposed Development on receptors has been assessed (section 9.5 'Likely Significant Effects' in this chapter). An Outline CEMP ('oCEMP') is provided at Appendix 5.1 of the PEIR. Baseline conditions of WFD waterbodies in the vicinity of the Site have been assessed in paragraphs 9.4.23 – 9.4.28. Section 9.2 'Planning Policy Context' of this chapter (paragraphs 9.2.1 – 9.2.24). The operational effect on water quality has

Consultee	Type and Date	Summary of Consultation	Response to Consultee
		Construction Environmental Management Plan ('CEMP') ▪ Requirement for assessment of WFD waterbodies. ▪ Requirement for identification of legislation, policy and guidance that relates to the water environment. ▪ Requirement for the assessment of operational effect on water quality.	been assessed in paragraphs 9.5.71 – 9.5.79 of this chapter.
EA	Email 12th July 2022 10th August 2022 16th August 2022 18th August 2022	The Applicant requested flood risk data and information (Products 4, 5, 6, 7 and 8) from the EA. Data (including outputs from Upper Humber Study) and clarifications provided by the EA.	The flood risk data has been reviewed and used to inform the FRA (Appendix 9.1).
EA	Email 6th September 2022 7th September 2022	Applicant requested missing information from the Upper Humber Study (2016) from the EA. EA provided additional information to the application (Product 6).	The flood risk data has been reviewed and used to inform the FRA (Appendix 9.1).
EA	Email 19th October 2022 20th October 2022 28th October 2022	Applicant requested pre application engagement with the EA regarding the scope of flood modelling activities. EA planning specialist confirmed to the Applicant that EA flood modelers would not attend a meeting due to resourcing issues. EA advised written advice preferred requiring	Charging arrangements for planning advice were agreed between the Applicant and EA on 30th January 2023.

Consultee	Type and Date	Summary of Consultation	Response to Consultee
		charging arrangements to be agreed with the Applicant.	
EA	Email 6th December 2022	Applicant requested for strategic flood models (and all associated files) to be reissued by the EA via a hard drive.	The Applicant continues to engage with the EA regarding scope of flood modelling.
EA	Email 30th January 2023 12th February 2023 9th March 2023	Applicant issued 'Flood Model Scoping Document' to the EA for comment and charging arrangements for pre planning review agreed. Applicant chased the EA for the results of review of 'Flood Model Scoping Document'.	The Applicant continues to engage with the EA regarding scope of flood modelling.
EA	Email 10th March 2023	EA planning specialist issued 'Flood Model Scoping Document' to EA Data and Evidence team with estimated deadline for a response to the Applicant by end of March 2023.	The Applicant continues to engage with the EA regarding scope of flood modelling.
EA	Email 23rd March 2023	The Applicant sent follow up request for strategic flood models (and all associated files) to be reissued via a hard drive to the EA.	The Applicant continues to engage with the EA regarding scope of flood modelling.
EA	Email 28th March 2023 29th March 2023 18th April 2023 3rd May 2023 9th May 2023	The Applicant has followed up with the EA for the results review of 'Flood Model Scoping Document'. EA confirmed to Applicant that review is further delayed.	The Applicant continues to engage with the EA regarding scope of flood modelling.
EA	Email 15th May 2023	The Applicant requested for information on Groundwater Source Protection Zones on the Site from the EA.	Response received 20th June 2023 from the EA. Information to be reviewed and incorporated into the ES to.
EA	Email 16th May 2023	The EA responded to Applicant regarding review of 'Flood Model Scoping	Agreement on no requirement for undefended modelling;

Consultee	Type and Date	Summary of Consultation	Response to Consultee
		Document'. 'Method Statement Review' produced by JBA Group on behalf of the EA provided to the Applicant.	no requirement for panel mitigation and assessment through volumetric methods; and that solar PV panels can be designed to be resistant to flood waters. Details of design mitigation including equipment levels are contained in this chapter (paragraphs 9.5.2 – 9.5.19) and supporting FRA (Appendix 9.1, paragraphs 4.97 – 4.141). The EA request for breach and boundary conditions assessment to be reviewed by the Applicant and 'Flood Model Scoping Document' to be reissued to the EA for comment.
EA	Email 18th May 2023	The Applicant requested additional information from the EA (model report, files and outputs) regarding the Humber 2100+ Extreme Water Levels ('HEWL') project omitted from the EA August 2022 response.	The Applicant received additional information from the EA on 6th June 2023. Information to be reviewed and incorporated into site specific flood modelling exercise which will inform the EIA.

Table 9.7: Natural England Consultation Summary

Consultee	Type and Date	Summary of Consultation	Response to Consultee
Natural England	Response to Scoping Opinion 4th July 22	Natural England provided a response to the Applicant's request for a Scoping Opinion. NE state the assessment should take account of the risks of water pollution and how these can be managed or reduced. The matter of	The effect of the Proposed Development on water quality is assessed in Section 9.4. The operational effect of the Proposed Development on nutrients is assessed in paragraph 9.5.74.

Consultee	Type and Date	Summary of Consultation	Response to Consultee
		elevated nutrient levels in water dependent protected nature conservation sites and nutrient neutrality is raised.	

Table 9.8: PINS Consultation Summary

Consultee	Type and Date	Summary of Consultation	Response to Consultee
PINS	Scoping Opinion 14th July 2022	The assessment of hydrology and flood risk has progressed since the EIA Scoping Report has been prepared as informed by the EA strategic flood models and other data sources. Matters raised by PINS that are still relevant include:	
		▪ Requirement to assessment effect of soil/sediment input (ID 3.5.1).	The effect of soil/sediment on water quality and conversion to permanent pasture has been assessed as part of Appendix 9.1 FRA (paragraphs 5.41 – 5.44) and this chapter (paragraphs 9.5-50 – 9.5.54, 9.5.74 – 9.5.76.
		▪ Requirement to assess contamination impacts to groundwater (ID 3.5.2).	The effect of the Proposed Development on receptors has been assessed in this chapter (paragraphs 9.5.50-9.5.54, 9.5.58,9.5.74, 9.5.77 – 9.5.79).
		▪ Requirement for assessment of Water Framework Directive ('WFD') waterbodies (ID 3.5.3).	Baseline conditions of WFD waterbodies in the vicinity of the Site have been assessed in this chapter (paragraphs 9.4.23 – 9.4.28).
		▪ Requirement for the assessment of operational effect on water quality (ID 3.5.4).	The operational phase effect on water quality has been assessed in this chapter (paragraphs 9.5.71 – 9.5.79).

Consultee	Type and Date	Summary of Consultation	Response to Consultee
		▪ Requirement to define study area (ID 3.5.5).	The study area taking into account the hydrological catchment has been defined in paragraph 9.3.5 of this chapter.
		▪ Requirement to assess implications of breach of flood defences on Proposed Development (ID 3.5.6)	The effect of breach of flood defences along the River Ouse and River Aire is considered in paragraphs 4.54 – 4.62 of the FRA. Further assessment of breach will be conducted as part of the site specific flood modelling.
		▪ Requirement to assess operational impacts of the Proposed Development on flood risk (ID 3.5.7)	The FRA (paragraphs 4.142 – 4.169) and this chapter (paragraphs 9.5.60 – 9.5.70) assess the operational effects of the Proposed Development on flood risk.
		▪ Requirement to assess flood defences in the vicinity of the Site (ID 3.5.8)	Flood defences are considered in paragraphs 4.9 – 4.64 of the FRA.
		▪ Requirement to identify culvert locations (ID 3.5.9).	Locations and principles of watercourse crossings identified in the FRA (paragraphs 4.133 – 4.139) and this chapter (paragraphs 9.5.36 – 9.5.39).

Limitations and Assumptions

9.3.14. The assessment of the significance of the effects of the Proposed Development on the Water Environment is based on the assumption that the baseline data is correct, and the EA have provided the best available flood modelling information (Upper Humber Flood Risk Mapping Study 2018).

9.3.15. The climate change allowances in the Upper Humber Study differ to those that

require assessment under the current EA guidance[26]. A site-specific flood model is being commissioned to determine the assessment of the design flood, and credible maximum scenario sensitivity test and will inform the EIA. At this stage, the scope of the site-specific flood model has yet to be agreed with the EA and is subject to ongoing consultation.

9.3.16. In the absence of a site-specific flood model the outputs from the Upper Humber Study strategic flood model will be used as a proxy for the design flood and inform the design and assessment of mitigation measures. The design of mitigation measures and assessment of the Proposed Development will be reappraised and finalised following the results of the site-specific flood modelling and the ES and FRA will be updated to inform the ES to be submitted in support of the DCO application.

9.4. Baseline Conditions

9.4.1. This section describes the Proposed Development in the context of the hydrological and the hydrogeological environment; and sets the baseline and future baseline conditions against which the potential effects of the Proposed Development can be assessed. The baseline takes into account the effects of climate change over the modelled operational lifespan of the Proposed Development on flood hazards. The future baseline considers the changes on the Site between this assessment (2023) and the site commissioning (2026).

Site Description, Context and Drainage

9.4.2. The Site lies predominately within the catchment of the River Aire. The River Aire flows to the south of the Site to the south of Hirst Road and the villages of Temple Hirst and Hirst Courtney and flows predominately from west to east. At its closest point, the River Aire is located 700m south of the area of the Solar Farm Zone (refer to Figure 3.2 Parameter Plan of the PEIR) which is to the south west of the village of Camblesforth, to the north of the village of Hirst Courtney and Hirst Road, to the south of the A1041 and to the east of the Selby Branch of the East Coast Mainline railway.

9.4.3. The River Aire is a tributary of the River Ouse and flows into the River Ouse approximately 7.5km to the east of the Development Area.

[26] Environment Agency (2022) Guidance: Flood risk assessments: climate change allowances. Available from: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (accessed on 25.05.23).

9.4.4. The northern area of the Solar Farm Zone (to the north of Fair Oaks) lies within the wider catchment of the River Ouse. At its closest point, the River Ouse is located 2.2km northeast of the Solar Farm Zone and flows predominately from the north west to the south east. Due to the Site's position in the lower catchment of the River Ouse, there are a number of tributaries in the vicinity of the Site that are relevant to this assessment. The River Derwent joins the River Ouse approximately 4.5km to the north east of the Solar Farm Zone and to the north east of Drax Power Station. The Dutch River flows into the River Ouse to the south of Goole approximately 10.4km to the south east of the Solar Farm Zone. The last major tributary of the River Ouse in the vicinity of the Site is the River Trent which flows into the river approximately 21.6 km to the south east of the Solar Farm Zone. At this location, the River Ouse becomes the River Humber / Humber Estuary and flows into the North Sea. The River Aire and River Ouse are tidally influenced in the vicinity of the Site. The River Ouse tidal limit is located at Naburn Weir significantly upstream of the Site and the River Aire tidal limit is the lock and weir at Chapel Haddlesey, west of the Site.

9.4.5. The River Ouse, River Aire, River Derwent, Dutch River, and River Trent are all classified as 'Main Rivers'.

9.4.6. Numerous drainage ditches cross the Site which drain ultimately into the River Aire or River Ouse. The drainage ditches are located within the boundary of the existing fields and are classified as ordinary watercourses. The ordinary watercourses drain into the River Aire and River Ouse via gravity outfalls or pumping stations. A number of the 'ordinary watercourses' which cross the Site are managed by the Selby Area IDB and their byelaws apply controlling activities along these watercourses.

9.4.7. The ASWYAS geophysical survey (provided at Appendix 6.3 of the PEIR) has identified extensive agricultural land drains through large parts of the Solar Farm Zone. These systems likely consist of mole drains or tile drains (clay or plastic perforated pipes) installed to improve the agricultural quality of the land and reduce waterlogging.

9.4.8. The topography across the Solar Farm Zone is relatively flat and low lying. Site levels range between approximately 3m Above Ordnance Datum ('AOD') to 6m AOD. The western area of the Solar Farm Zone and along the southernmost boundary are at the highest elevation and levels fall predominately towards the northeastern boundary. The lowest area of the Solar Farm Zone is the easternmost area.

9.4.9. The gradient across the Solar Farm Zone varies and typically ranges between 1 in 100 to 1 in 150. The area with the steepest gradients are located in the north western area and along the southern boundary and gradients range between typically 1 in 20 and 1 in 50. The areas with the shallowest gradients are located in the eastern area and gradients are typically around 1 in 200.

9.4.10. Currently, the Site naturally drains by a combination of overland flow towards the low points and the ordinary watercourses / drainage ditches which cross the Site and infiltration into the underlying ground.

Ground Conditions

9.4.11. The Site is underlain by Sherwood Sandstone Group (Sandstone) bedrock. Superficial deposits are present across the Site. Hemingbrough Glaciolacustrine Formation (clay, silty) deposits are found towards the south-western and eastern parts of the Solar Farm Zone. Breighton Sand Formation (sand) deposits are found through the central and northern areas of the Solar Farm Zone. Small isolated areas of Alluvium (clay, silt, sand and gravel) deposits are present along watercourse corridors bisecting the northern and southern areas of the Solar Farm Zone.

9.4.12. The geological deposits have been classified by the EA for their water bearing properties. The definitions of different aquifer classifications are set out in Table 9.9 below.

Table 9.9 Aquifer Designation Definitions

Aquifer Designations	Definition
Principal	Geological deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A	Permeable geological layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B	Predominantly lower permeability geological layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary Undifferentiated	This is an aquifer designation has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

9.4.13. The Site's Sherwood Sandstone Group (Sandstone) bedrock is classified as a Principal Aquifer. The Breighton Sand Formation (sand) superficial deposits are classified as a Secondary A aquifer. The other superficial deposits are classified as unproductive strata.

9.4.14. Based on the Flood Studies Report ('FSR') Winter Rainfall Acceptance Potential ('WRAP') Map[27], the Site is located in a 'Soil Index Class 2' area. Soil Index Class 2 has the second highest Winter Rainfall Acceptance Potential and therefore the second lowest standard percentage runoff.

9.4.15. The Soilscapes dataset map[28] indicates that soils in the central and northern area of the Solar Farm Zone are classified as *'Naturally wet very acid sandy and loamy soils'* and are described as naturally wet. Naturally wet soils are permeable soils in low lying areas often affected by high ground water that has drained from the surrounding landscape. The central and southern area of the Solar Farm Zone is underlain by soils described as *'Loamy soils with naturally high groundwater'* and are naturally wet. A small band of *'Freely draining slightly acid loamy soils'* is present running along the southern edge of the Site by the village of Hirst Courtney. Freely draining soil absorb rainfall readily and allow it to drain through to underlying layers. The easternmost area of the Solar Farm Zone is underlain by *'Freely draining slightly acid sandy soils'*. The area of the Underground Cable Corridor for the connection to the grid in the vicinity of Drax Power Station crosses areas underlain by *'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'* which are described as having impeded drainage. Soils with impeded drainage refer to soils with a tight, compact deep subsoil that impedes downward water movement; after heavy rainfall, particularly during the winter, the subsoil becomes waterlogged and can result in very wet ground conditions.

9.4.16. Based on the available information the underlying ground conditions appear to have variable permeability; however, due to the low lying nature of the Site and presence of superficial and principal aquifers, high groundwater is likely to be present.

9.4.17. The southern, central and western area of the Solar Farm Zone and areas of the underground cable and grid connection fall within a Groundwater Source Protection Zone – Zone III Total Catchment ('SPZ3'). The total catchment – SPZ3 is defined as

[27] NERC (1975) Flood Studies Report (FSR), Natural Environment Research Council, London, UK

[28] Cranfield University (2023) Soilscapes Map. Available at: https://www.landis.org.uk/soilscapes/ Accessed: May 2023.

the area around a supply source within which all the groundwater ends up at the abstraction point. The northern area of the Solar Farm Zone falls predominately outside of a Groundwater Source Protection Zone. However, a small, isolated Groundwater Source Protection Zone – Zone I Inner Protection Zone ('SPZ1') is present in the northern area of the Solar Farm Zone approximately 100m to the west of Bales Wood and approximately 400m to the east of Hagg Bush Cottages. The inner zone – SPZ1 is defined as the zone with a 50 day travel time of pollutant to source and have a 50m default minimum radius.

9.4.18. The EA's Groundwater Vulnerability Maps show that areas of 'medium-high' vulnerability are present associated with the area of Breighton Sand Formation (sand) superficial deposits. Areas of 'low' vulnerability are associated with the Hemingbrough Glaciolacustrine Formation (clay, silty) superficial deposits, which would act as barrier to the bedrock aquifer below. The underground grid connection area crosses areas of 'medium-high', 'medium', 'medium-low' and 'low' vulnerability.

Flood Risk

9.4.19. The FRA is provided at Appendix 9.1.

9.4.20. The flood hazards affecting the Site are summarised in Table 9.10 below for the baseline scenario (taking into account the likely effects of climate change over the lifetime of the Proposed Development). The flood hazards are assessed in detail within the FRA.

Table 9.10 Baseline – Potential Flood Risk from All Sources of Flooding

Flood Source	Potential Risk	Description
Watercourses & Tidal	High – Very Low	Flood defences along the River Aire are overtopped once the effect of climate change on peak river flows and tidal levels are taken into account in the 1% Annual Exceedance Probability ('AEP') (1 in 100 RP) plus climate change fluvial flood event and 0.5% AEP (1 in 200 RP) joint probability event. Floodwaters spread out over the floodplain and flood depths and extent vary across the Site.
Surface Water	High - Very Low	Majority of the Site is at very low risk with areas of elevated risk associated with isolated low points and the route of on-Site ordinary watercourses where surface waters could collect.
Groundwater	High – Very Low	Due to the presence of groundwater bearing superficial and bedrock deposits and low lying nature of the site shallow groundwater may be present.

Flood Source	Potential Risk	Description
Overwhelmed Sewers	Low - Very Low	Due to the Site's rural location limited sewerage infrastructure is likely to be present and the Site is located in an area with low number of historic records.
Artificial Sources	Low – Very Low	Reservoirs are present in the upstream catchment which could pose a risk to the Site. However, due to the management regime of the reservoirs the risk of failure is considered to be extremely unlikely and a managed risk.

9.4.21. The pre-development potential flood risk to the Site from overwhelmed sewers and artificial sources is considered to be 'low' to 'very low'. There are areas of elevated risk ('high' – 'medium') associated with the combined risk of flooding from watercourse and tidal sources due to the proximity of the site to the River Aire and River Ouse, low points where surface waters could collect and the likely presence of shallow groundwaters in underlying superficial and bedrock deposits.

9.4.22. The areas of the Site at elevated risk of flooding from watercourses and tidal sources includes the land predominately to the east, south and south east of Bales Wood. This corresponds with Field Numbers 10 – 8 and 31 – 44 as defined on the Field Boundaries Plan contained in Figure 3.1 of this PEIR. The areas of the Site at elevated risk of flooding from surface water associated isolated low points and the route of on-Site ordinary watercourses where surface waters could collect and are distributed throughout the Site. The areas of the Site at elevated risk of flood from groundwater is predominately in the northern, central and western areas of the Site which correspond with Field Numbers 1 – 33 and 43 – 44.

Environmental Quality

9.4.23. A number of sites designated for their nature conservation importance are located in the vicinity of the Site. Their distance between the designated site and the Solar Farm Zone and the potential hydrological connectivity is summarised in Table 9.11 below.

Table 9.11 Hydrological Connectivity of Designated Sites

Designated Site	Approximate Distance from the Site	Hydrological Connectivity
Barlow Common LNR	500m North	Indirect connection due to location in different sub catchment. The northern area of the Site drains via IDB managed ordinary watercourses which drain into the Lendall Drain/Common Drain located to the south of the dismantled railway. The LNR is located to the northeast of A1041 and to the north of a dismantled railway. Barlow Common drains to the Barlow Common Drain which drains into the Lendall Drain/Common Drain 2.8km downstream of the Site.
Eskamhorn Meadows SSSI	2.1km South East	Indirect connection due to location in different sub catchment. The southern area of the Site drains via IDB managed ordinary watercourses into the River Aire. The most downstream connection point from the Site into the River Aire is from the Weigh Bridge Drain which drains into the River Aire via sluices and a pumping station on land to the east of Bridge Farm. The Eskamhorn Meadows SSSI drains via IDB managed ordinary watercourses into the River Aire via a sluice approximately 3.8km downstream from this point.
River Derwent SAC & SSSI	4.3km North East	Indirect connection due to location in different sub catchment. The northern area of the Site drains via IDB managed ordinary watercourses which drain into the Lendall Drain/Common Drain which drains into the River Ouse via sluices and a pumping station on land at Lendall Clough on land to the north of Drax Abbey Farm. The River Derwent drains into the River Ouse approximately 0.4lm downstream from this point.
Humber Estuary Ramsar Site, SPA, SAC & SSSI	8.5km East	Direct downstream connection. The Humber Estuary designated site is located on the River Ouse downstream of the Boothferry Road bridge. This is approximately 13.4 km downstream of the northern area of the Site (the River Ouse catchment) and 16.8 km downstream of the southern area of the Site (the River Aire).

9.4.24. The River Ouse and Lendall Drain/ Common Drain to the north of the Site are assessed by the EA through the River Basin Management Plan and a summary of its quality is set out in Table 9.12 below.

Table 9.12 River Ouse and Lendall Drain/ Common Drain Environmental Quality

Waterbody: Ouse from R Wharfe to Upper Humber Water Body **Water Body ID: GB104027064270** **Water Body Type: River** **Hydromorphological designation: heavily modified**		
	2019	**Objectives & Reasons**
Ecological	Moderate	Good by 2027 - Low confidence Disproportionately expensive: Disproportionate burdens
Biological quality elements	Not Assessed	N/A
Physico-chemcial quality elements	Moderate	Good by 2027 - Low confidence Disproportionately expensive: Disproportionate burdens
Hydromorphological Supporting Elements	Supports Good	N/A
Chemical	Fail	Good by 2063 Disproportionately expensive: Disproportionate burdens; Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available

9.4.25. The EA's Catchment Data Explorer on the River Ouse at this location stated that the reasons for not achieving good status and reasons for deterioration are listed as:

- Diffuse and point source Phosphate pollution from Agriculture and rural land management and Water Industry sources;
- Diffuse sources of para – para DDT from industrial sources;
- Sources of Perfluorooctane sulphonate ('PFOS'), Mercury and its compounds, and Polybrominated diphenyl ethers ('PBDE');
- Physical modifications; and
- Low dissolved oxygen levels.

9.4.26. The River Aire to the south of the Site is assessed by the EA through the River Basin Management Plan and a summary of its quality is set out in Table 9.13 below.

Table 9.13 River Aire Environmental Quality

Waterbody: Aire from Fryston Beck to River Ouse Water Body **Water Body ID: GB104027063037** **Water Body Type: River** **Hydromorphological designation: heavily modified**		
	2019	**Objectives & Reasons**
Ecological	Moderate	Good by 2027 - Low confidence Disproportionately expensive: Disproportionate burdens
Biological quality elements	Moderate	Good by 2027 - Low confidence Disproportionately expensive: Disproportionate burdens
Physico-chemical quality elements	Moderate	Good by 2027 - Low confidence Disproportionately expensive: Disproportionate burdens
Hydromorphological Supporting Elements	Supports Good	N/A
Chemical	Fail	Good by 2063 Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available

9.4.27. The EA's Catchment Data Explorer for the River Aire at this location does not give any further details on reasons for not achieving good status or reasons for deterioration.

9.4.28. The other on-Site watercourses are not assessed by the EA through the River Basin Management Plan.

Future Baseline Conditions

9.4.29. The future baseline conditions existing at the Site in the year 2026 (when construction will start) is consistent with that of the present-day (2023) baseline described above. The flood risk baseline is a conservative and precautionary estimate of the baseline as it takes into account the effect of climate change over the lifetime of the Proposed Development.

Summary of Receptors

9.4.30. The sensitivity / value of the receptors identified as part of the baseline and future baseline conditions are set out in Table 9.14 below.

Table 9.14: Summary of Sensitivity/Value of Receptors

Sensitivity / Value	Receptor
High	▪ Residents and property located in the vicinity of the Site; ▪ Principal Aquifer and associated Source Protection Zone (SPZ1 & SPZ3); and ▪ The environmental quality of the Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Humber Estuary Ramsar Site, SPA, SAC & SSSI.
Medium	▪ Fluvial / tidal floodplain that affects part of the Site; ▪ Areas of elevated surface water flood risk in low lying areas adjacent to watercourses; ▪ The environmental quality of the Barlow Common LNR; and ▪ The environmental quality of the River Ouse and River Aire in the vicinity of the Site.
Low	▪ The environmental quality of the on-site ordinary watercourses / drainage ditches within the Site.
Very Low	▪ The environmental quality of the on-site ordinary watercourses / drainage ditches within the Site.

9.5. Likely Significant Effects

9.5.1. This section identifies the likely significant effects (beneficial and adverse) resulting from the Proposed Development on the water environment. The assessment of effects accounts for all primary and tertiary mitigation measures that are an integral part of the Proposed Development. These mitigation measures are embedded into the design of the development or are management control measures that are necessary and are summarised below for completeness.

Embedded Mitigation

Design of Site Equipment for Flood Resilience and Resistance

9.5.2. The Site layout has been devised using a sequential approach to locate sensitive equipment in areas of lowest flow risk as much as possible, taking into account other material planning considerations and operational requirements.

9.5.3. Ancillary control equipment, battery energy storage system (’BESS’) facility and the 132 kilovolt (‘kV’) Substation will be preferentially located in areas of very low surface water flood risk.

9.5.4. In areas of elevated flood risk, flood resilience and resistance measures have been considered to manage the residual flood risk to the Proposed Development. The

Proposed Development has been designed to be compatible with the risk of flooding on the Site.

9.5.5. Non-flood sensitive infrastructure (solar PV arrays) will be designed to be resistant and resilient to flood waters in the combined fluvial and tidal design flood event.

9.5.6. During times of elevated tidal and fluvial flood risk, and when an EA flood alert is issued, solar PV arrays within the areas of elevated flood risk will be rotated to the horizontal position (referred to as 'the stow position') to ensure the solar PV panels are raised above the flood level. This action will be performed remotely, and no operatives will be required on-Site during periods of elevated flood risk.

9.5.7. It is proposed to provide a minimum of a 0.3m freeboard between the combined fluvial and tidal design flood level and the stow position of the solar array. Solar PV arrays will be locally raised where this is not achieved by default.

9.5.8. Solar PV panel supports in flood risk areas will be securely piled into the ground and designed to allow for the effect of flowing water pressures and to be resistant to inundation during a flood event.

9.5.9. It is proposed that the mesh size of any security fencing within flood risk areas would be increased to a minimum of 0.15m to minimise the risk of it collecting debris and allow flood waters to flow around and through the structure.

9.5.10. To achieve the required level of protection from the combined fluvial and tidal design flood, suitably designed earth flood defence bunds are proposed around ancillary control equipment, BESS facility and 132kV Substation located in areas of elevated tidal and fluvial flood risk. The proposed earth flood defence bunds will be raised at least +0.6m above the combined fluvial and tidal design flood level to protect the equipment from inundation.

9.5.11. In line with normal building practice, it is proposed that any on site buildings will have floor levels raised at least 0.3m above existing ground level with appropriate damp proof course protection. This will ensure that the interior of any such building is kept suitably dry.

9.5.12. The detailed design of the scheme may utilise string inverters located on the back of the frames of the solar PV arrays. If string inverters are proposed, they will be situated a minimum of 0.3m above the combined fluvial and tidal design flood level.

9.5.13. BESS units will be raised 0.3m above ground which provides additional protection from the ingress of surface water within the bunded area.

9.5.14. To ensure the use of earth flood defence bunds does not increase flood risk elsewhere, 'level for level' floodplain storage compensation will be provided on the Site.

9.5.15. The design of the equipment and floodplain compensation will be finalised following the results of the site specific flood modelling and the FRA will be updated to inform the ES in support of the DCO application. In addition to level for level floodplain compensation, calculations of the effect of the flood defence bund earthworks will be assessed as part of the site specific flood model.

9.5.16. On-Site watercourses are retained within the Proposed Development. 7m minimum buffer zone distances have been established from the edge of a bank of any IDB managed ordinary watercourses for all infrastructure (with the exception of fence crossings, culverts and access tracks) and ordinary watercourses on-Site.

9.5.17. The Proposed Development will require below ground electricity and data cables to cross on-Site watercourses. To minimise the potential for adverse effects, service crossings of watercourses will be rationalised to minimise the number of crossings. Crossings of IDB maintained ordinary watercourses will be installed by directional drilling techniques under the channel of the watercourse and will be based on the following design parameters:

- The service crossing is within 10 degrees of perpendicular to the direction of flow in the watercourse;
- The service crossing is at least 1.5m below the bed of the watercourse along its whole length, and the same height is maintained for at least 5m beyond each bank (measured from the top);
- The service crossing does not pass through any bank, culvert, formal flood defence or other structure;
- Appropriate permanent hazard markers on both banks should be installed; and
- Works do not disturb the bed and banks of the watercourse.

9.5.18. If alternative construction methods are proposed for service crossings of IDB maintained ordinary watercourses, it is likely IDB Byelaw consent would be required

and construction methods should be approved by the Selby Area IDB.

9.5.19. These flood mitigation measures are predicted to ensure the Proposed Development will remain operational and safe in times of flood and are described in more detail in the FRA contained in Appendix 9.1.

Design of Site Equipment for Pollution Prevention

9.5.20. Any electrical plant within the Site which contains oil will be designed to be suitably bunded in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001 and the EA and Department for Environment, Food & Rural Affairs guidance entitled 'Oil storage regulations for businesses'[29].

9.5.21. Any relevant materials including oil filled plant in the 132 kV Substation will be stored in accordance with the appropriate pollution prevention principles to reduce the likelihood of spillage and with an impermeable base and suitable bunding to prevent discharge in the event of spillage and leakage, and the design and location will be in accordance with the EA's requirements.

9.5.22. Cables will be buried at depths in accordance with National Joint Utility Group ('NJUG') Guidelines on the positioning and colour coding of underground utilities' apparatus to reduce the likelihood of cable strikes. Cable trench excavations are typically up to 1.5m in width and up to 1.2m in depth, depending on ground conditions.

9.5.23. As set out above, protective earth flood defence bunds surrounding the ancillary equipment, BESS facility and 132 kV substation in areas of elevated flood risk are proposed so that the combined fluvial and tidal design flood level does not affect the on-Site control equipment. It is predicted that, through the provision of earth flood defence bunds, flood waters would not interact with the control equipment, reducing the risk of a pollution event or contamination of flood water occurring.

9.5.24. The detailed site design will ensure that no fluid filled cables pass through the small area of SPZ1 on the Site.

9.5.25. Ancillary control equipment which could contain oil-filled plant should be located outside of the small area of SPZ1 on the Site.

[29] EA (2023) Oil storage regulations for businesses. Available at: https://www.gov.uk/guidance/storing-oil-at-a-home-or-business. Accessed in August 2023.

Surface Water Management Measures

9.5.26. It is considered that the overall existing drainage characteristics of the Site are not materially changed as a consequence of the introduction of the Proposed Development. Surface water runoff from the Site will continue to drain by a combination of overland flow towards the low points and the ordinary watercourses / drainage ditches which cross the Site and infiltration into the underlying ground as per the baseline situation.

9.5.27. The land will be sown with the appropriate seed mix upon construction of the solar PV panels to reduce the risk of soil erosion, enhance potential for runoff 'interception losses' (from infiltration / evapotranspiration) and reduce the overland flows. Vegetation cover will be maintained through the lifetime of the Proposed Development.

9.5.28. As an additional mitigation measure, interception swales will be located at low points across the Site to intercept extreme flows which may already run off-Site. The design of the swales is to intercept runoff and encourage depression storage within the features, promoting interception losses by infiltration and evapotranspiration.

9.5.29. The interception swales will enhance the quality of runoff and contribute to the sedimentation and removal of fine sediments from overland flows.

9.5.30. The BESS facility and 132kv Substation will drain to a formal drainage system utilising SuDS features to collect and convey runoff. Runoff would be discharged at a controlled rate into the on-Site ordinary watercourses/ drainage ditches.

9.5.31. Details of the surface water management in the Proposed Development is discussed further in the Drainage Strategy section of the FRA contained in Appendix 9.1.

9.5.32. The interception swales and SuDS Features will be maintained in accordance with the maintenance procedures provided in the FRA contained in Appendix 9.1.

Design of Watercourse Crossings

9.5.33. The number of new watercourse crossings has been minimised and the internal access track utilises existing watercourse/hedgerow crossings where possible.

9.5.34. It is proposed that opportunities are sought within the development areas for

crossings of ordinary watercourses to be formed from single span structures, clear of the watercourse channels, wherever feasible. Where this is not possible, oversized box culverts should be utilised such that existing bed and bank profiles can be retained or reinstated in order to provide ecological benefits and maintain the existing hydrological characteristics of the water environment.

9.5.35. The watercourse crossings will be sized such that no hydraulic restriction is created, and flood risk is not materially affected. The size and design of the watercourse crossings will be determined at detailed design stage, post consent, in accordance with the principles established in the FRA contained in Appendix 9.1.

9.5.36. Works on or near an ordinary watercourse (including temporary works) may require Land Drainage Consent or Byelaw Consent from Selby Area IDB. Any relevant works must comply with the consent conditions.

Measures to be Adopted by the Project

Site Evacuation Procedure to Manage Residual Risk

9.5.37. The construction contractor and operating staff will register to receive flood alerts from the EA. When a flood alert is issued, the Proposed Development will be evacuated along the local highway network as a precautionary measure. The site evacuation procedure applies to construction, operation and decommissioning phases of the Proposed Development. The evacuation procedure will be covered by a suitably worded DCO requirement requiring the submission of details to be submitted to and approved by the Local Planning Authority.

9.5.38. Solar farm developments are not ‘occupied’ and only occasional maintenance visits are required for landscape maintenance and equipment repairs. Maintenance visits will be scheduled to avoid periods of elevated flood risk. No maintenance operatives will be on-Site during periods of elevated flood risk and access to the Site will be restricted.

Management of Vegetation

9.5.39. The vegetation coverage across the Site will be maintained and monitored in accordance with a Landscape and Ecological Management Plan (to be provided in the ES to be submitted in support of the application for development consent for the Proposed Development) to reduce soil erosion and overland flow which will be

secured by way of a suitably worded DCO requirement requiring details to be submitted to and approved by the Local Planning Authority.

Construction Site Management

9.5.40. Adopting best practice construction site management with adequate contingency planning, and following the principles of pollution prevention guidance will reduce the risk of water pollution during the construction and decommissioning phases. Measures include:

- The proper supervision of construction activities using appropriately experienced and qualified staff and supervisors, and strict adherence to Health and Safety Regulations, Codes of Practice, and Consent Conditions;
- Contractors will employ best practice, good housekeeping and adopt the principles set out in the CIRIA Toolbox Talks: Environmental[30], CIRIA C532[31], CIRIA C741[32], and CIRIA C648[33];
- The contractor will provide additional street cleaning facilities as necessary to keep highways leading to the site clear of mud and prevent sediment contaminating surface water runoff. Wheel cleaning facilities, appropriate stockpiling of topsoil, suitable timing of earthwork and earthmoving operations, and dust suppression measures will be used to prevent migration of sediment and other potentially polluting substances onto the highway and into watercourses;
- Vehicle and plant washing will be carried out on designated areas at least 10m from any watercourse or surface water body;
- Contractors will use well maintained plant, but the likelihood of spills will be reduced through adoption of pollution prevention principles;
- Where construction activities occur in close proximity to watercourses, additional silt management measures will be required. Silt fences should be erected along the boundary of watercourses to minimise silt laden runoff entering the on-Site watercourses and the use of Siltbusters (or similar approved product) may be necessary:

[30] CIRIA (2016) Toolbox talks: Environmental. Available at: https://www.ciria.org/Resources/All_toolbox_talks/Env_toolbox_talks/environmental_tbt.aspx (accessed June 2023).

[31] CIRIA (2015) The SuDS Manual (Version 6 including 2016, 2018, 2019) CIRIA C753.

[32] CIRIA (2015) Environmental good practice on site guide CIRIA C741.

[33] CIRIA (2016) Control of water pollution from linear construction projects. Site guide CIRIA C649.

- All construction compounds and material and plant storage areas should be located outside areas susceptible to flooding, where practicable:
- Effective contingency plans will be put in place to manage the risk associated with accidents and/or unforeseen circumstances. For example, information relating to the use and location of accidental spill kits will be relayed to the construction personnel;
- Only light machinery will be used to install the solar panels and all HGVs will be restricted to the temporary construction compound; and
- The significant storage of fuels, lubricants or chemicals on site is not expected. Any relevant materials will be stored in accordance with the appropriate pollution prevention principles to reduce the likelihood of spillage and with an impermeable base and suitable bunding or double skinned tanks.

9.5.41. On completion of the Proposed Development, if necessary to alleviate the effects of any compaction, any affected areas will be harrowed and seeded prior to commissioning.

9.5.42. If, during construction, the Site becomes significantly disturbed, temporary swales will be constructed to intercept overland flows and act as silt traps to mitigate the disturbance of construction activities on site drainage.

9.5.43. Construction activities will be paused during periods of elevated surface water flood risk to minimise the disruption to on-Site overland flows.

9.5.44. Taking into account the measures outlined above, adopting best practice construction site management with adequate contingency planning, and following the principles of pollution prevention, which will be formalised and incorporated into a Construction Environmental Management Plan ('CEMP') secured through a DCO requirement, will reduce the risk of a pollution event occurring. The Outline CEMP ('oCEMP') is provided at Appendix 5.1 of the PEIR.

9.5.45. A site maintenance plan will be implemented so that all operational plant is routinely checked and maintained to reduce the likelihood of leakages during the operation of the Proposed Development. A site maintenance plan will be secured by a suitably worded DCO requirement requiring details to be submitted to and approved by the Local Planning Authority.

Construction Phase

Surface Water Drainage and Flood Risk

9.5.46. The Site's drainage regime may be temporarily disrupted during the construction phase. This could cause minor increases in the runoff rates, minor disruption to overland flow routes and soil compaction.

9.5.47. Scheduling construction activities to avoid periods of elevated flood risk in susceptible areas of the site as detailed in the CEMP and minimising work in close proximity to watercourses (due to the design of the Proposed Development) will reduce the likelihood of construction activities affecting overland flow routes. Use of temporary construction drainage, where appropriate as detailed in the CEMP, will further reduce the effects of construction activities on runoff rates.

9.5.48. The magnitude of the effect of the construction of the Proposed Development on surface water runoff rates and volumes and the resultant flood risk implications in the receiving water bodies with embedded mitigation measures in place is 'Very Low Adverse'. The flood risk sensitivity of nearby receptors (people and property) is assessed as 'High'. The significance of the effect is therefore assessed as negligible to minor adverse (**not significant**). These effects would be temporary, and reversible with time.

9.5.49. There would be temporary disturbances within the channel of on-Site watercourses. With management control mitigation, the magnitude of the effect of construction of any watercourse crossings on on-Site flood risk/ watercourse conveyance capacity is 'Low Adverse'. The sensitivity of on-Site ordinary watercourses/ drainage ditches are 'Low' to 'Very Low'. The significance of the effect of any new watercourse crossings on flood risk is considered to be negligible (**not significant**). These effects would be temporary for the duration of the construction phase and would only affect the local area around the watercourse crossing.

Environmental Quality

9.5.50. There are a number of operations which could adversely affect surface water quality on the Site and its immediate vicinity as a result of construction activities associated with the grid connection and the Proposed Development. Potentially polluting construction activities include excavation and groundworks; vehicle operation;

machine and plant washing; erosion from temporary vehicle routes and exposed earth; incorrect storage of substances; and accidental spillages. Vandalism of plant and material storage could also be a pollution risk if substances are discharged or if leakage occurs as a result of damage.

9.5.51. The potential polluting substances could include:

- Fine sediment (e.g. silts and clays);
- Cementitious materials;
- Oil, fuels and chemicals, including lubricants, coolants and hydraulic fluids; and
- Other general wastes including wood, plastics, sewerage and construction aggregate.

9.5.52. These substances contaminate watercourses via surface runoff, especially after periods of rainfall. The significance of the contaminate effects is dependent on the pollution event, the nature of the pollutant, and antecedent conditions.

9.5.53. Adopting best practice construction site management as set out in the oCEMP with adequate contingency planning, and following the principles of pollution prevention will reduce the risk of water pollution.

9.5.54. The magnitude of the effect on water quality of on-Site watercourse via direct flow as a result of construction activities with management control mitigation measures in place it is considered to be between 'Low Adverse' and 'Very Low Adverse'. The sensitivity of on-Site ordinary watercourses / drainage ditches is assessed as 'Low' to 'Very Low'. The effect significance is therefore negligible (**not significant**) and considered to be temporary, and reversible with time.

9.5.55. As set out in Table 9.11, the Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Barlow Common LNR have an indirect hydrological connection to the Site. As such the risk of construction activities with management control mitigation measures affecting water quality of these designated sites is considered to be 'Very Low Adverse'. Due to their indirect hydrological connection the sensitivity of these designated sites is assessed as 'Low'. The effect significance is therefore negligible (**not significant**) and considered to be temporary, and reversible with time. This is consistent with the methodology of Chapter 8 Biodiversity of the PEIR, which scopes out these designated sites of the detailed assessment.

9.5.56. The River Ouse and River Aire are located downstream of the Site. There is a potential that any on-Site contamination is transported downstream, potentially affecting the water and habitat quality of the receiving watercourses and waterbodies. Due to the size of the receiving watercourses, there will be dilution potential which could minimise the effect of a pollution incident on ecological receptors. The magnitude of the effect on water quality of the River Ouse and River Aire via direct flow and as a result of construction activities with management control mitigation measures in place it is considered to be 'Low Adverse' to 'Very Low Adverse'. The sensitivity of the River Aire and River Ouse designations are assessed as 'Medium'. The effect significance is therefore minor adverse to negligible (**not significant**) and considered to be temporary, and reversible with time and not significant.

9.5.57. The Humber Estuary designated sites are located downstream of the Site. There is a potential that any on-Site contamination is transported downstream, potentially affecting the water and habitat quality of the receiving watercourses and waterbodies. The tidal nature of the Humber Estuary will provide significant and cyclical dilution potential which could minimise the effect of a pollution incident on ecological receptors. The magnitude of the effect on water quality of the Humber Estuary and its nature designations via direct flow and as a result of construction activities with management control mitigation measures in place it is considered to be 'Very Low Adverse'. The sensitivity of the Humber Estuary designations are assessed as 'High'. The effect significance is therefore minor adverse (**not significant**) and is considered to be temporary, and reversible with time and not significant. This is consistent with the methodology of Chapter 8 Biodiversity of the PEIR which scopes out these designated sites of the detailed assessment.

9.5.58. Excessively deep excavations (>3m) are not anticipated as part of the construction of the Solar Farm Zone and Substation/BESS Compound elements of the Proposed Development. The construction activities are unlikely to create new pathways which could pose a risk to groundwater bodies. The risk of groundwater pollution would be as a result of a pollution incident at the surface contaminating the underlying ground and infiltrating/ leaching into the underlying geological deposits which may be a source of groundwater. The management control mitigation measures would ensure pollution incidents are identified and appropriately managed at the earliest opportunity minimising the risk of a surface water pollution incident contaminating deeper geological deposits. Restricting sources of potential contamination to areas

outside SPZ1 further reduces the risk of a pollution incident occurring.

9.5.59. The Site will connect to the National Grid substation at the Drax Power Station via underground cabling located within the Underground Cable Corridor (shown on Figure 3.2 Parameter Plan of the PEIR). The Underground Cable Corridor requires to cross the railway located to the south of Drax Power Station in the vicinity of the A645 road bridge. The Underground Cable Corridor will be installed by horizontal directional drilling ('HDD') at this location. The details of the depth of the HDD have yet to be determined and will be dependent on the ground conditions and detailed engineering design of the utility crossing. The risk of creating new pathways which could pose a risk to groundwater bodies as a result of HDD utility crossing of the railway is uncertain at this stage.

9.5.60. The magnitude of the effect on water quality of groundwater bodies via direct flow as a result of construction activities with management control mitigation measures in place it is considered to be between 'Medium Adverse' and 'Very Low Adverse'. The sensitivity of on-Site groundwater bodies (SPZ1 and SPZ3) is assessed as 'High'. The effect significance is therefore major adverse to minor adverse (**significant**) and considered to be temporary, and reversible with time. The risk of an accidental pollution incident can never be completely removed but the risk can be minimised to an acceptable level with additional mitigation measures outlined in the section below.

Operational Phase

Surface Water Drainage and Flood Risk

9.5.61. The Proposed Development will not result in a material increase in surface water runoff.

9.5.62. The Proposed Development will have a negligible effect on the extent of impermeable ground cover on the Site. The area beneath the solar PV panels will remain grassed. Rainwater falling onto each panel will drain freely onto the ground beneath the panel and infiltrate into the ground at the same rate as it does in the Site's existing greenfield state. Similarly, it can be assumed that any rainwater falling onto the crushed stone access tracks will soak into the ground beneath or adjacent to the tracks at the same rate that it presently does.

9.5.63. Discrete impermeable areas created by the proposed control equipment amounts to

only 0.1% of the area of the Site where built development is proposed. Surface water falling on these small areas will run off onto the adjacent land without a measurable effect and the overall existing pre-development drainage characteristics of the Site are not materially changed as a consequence of the introduction of the Proposed Development.

9.5.64. It is assessed that the Proposed Development has a 'Negligible' effect on surface water runoff rates, and the resultant risk of flooding both on-Site and off-Site compared with pre-development conditions by retaining existing drainage characteristics and securing permanent vegetation cover.

9.5.65. Interception swales are proposed, creating depression storage on the Site and contributing to 'slowing the flow'. Formal SuDS features for the BESS facility and 132kv Substation create attenuation storage. The beneficial magnitude of the effect of interception swales and SuDS features and the resultant effect on downstream flood risk is considered to be 'Low Beneficial'.

9.5.66. The magnitude of the effect of the Proposed Development on surface water flood risk and surface water drainage regime taking into account design mitigation measures would be 'Low Beneficial' to 'Very Low Beneficial'. The flood risk sensitivity of nearby receptors (people and property) is assessed as 'High'. The significance of the effect of the Proposed Development on surface water flood risk and surface water drainage regime would be between moderate beneficial and minor beneficial (**not significant**) and would be permanent.

9.5.67. All control and sensitive equipment including solar panels are elevated above ground level or protected by a suitably designed earth flood defence bund and would be unaffected by shallow overland flows, emergent groundwater, or combined fluvial and tidal flooding.

9.5.68. Due to the nature of the proposed equipment in the area of elevated flood risk the volume of flood water displaced by the PV panel supports and fence posts is negligible in the context of the wider floodplain and flood waters can flow freely around the panel supports, base of the structures, and security fence.

9.5.69. Any displacement of flood waters as a result of mitigation measures during the combined fluvial and tidal design flood would be mitigated by 'level for level' floodplain compensation.

9.5.70. The flood resilience and resistance design mitigation measures reduce the magnitude of the effect of the proposed equipment on overland flows, emergent groundwater, or combined fluvial and tidal flood flows to 'Very Low'. The flood risk sensitivity of nearby receptors (people and property) is assessed as 'High'. The significance of the effect of the Proposed Development on disruption to flood hazards (tidal, surface water and emergent groundwater) and resultant flood risk, taking into account design mitigation measures that ensure the Proposed Development will not increase flood risk elsewhere, would be negligible (**not significant**).

9.5.71. New watercourse crossings could create new structures in the channel of on-Site watercourses (large diameter pipes/ box culvert). The design of the crossings so that no hydraulic restriction is created results in flood risk not being materially affected and the magnitude of the effect of new crossings on flood risk is assessed as 'Very Low Adverse'. The sensitivity of on-Site ordinary watercourses / drainage ditches is 'Low' to 'Very Low'. The significance of the effect of watercourse crossings on on-Site flood risk would be negligible (**not significant**) and would be permanent.

Environmental Quality

9.5.72. During the operation of the Proposed Development, there is potential for polluting substances to have a detrimental effect on the water quality of the surface water runoff and consequently the receiving water body. These substances include:

- Spillages from maintenance vehicles;
- Spillages from on-Site plant, such as transformers; and
- Sediment introduced to the Site from vehicle movement.

9.5.73. The significance of any pollution incident will be dependent upon the nature of the pollutant, the nature of the incident, the sensitivity of the receiving environment, and the effectiveness of mitigation measures.

9.5.74. The pollution prevention design mitigation for on-Site plant reduces the likelihood of a pollution event occurring.

9.5.75. The Site will remain vegetated throughout the construction and operation of the Proposed Development, therefore minimising the risk of soil erosion. The cessation of arable agricultural activities will reduce sediment and nutrient transportation to watercourses, reducing diffuse pollution loads to the downstream watercourses. The

provision of interception swales and SuDS features will encourage biodiversity by creating small wetland areas and infiltration within the Site. The Proposed Development is not a significant source of foul sewage and therefore the nutrient loading at wastewater treatment works and resultant effects on water dependent protected nature conservation sites in the catchment is unaffected by the operation of the Proposed Development.

9.5.76. The magnitude of the effect of potential for polluting substances to have a detrimental effect on the water quality of the surface water runoff and consequently the receiving water body is assessed as 'Low Adverse' to 'Very Low' for on-Site watercourses / drainage ditches. The sensitivity of on-Site watercourses / drainage ditches is assessed as 'Low' to 'Very Low'. Therefore, the significance of the adverse effects on surface water quality of on-Site watercourses via direct flow, taking into account design mitigation, is assessed as negligible (**not significant**). These effects of an isolated pollution incident are considered to be temporary, and reversible with time. The magnitude of the effect of potential for polluting substances to have a detrimental effect on the water quality of the surface water runoff and consequently the receiving water body is assessed as 'Very Low Adverse' for the River Ouse, River Aire and Humber Estuary and its nature designations due to the low risk nature of an operational solar farm development, dilution capacity of interconnecting watercourses and the wider tidal estuary. The sensitivity of the River Ouse and River Aire is assessed as 'Medium' and the Humber Estuary nature designations as 'High'. The significance of the effects of potential pollution incidents on the River Ouse, River Aire and Humber Estuary and its nature designations via direct flow with the design mitigation is assessed as minor adverse to negligible (**not significant**) and considered to be temporary, and reversible with time.

9.5.77. The operation of the Proposed Development is unlikely to create a significant source or new pathway for pollution which could pose a risk to groundwater bodies. The risk of groundwater pollution would be as a result of a pollution incident at the surface contaminating the underlying ground and infiltrating/ leaching into the underlying geological deposits which may be a source of groundwater. The design mitigation measures of suitably bunded plant which could contain potentially polluting materials minimises the risk of a pollution event occurring and of a surface water pollution incident contaminating deeper geological deposits. Restricting sources of potential contamination to areas outside SPZ1 further reduces the risk of a pollution incident occurring.

9.5.78. The magnitude of the effect on water quality of groundwater bodies via direct flow as a result of operational activities with design mitigation measures in place it is considered to be 'Very Low Adverse'. The sensitivity of on-Site groundwater bodies (SPZ1 and SPZ3) is assessed as 'High'. The effect significance is therefore minor adverse (**not significant**) and considered to be temporary, and reversible with time.

9.5.79. The risk of an accidental pollution incident can never be completely removed but the risk can be minimised to an acceptable level and the risks identified are not significant. The Very Low enhanced pollution risk as a result of the operation of the Proposed Development is a permanent increased risk over the lifetime of the Proposed Development compared to the baseline.

Decommissioning Phase

9.5.80. The effects during decommissioning will be broadly similar to those during construction. The management control mitigation measures identified in the 'Embedded Mitigation' section above apply to decommissioning.

9.5.81. The assessment of flood hazards takes into account the effects of climate change over the lifetime of the Proposed Development on peak rainfall intensity, peak river flow and sea level rise. The effects of climate change will be more prominent in the decommissioning phase at the end of the modelled operational life of the Proposed Development. As a precautionary approach, the design mitigation measures and management control mitigation measures take into account the effect of climate change on flood hazards over the lifetime of the Proposed Development. By ensuring climate change is considered from the outset, the Proposed Development is appropriately resilient to the effects of climate change on flood hazards throughout its lifespan, including the decommissioning phase of the project.

9.5.82. As part of decommissioning, it is considered that all solar PV panels and other infrastructure would be removed and the Site restored. This includes dismantling and removing all control equipment (inverters, transformers, security fencing), foundations and below ground cabling to enable the return to agricultural usage.

9.5.83. Watercourse crossings will be retained to facilitate ongoing agricultural access and minimise further disturbance to on-Site watercourses.

9.5.84. Where not required for ongoing agricultural activities the access tracks will be

removed and land reinstated.

9.5.85. Any protective earth flood defence bunding would be redundant following the removal of control equipment and the land will be re-profiled and reinstated.

9.5.86. The effects of decommissioning will be temporary and reversible in time and are summarised below. The magnitude of the effect of the decommissioning of the Proposed Development on surface water runoff rates and volumes and the resultant flood risk implications in the receiving water bodies with mitigation measures in place is 'Very Low Adverse'. The flood risk sensitivity of nearby receptors (people and property) is assessed as 'High'. The significance of the effect is therefore assessed as minor adverse to negligible (**not significant**) These affects would be temporary, and reversible with time.

9.5.87. The magnitude of the effect on water quality of on-Site watercourses via direct flow as a result of decommissioning activities with mitigation measures in place is considered to be between 'Low Adverse' and 'Very Low Adverse'. The sensitivity of on-Site ordinary watercourses / drainage ditches are 'Low' to 'Very Low'. The effect significance is therefore negligible (**not significant**) and considered to be temporary, and reversible with time.

9.5.88. The magnitude of the effect on water quality of the River Ouse and River Aire via direct flow and as a result of decommissioning activities with management control mitigation measures in place is considered to be 'Low Adverse' to 'Very Low Adverse'. The sensitivity of the River Aire and River Ouse designations are assessed as 'Medium'. The effect significance is therefore minor adverse to negligible (**not significant**) and considered to be temporary, and reversible with time and not significant.

9.5.89. The magnitude of the effect on water quality of the Humber Estuary and its nature designations via direct flow and as a result of decommissioning activities with management control mitigation measures in place is considered to be 'Very Low Adverse'. The sensitivity of the Humber Estuary designations are assessed as 'High'. The effect significance is therefore minor adverse and considered to be temporary, and reversible with time and **not significant**.

9.5.90. The magnitude of the effect on water quality of groundwater bodies via direct flow as a result of decommissioning activities with management control mitigation measures

in place it is considered to be between 'Low Adverse' and 'Very Low Adverse'. The sensitivity of on-Site groundwater bodies (SPZ1 and SPZ3) is assessed as 'High'. The effect significance is therefore minor adverse to moderate adverse (**significant**) and considered to be temporary, and reversible with time.

9.6. Mitigation Measures

9.6.1. The embedded design and applied management control mitigation measures set out in the 'Embedded Mitigation' and 'Measures to be Adopted by the Project' sections above mitigate the majority of the significant effects of the Proposed Development on sensitive surface water drainage, flood risk and environmental quality receptors. The remaining significant adverse effect is a residual risk of construction and decommissioning activities to water quality of groundwater bodies.

Construction Phase

9.6.2. During the construction phase, the on-Site watercourses and the ground surface where potentially polluting construction activities are being undertaken or potential contaminating substances are stored will be inspected regularly to check for any unforeseen discharges from the Proposed Development (changes in colour, transparency, oil sheen or foam build up). If any deterioration in the quality of the on-Site watercourses is identified, or a spillage of a potential contaminant identified on the ground surface, this should be reported to the construction site manager and construction site management techniques reviewed and adjusted accordingly and appropriate containment and remediation measures enacted.

9.6.3. The enhanced monitoring of the Site reduces the risk of a pollution event going unnoticed. The enhanced monitoring of the Site will increase the opportunity for any pollution event to be identified, contained and remediated early thereby minimising the opportunity for the pollution event to spread along a potential pathway and affect a sensitive receptor.

9.6.4. An oCEMP is provided at Appendix 5.1 of the PEIR. A CEMP containing an enhanced monitoring schedule and pollution control measures to safeguard groundwater quality will be secured by a suitably worded DCO requirement requiring details to be submitted to and approved by the Local Planning Authority.

9.6.5. The risk of the HDD utility crossing of the railway on sensitive receptors (SPZ3 and

Principal Bedrock Aquifer) is uncertain. The design and implementation of the HDD utility crossing of the railway will be supported by a Hydrogeological Risk Assessment which will consider the implications of the proposals on physical disturbance of the aquifer and on groundwater levels or flow. Where necessary, additional mitigation measures will be identified to mitigate the effect of the HDD utility crossing of the railway on sensitive receptors (SPZ3 and Principal Bedrock Aquifer). The Hydrogeological Risk Assessment for the HDD utility crossing of the railway will be secured by a suitably worded DCO requirement requiring details to be submitted to and approved by the Local Planning Authority.

Operational Phase

9.6.6. The design of the equipment and floodplain compensation will be finalised following the results of the site-specific flood modelling and the FRA will be updated to inform the EIA in support of the application for development consent for the Proposed Development. In addition to level for level floodplain compensation, calculations demonstrating the effect of the flood defence bund earthworks will be assessed as part of the site-specific flood model.

Decommissioning Phase

9.6.7. A Decommissioning Environmental Management Plan ('DEMP') containing an enhanced monitoring schedule and pollution control measures to safeguard groundwater quality covering the decommissioning phase will be secured by a suitably worded DCO requirement, requiring details to be submitted to and approved by the Local Planning Authority.

9.7. Residual Effects

Construction Phase

9.7.1. The residual significance of the effect of the construction of the Proposed Development on surface water runoff rates and volumes and the resultant flood risk implications in the receiving water bodies with embedded mitigation measures in place is assessed as minor adverse to negligible (**not significant**). These effects would be temporary, and reversible with time.

9.7.2. The residual significance of the effect of the construction of any new watercourse crossings on flood risk taking into account management control mitigation is

considered to be negligible (**not significant**). These effects would be temporary for the duration of the construction phase and would only affect the local area around the watercourse crossing.

9.7.3. Adopting best practice construction site management with adequate contingency planning, and following the principles of pollution prevention, will reduce the risk of water pollution.

9.7.4. The residual significance of the effect of potentially polluting construction activities on the water quality of on-Site watercourse / drainage ditches via direct flow taking into account management control mitigation is negligible (**not significant**) and considered to be temporary, and reversible with time.

9.7.5. The residual significance of the effect of potentially polluting construction activities on water quality of Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Barlow Common LNR due to their indirect hydrological connection is negligible (**not significant**) and considered to be temporary, and reversible with time.

9.7.6. The residual significance of the effect of potentially polluting construction activities on water quality of the River Ouse and River Aire via direct flow taking into account management control mitigation is minor adverse to negligible (**not significant**) and considered to be temporary, and reversible with time and not significant.

9.7.7. The residual significance of the effect of potentially polluting construction activities on water quality of the Humber Estuary designated sites via direct flow, taking into account management control mitigation, is minor adverse and considered to be temporary, and reversible with time and **not significant**.

9.7.8. The residual significance of the effect of potentially polluting construction activities on water quality of groundwater bodies via direct flow taking into account management control mitigation, enhanced monitoring and a detailed Hydrogeological Risk Assessment for the HDD utility crossing of the railway is moderate adverse to minor adverse and considered to be temporary, and reversible with time. The risk of an accidental pollution incident can never be completely removed but the risk can be minimised to an acceptable level through the enhanced monitoring and implementation of a detailed Hydrogeological Risk Assessment where there is uncertainty in construction methodology and the risks identified are **not significant**.

Operational Phase

9.7.9. The residual significance of the effect of the Proposed Development on surface water flood risk and surface water drainage regime taking into account design mitigation measures is moderate beneficial to minor beneficial (**not significant**) and would be permanent.

9.7.10. The residual significance of the effect of Proposed Development on disruption to flood hazards (tidal, surface water and emergent groundwater) and resultant flood risk taking into account design mitigation measures that ensure the Proposed Development will not increase flood risk elsewhere would be negligible (**not significant**).

9.7.11. The residual significance of the effect of watercourse crossings on on-Site flood risk taking into account design mitigation measures would be negligible (**not significant**) and would be permanent.

9.7.12. The residual significance of the effect of the potential for polluting substances on surface water quality of on-Site watercourses/ drainage ditches via direct flow taking into account design mitigation is assessed as negligible (**not significant**). These effects of an isolated pollution incident are considered to be temporary, and reversible with time.

9.7.13. The residual significance of the effect of the potential for polluting substances on surface water quality and consequently the receiving water body (River Aire, River Ouse and Humber Estuary and its designations) via direct flow taking into account design mitigation is assessed as minor adverse to negligible (**not significant**). These effects of an isolated pollution incident are considered to be temporary, and reversible with time.

Decommissioning Phase

9.7.14. The residual significance of the effect of the decommissioning of the Proposed Development on surface water runoff rates and volumes and the resultant flood risk implications in the receiving water bodies with embedded mitigation measures in place is assessed as minor adverse and negligible (**not significant**). These effects would be temporary, and reversible with time.

9.7.15. Adopting best practice construction site management with adequate contingency

planning, and following the principles of pollution prevention will reduce the risk of water pollution.

9.7.16. The residual significance of the effect of potentially polluting decommissioning activities on water quality of on-Site watercourse / drainage ditches via direct flow taking into account management control mitigation is negligible and considered to be temporary, and reversible with time.

9.7.17. The residual significance of the effect of potentially polluting decommissioning activities on the water quality of the Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Barlow Common LNR due to their indirect hydrological connection is negligible (**not significant**) and considered to be temporary, and reversible with time. The residual significance of the effect of potentially polluting decommissioning activities on water quality of the River Ouse and River Aire via direct flow taking into account management control mitigation is minor adverse to negligible and considered to be temporary, and reversible with time and **not significant**.

9.7.18. The residual significance of the effect of potentially polluting decommissioning activities on water quality of the Humber Estuary designated sites via direct flow taking into account management control mitigation is minor adverse and considered to be temporary, and reversible with time and **not significant**.

9.7.19. The residual significance of the effect of potentially polluting decommissioning activities on the water quality of groundwater bodies via direct flow taking into account management control mitigation and enhanced monitoring is moderate adverse to minor adverse and considered to be temporary, and reversible with time. The risk of an accidental pollution incident can never be completely removed but the risk can be minimised to an acceptable level through the enhanced monitoring and the risks identified are **not significant**.

9.8. Cumulative Effects

9.8.1. Cumulative effects can result from a combination of impacts, which on their own may not be significant but when combined with others, could generate significant effects.

9.8.2. It is necessary to assess the effects of the Proposed Development taking into account the potential cumulative effects as a result of other developments in the vicinity of the Site. Due to the nature of the potential effect of the Proposed

Development on hydrology and flood risk, it is considered that a cumulative effect can only occur if the schemes identified for cumulative effects assessment (and therefore their effects) are within the surface water drainage catchment or wider river catchment of the Site. The effects of cumulative and individual development on surface water drainage and flood risk are limited to within the surface water or river catchment, and cross catchment effects are rare.

9.8.3. On this basis, it is possible to scope out other schemes situated outside of the natural drainage catchment of the Site and the River Aire and River Ouse. Schemes which fall outside of the River Aire and River Ouse catchment and not assessed further comprise:

- Land near Osgodby Grange, South Duffield Road, Osgodby, Selby (ref: 2021/0978/FULM); and
- Bradholme Farm, High Levels Bank, Thorne, Doncaster (ref: 21/00500/OUTA).

9.8.4. Schemes which require further assessment comprise:

- Land South of A645, Wade House Lane, Drax (ref: 2023/0128/EIA);
- East Yorkshire Solar Farm Nationally Significant Infrastructure Project ('NSIP') (PINS ref: EN010143);
- Drax Bioenergy with Carbon Capture and Storage Project NSIP (PINS ref: EN010120);
- Land off New Road, Drax (ref: 2020/1357/FULM);
- Land off Hales Lane, Drax (ref: 2021/1089/FULM);
- Land North and South of Camela Lane, Camblesforth (ref: 2021/0788/EIA);
- Drax Power Station, Drax (ref: 2022/0107/NYSCO);
- Land to the East of New Road, Drax (ref: 2022/0711/EIA);
- Land Adjacent to Barlow Common Road, Barlow, Selby (ref: 2022/0287/SCN);
- Newlands Farm, Turnham Lane, Cliffe, Selby (ref: 2021/0348/SCN);
- Eggborough Power Station, Selby Road, Eggborough (ref: 2019/1343/EIA); and
- Former Kellingley Colliery, Turvers Lane, Kellingley, Knottingley (ref: 2016/1343/OUTM).

Design of Cumulative Assessment Schemes

9.8.5. The basis of the assessment for cumulative effects is that the other developments will deliver mitigation measures to address their effects on hydrology and flood risk. Government Planning Policy (NPS and NPPF) ensures that the significance of the residual effects of new development on surface water drainage and flood risk is minimised following the construction of suitably designed surface water drainage systems, the application of SuDS and pollution prevention principles. Thus, the cumulative effects of several developments in an area should have 'Negligible' effect on surface water drainage and flood risk, provided government planning policy, industry best practice and EA Guidance are complied with.

9.8.6. The proposed mitigation measures set out in the sections above relating to the Proposed Development will complement the nearby developments' mitigation measures, minimising the cumulative effects of several schemes in the area.

9.8.7. In order to assess the cumulative and in-combination effects of the other schemes, their drainage strategies for the above developments are summarised in Table 9.15 below.

Table 9.15 Summary of Other Schemes' Surface Water Drainage Arrangements

Scheme	Summary of Flood Risk and Drainage
Land South of A645, Wade House Lane, Drax (Ref: 2023/0128/EIA)	The site is located in Flood Zone 3 but benefits from flood defences in the fluvial and tidal design flood. There is residual risk of flooding from a breach of a flood defence, or overtopping of the flood defences in an exceedance event. Surface water is proposed to be discharged by infiltration methods. Any surface water exceeding the infiltration capacity of the surrounding strata will naturally drain to the surrounding land drains in line with the existing scenario.
East Yorkshire Solar Farm NSIP (PINS Ref: EN010143)	The majority of the Solar PV Site is located in Flood Zone 1 and development in this Zone is considered acceptable without the need for additional flood risk mitigation. Some areas are located in Flood Zone 2, with limited areas of Flood Zone 3 associated with the River Foulness. The majority of the area located in Flood Zone 3 benefits from existing flood defences. A Surface Water Drainage Strategy will be prepared to ensure the risk of surface water flooding is not increased as a result of the Scheme, and any increased land take for foundations and any access roads. Mitigation will be provided by restricting surface water discharge rates and providing on-site attenuation to ensure there will be no increase in flood risk elsewhere.
Drax Bioenergy with Carbon	The site is located in Flood Zone 3A. The site is shown to be at risk of flooding from overtopping or breach of flood defences along the

Scheme	Summary of Flood Risk and Drainage
Capture and Storage Project NSIP (PINS Ref: EN010120)	River Ouse during the joint probability 1 in 200 RP + CC flood event. The flood risk is informed by a site-specific flood model. Sensitive infrastructure located within the floodplain was raised a minimum of 800mm above the design flood level, which provides mitigation for the sensitivity analysis and the breach event. Volume for volume floodplain compensation provided on-site to mitigate the volume of floodplain storage displaced by the proposals. The surface water drainage strategy utilises the existing Drax Power Station site surface water drainage network. Ultimately runoff is pumped to the River Ouse and regulated by an Environmental Permit. The scheme results in no increase in peak flow to the River Ouse during the large magnitude events and a reduction in volume from all other lesser events.
Land off New Road, Drax (Ref: 2020/1357/FULM)	The site is located in Flood Zone 3A and but benefits from flood defences in the fluvial and tidal design flood. There is residual risk of flooding from a breach of a flood defence. Finished floor levels will be raised above the 1 in 200 RP +CC flood level and compensatory volume for volume flood storage will be provided. Surface water is proposed to be discharged by infiltration methods or via attenuation swales/detention basin and discharged at greenfield Q_{BAR} rate into adjacent drainage ditch.
Land off Hales Lane, Drax, (Ref: 2021/1089/FULM)	The battery storage facility scheme is located in Flood Zone 3a but benefits from flood defences in the fluvial and tidal design flood. There is residual risk of flooding from a breach of a flood defence. Finished floor levels will be raised at least 650mm above surrounding ground levels. Surface water is proposed to be discharged by infiltration methods utilising permeable surfaces (porous sub base with a 30% void ratio and grass)
Land North and South of Camela Lane, Camblesforth (Ref: 2021/0788/EIA)	The scheme is located in Flood Zone 3a and affected by the fluvial 1 in 100 RP +20% CC flood event. Sequential approach to site layout has been undertaken with Substation located outside of this area. Solar panels will be mounted on posts and fitted with a mechanical tracking system. Upon receipt of a flood warning the solar panels will be raised and tilted to a horizontal position allowing flood water to flow freely underneath the panels. The FRA notes that the panel supports have a negligible effect on floodplain volume. Any cabinets proposed within the 1 in 100 + 20 % CC flood extent should be raised above the maximum flood level and / or appropriately waterproofed to ensure flood resilience. Batteries should be stored above the maximum 1 in 100 + 20 % CC flood depth. Regarding surface water management no formal measures are proposed and the flat nature of the site and replacement of intensively managed agricultural land with planted grassland under and in between the solar panels, and along the margins of the scheme provide mitigation for the solar panel areas. Larger equipment such as the cabinets and the sub-station should be constructed surrounded by a gravel filled filter drain to retain surface water as close to the source as possible and stop lateral migration. Surface water will be retained within the gravel subbase

Scheme	Summary of Flood Risk and Drainage
	and allowed to infiltrate into the ground mimicking the existing scenario.
Drax Power Station, Drax (Ref: 2022/0107/NYSCO)	A planning application has not yet been submitted and minimal information on flood risk and drainage is available. The Scoping Report suggests no significant flood risk effects are anticipated and there is an existing surface water drainage strategy for the site controlled under the Drax Power Station Permit. It is noted that Water Quality and Resources is scoped out of the ES but an FRA will be provided. The proposals primarily relate to operational activities for the extraction of material. The lack of new permanent infrastructure will minimise the effect of the scheme on flood risk and drainage receptors.
Land to the East of New Road, Drax (Ref: 2022/0711/EIA)	Majority of the underground high voltage cables between Fraisthorpe, East Riding and the River Ouse are outside the River Ouse catchment and does not need to be assessed further. However, the proposed converter station at Drax requires further assessment of cumulative effects. Sensitive equipment is proposed to be raised above the 0.1% AEP+50% CC event modelled flood level including a freeboard. Flood modelling undertaken demonstrates the converter scheme has a de minimis impact on flood risk to the site and third party land. Nonetheless floodplain compensation will be provided and subject to a planning condition. SuDS in the form of swales and attenuation ponds will be included in the design of the proposed converter station to mitigate surface water runoff rates to greenfield rates.
Land Adjacent to Barlow Common Road, Barlow, Selby (Ref: 2022/0287/SCN)	The scheme is located in Flood Zone 3 to the south of the River Ouse. A planning application has not yet been submitted and no information on flood risk or drainage is provided in the request for a formal EIA screening opinion for a 50MW battery storage system.
Newlands Farm, Turnham Lane, Cliffe, Selby (Ref: 2021/0348/SCN)	The scheme is located in Flood Zone 3 to the north of the River Ouse. A planning application has not yet been submitted and no information on flood risk or drainage is provided in the request for a formal EIA screening opinion for five wind turbines.
Eggborough Power Station, Selby Road, Eggborough (Ref: 2019/1343/EIA)	Surface water runoff discharges to on-site watercourses utilising two existing outfalls at a rate agreed with the IDB (5 l/s/ha) providing betterment on existing brownfield rates. The surface water drainage system will include a treatment train consisting of permeable paving, natural swales and ponds, and interceptors. Surface water drainage (including SuDS) is designed to accommodate the 1 in 100 year storm event including a 40% allowance for climate change. The scheme is restricted to areas of Flood Zone 1 and does not impact on flood levels outside of the boundary.
Former Kellingley Colliery, Turvers	Surface water runoff discharges to on-site watercourses utilising two separate outfalls. Surface water drainage is discharged at the lesser of the existing consented discharge rate agreed with the

Scheme	Summary of Flood Risk and Drainage
Lane, Kellingley, Knottingley (Ref: 2016/1343/OUTM)	Danvm Drainage Commissioners, or the equivalent greenfield run-off rate. On-plot attenuation and balancing / attenuation ponds in the proximity of the discharge locations are proposed. Surface water drainage is designed to accommodate the 1 in 100 year storm event including a 40% allowance for climate change. The scheme should not increase flood risk to the site or to third party land, and as it is located in Flood Zone1.

9.8.8. It is considered the effect of other developments and mitigation measures will not change the sensitivity, importance or value of the receptors. The cumulative assessment will therefore focus on the effects of the other developments on affecting the magnitude or severity of the effect. The effects of the Proposed Development identified in the sections above are considered to occur regardless of the presence of the other schemes.

Construction Phase

9.8.9. It is assumed that during the construction phase for the other schemes, best practice construction site management with adequate contingency planning, and following the principles of pollution prevention which will be formalised and incorporated into a CEMP. The CEMP will be implemented and adhered to during the construction of these schemes. These measures will reduce the risk of a pollution event occurring and reduce the disruption of surface water drainage regime and the resultant flood risk implications in the receiving water bodies.

9.8.10. The cumulative effect magnitude of construction activities on flood risk, drainage and surface water quality taking into account mitigation measures for the cumulative schemes listed above is assessed as ‘Low Adverse’ and ‘Very Low Adverse’ and the residual effect significance is therefore minor adverse to negligible (not significant) and considered to be temporary, and reversible with time.

Operational Phase

9.8.11. The cumulative and in-combination effects of the operation of the Proposed Development and of the other schemes on flood risk, drainage and surface water quality receptors is assessed in Table 9.16 below.

Table 9.16 Cumulative Impacts of the Operation of the Proposed Development and Other Schemes

Scheme	Summary of Cumulative Effects
Land South of A645, Wade House Lane, Drax (Ref: 2023/0128/EIA)	Due to the presence of flood defences the proposals would not affect flood hazards on the cumulative site in the design flood. Equipment will be raised above the flood level and it is therefore anticipated that the cumulative flood risk effects would be negligible (**not significant**)**.** The proposals are free draining through perimeter gaps around all panels, allowing for infiltration as existing within the grassland/vegetation surrounding and beneath the panels. There will be minimal increase in impermeable area meaning the proposals will not increase surface water flood risk elsewhere. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
East Yorkshire Solar Farm NSIP (PINS Ref: EN010143)	The majority of the solar PV cumulative site is located in Flood Zone 1 and development in this Zone is considered acceptable without the need for additional flood risk mitigation. Limited areas are located in Flood Zone 3, but due to the presence of flood defences the proposals would not affect flood hazards on the cumulative site in the design flood. Where development is to take place within areas at risk of flooding (Flood Zones 2 and 3), there may be a requirement for the construction of flood compensation or mitigation measures to ensure no detrimental effect to flooding potential within or from the affected watercourse in the catchment once the Scheme is operational. On the assumption the emerging proposals provide the necessary flood compensation or mitigation measures, it is anticipated that the cumulative flood risk effects would be negligible (**not significant**). A Surface water Drainage Strategy will be prepared to ensure the risk of surface water flooding is not increased as a result of the Scheme, and any increased land take for foundations and any access roads. Mitigation will be provided by restricting surface water discharge rates and providing on-site attenuation to ensure there will be no increase in flood risk elsewhere. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Drax Bioenergy with Carbon Capture and Storage Project NSIP (PINS Ref: EN010120)	In addition to raising equipment above the flood level, on-site volume for volume compensatory flood storage will be provided. As such it is anticipated that the cumulative flood risk effects would be negligible (**not significant**). The surface water management proposals result in a neutral effect on surface water runoff compared with the existing operating conditions of the Drax Power Station site. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**)**.**
Land off New Road, Drax	Due to the presence of flood defence the proposals would not affect flood hazards on the cumulative site in the design flood. In addition to raising equipment above the flood level compensatory

Scheme	Summary of Cumulative Effects
(Ref: 2020/1357/FULM)	flood storage will be provided. As such it is anticipated that the cumulative flood risk effects would be negligible (**not significant**) The surface water management proposals incorporate either infiltration or attenuation SuDS and flow control and would mitigate its effect on runoff. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Land off Hales Lane, Drax, (Ref: 2021/1089/FULM)	Due to the presence of flood defence the proposals would not affect flood hazards on the cumulative site in the design flood. As such it is anticipated that the cumulative flood risk effects would be negligible (**not significant**). The surface water management proposals incorporate a porous sub-based to capture and infiltrate surface water runoff should be sufficient to mitigate its effect on runoff and the effect on surface water drainage is anticipated to be minor. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Land North and South of Camela Lane, Camblesforth (Ref: 2021/0788/EIA)	It is noted the FRA did not take into account joint probability of fluvial and tidal flooding. Nonetheless the sequential approach to the site layout and raising equipment above the flood level minimise the volume of flood waters displaced. As such it is anticipated that the cumulative flood risk effects would be negligible (**not significant**). Due to the nature of the scheme the effect of solar farm developments on surface water runoff should be minimal. In addition the surface water management measures for the control equipment minimise the effect of runoff. As such it is anticipated that the cumulative surface water effects would be negligible (**not significant**).
Drax Power Station, Drax (Ref: 2022/0107/NYSCO)	Due to the nature of the proposals and existing surface water drainage strategy for the cumulative site controlled by the Drax Power Station Permit the scheme will have minimal effect on flood risk and drainage receptors. As such it is anticipated that the cumulative effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Land to the East of New Road, Drax (Ref: 2022/0711/EIA)	The proposed surface water management measures for the converter replicate the existing drainage regime and incorporate SuDS and would not increase flood risk elsewhere. The effect of tidal and fluvial flood risk is assessed as de minimis and a floodplain compensation scheme will be provided. As such it is anticipated that the cumulative effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Land Adjacent to Barlow Common	The scheme is situated in Flood Zone 3 and would need to assess and mitigate its effect on flood risk in accordance with national

Scheme	Summary of Cumulative Effects
Road, Barlow, Selby (Ref: 2022/0287/SCN)	planning policy and guidance to ensure flood risk does not increase elsewhere. Due to the nature of the BESS proposals the development should be able to incorporate sufficient surface water drainage to mitigate its effect on runoff and the effect on surface water drainage is anticipated to be minor. As such it is anticipated that the cumulative effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Newlands Farm, Turnham Lane, Cliffe, Selby (Ref: 2021/0348/SCN)	The scheme is situated in Flood Zone 3 and would need to assess and mitigate its effect on flood risk in accordance with national planning policy and guidance to ensure flood risk does not increase elsewhere. The effect of wind turbines on surface water drainage is anticipated to be minor. As such it is anticipated that the cumulative effects would be negligible (**not significant**) on the assumption the emerging proposals comply with the requirements of national planning policy and guidance.
Eggborough Power Station, Selby Road, Eggborough (Ref: 2019/1343/EIA)	The proposed surface water management measures provide betterment on the existing drainage regime and incorporate SuDS and would not increase flood risk elsewhere. Due to its location in Flood Zone 1 the proposals would not affect flood hazards on the cumulative site. As such cumulative effects are negligible (**not significant**).
Former Kellingley Colliery, Turvers Lane, Kellingley, Knottingley (Ref: 2016/1343/OUTM)	The proposed surface water management measures replicate the existing drainage regime and incorporate SuDS and would not increase flood risk elsewhere. Due to its location in Flood Zone 1 the proposals would not affect flood hazards on the cumulative site. As such cumulative effects are negligible (**not significant**).

9.8.12. The proposed mitigation measures relating to the Proposed Development take account of the cumulative schemes and will complement the other developments' mitigation measures, thereby minimising the cumulative effects of various schemes across the wider watercourse catchment.

9.8.13. With design and management control mitigation measures in place (as set out in the section above) the overall magnitude of the cumulative effect of the above schemes and the Proposed Development on surface water drainage, flood risk and environmental quality of on-Site watercourses will be 'Low Beneficial' to 'Very Low' due to the introduction of surface water management measures.

9.8.14. The significance of the cumulative effect of the Proposed Development on surface water drainage, flood risk and environmental quality of on-Site watercourses would be negligible (**not significant**).

Decommissioning Phase

9.8.15. It is unlikely that the decommissioning of numerous schemes will coincide. In the event that the programmes coincide the effects will be of similar nature, magnitude and significance as assessed during the cumulative effect of construction section above and therefore minor adverse to negligible (**not significant**) and considered to be temporary, and reversible with time.

9.9. Summary

9.9.1. An assessment has been undertaken of the likely significant effects that the Proposed Development would have on the water environment including flood risk, surface water drainage and the water quality of nearby watercourses and groundwater bodies. This assessment is supported by a detailed FRA and Drainage Strategy.

9.9.2. The assessment and FRA draw on desktop information, results of the EA's strategic flood models and best practice guidance. A site-specific flood model is being commissioned to develop the assessment and will inform the ES to be submitted in support of the DCO application. The mitigation measures will be refined and finalised following the results of the site-specific flood modelling and the FRA will be updated to inform the ES.

9.9.3. The Site falls within the catchment of the River Aire and River Ouse and numerous drainage ditches cross the Site which drain ultimately into these watercourses.

9.9.4. The underlying ground conditions appear to have variable permeability. The underlying geological deposits are classified as superficial and principal aquifers and the Site falls within a Groundwater SPZ.

9.9.5. The majority of the Site falls within Flood Zone 3a meaning it has a high risk of flooding. Flood defences along the River Aire are overtopped once the effect of climate change on peak river flows and tidal levels are taken into account. Floodwaters spread out over the floodplain and flood depths and extent vary across the Site.

9.9.6. With respect to other pre-development sources of flood risk, overwhelmed sewers and artificial sources are considered to be 'low' to 'very low' risk and there are areas of elevated risk ('high' – 'medium') associated with low points where surface waters

could collect and where the presence of shallow groundwaters in underlying superficial and bedrock deposits is likely.

9.9.7. The environmental quality of on-Site watercourses is not assessed by the EA through the River Basin Management Plan. The River Aire and River Ouse are assessed as having moderate ecological quality.

9.9.8. The Proposed Development benefits from embedded mitigation in the form of design mitigation and management control measures. The scheme will be designed to be appropriately safe in the combined fluvial and tidal design flood without increasing flood risk elsewhere. These design mitigation measures include the appropriate sequential design of the site to avoid (as best possible) areas of elevated flood risk and incorporation of flood resilience and resistance measures so that the equipment can remain operational during times of elevated flood risk. Pollution prevention measures, surface water management measures, appropriate design of watercourse crossings and, where necessary, floodplain compensation are also proposed. Management control mitigation includes site evacuation procedures and construction site management measures.

9.9.9. Taking into account the embedded mitigation measures the remaining effects of the construction, operational and decommissioning phases on surface water drainage, flood risk and quality of on-Site watercourses would not be significant. Although the risk of an accidental pollution incident can never be completely removed, the risk is minimised to an acceptable level and the risks identified are not significant.

9.9.10. Additional mitigation measures are proposed in the form of an enhanced monitoring schedule and pollution control measures contained in the CEMP to minimise the risk to the quality of groundwater bodies. A Hydrogeological Risk Assessment will be undertaken to inform the design and implementation of the HDD utility crossing of the railway. The design of the equipment and floodplain compensation will be finalised following the results of the site-specific flood modelling.

9.9.11. Taking into account the embedded and additional mitigation measures, the residual significance of the effect of the construction, operation and decommissioning of the Proposed Development on surface water drainage and flood risk is not significant. The risks of an accidental pollution incident affecting water quality of surface water and groundwater bodies are minimised to an acceptable level and the risks identified are not significant.

9.9.12. A cumulative assessment of the Proposed Development and other developments in the vicinity of the Site has been undertaken. Government planning policy ensures that the significance of the residual effects of new development on surface water drainage and flood risk is minimised following the application of appropriate mitigation measures. Thus, the cumulative effects of several developments in an area is negligible on the basis of the mitigation measures proposed by the Proposed Development in combination with mitigation measures proposed by other schemes.

9.9.13. Table 9.17 below contains a summary of the preliminary assessment of the likely significant effects of the Proposed Development.

Table 9.17: Table of Significance – Water Environment

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
Construction Phase (accounting for Embedded Mitigation and Measures to be Adopted by the Project)										
Disruption to drainage regime (surface water runoff rates and volumes) and resultant elevated flood risk	Temporary Short-term	Minor Adverse – Negligible	None required						X	Minor Adverse – Negligible (**not significant**)
Construction of new watercourse crossings and resultant elevated flood risk	Temporary Short-term	Negligible	None required						X	Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting on-Site watercourse / drainage ditches via direct flow	Temporary Short-term	Minor Adverse – Negligible	None required						X	Minor Adverse – Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting water quality of	Temporary Short-term	Negligible	None required	X	X					Negligible (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Barlow Common LNR										
Potentially polluting construction activities and spillage/leakage of polluting substances affecting water quality of the River Ouse and River Aire via direct flow	Temporary Short-term	Minor Adverse to Negligible	None required				X			Minor Adverse to Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting water quality of water quality of the Humber Estuary designated sites via direct flow	Temporary Short-term	Minor Adverse	None required	X						Minor Adverse (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting	Temporary Short-term	Major Adverse – Minor Adverse	Enhanced monitoring measures and Hydrogeological Risk Assessment for HDD activities				X			Moderate Adverse – Minor Adverse (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
groundwater bodies via direct flow										
Operational Phase (accounting for Embedded Mitigation and Measures to be Adopted by the Project)										
Disruption to drainage regime (surface water runoff and volume) and resultant elevated flood risk	Permanent	Moderate Beneficial – Minor Beneficial	None required						X	Moderate Beneficial – Minor Beneficial (**not significant**)
Disruption to flood hazards (combined fluvial and tidal, surface water and emergent groundwater)	Permanent	Negligible	Design of the equipment and floodplain compensation will be finalised following the results of the site-specific flood modelling						X	Negligible (**not significant**)
Operation of new watercourse crossings and resultant elevated flood risk	Permanent	Negligible	None required						X	Negligible (**not significant**)
Potentially polluting operational activities and spillage/leakage of polluting substances affecting on-Site watercourse / drainage ditches	Permanent	Negligible	None required						X	Negligible (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
via direct flow										
Potentially polluting operational activities and spillage/leakage of polluting substances affecting water quality of the River Ouse and River Aire and Humber Estuary and its nature designations via direct flow via direct flow	Permanent	Minor Adverse - Negligible	None required	X	X		X			Minor Adverse – Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting groundwater bodies via direct flow	Temporary Short-term	Minor Adverse	None required				X			Minor Adverse (**not significant**)
Decommissioning Phase (accounting for Embedded Mitigation and Measures to be Adopted by the Project)										
Disruption to drainage regime (surface water runoff rates and volumes) and resultant elevated flood risk	Temporary Short-term	Minor Adverse – Negligible	None required						X	Minor Adverse – Negligible (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
Construction of new watercourse crossings and resultant elevated flood risk	Temporary Short-term	Negligible	None required						X	Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting on-Site watercourse / drainage ditches via direct flow	Temporary Short-term	Minor Adverse – Negligible	None required						X	Minor Adverse – Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting water quality of Eskamhorn Meadows SSSI, River Derwent SAC & SSSI, and Barlow Common LNR	Temporary Short-term	Negligible	None required	X	X					Negligible (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances	Temporary Short-term	Minor Adverse to Negligible	None required				X			Minor Adverse to Negligible (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
affecting water quality of water quality of the River Ouse and River Aire via direct flow										
Potentially polluting construction activities and spillage/leakage of polluting substances affecting water quality of the Humber Estuary designated sites via direct flow	Temporary Short-term	Minor Adverse	None required	X						Minor Adverse (**not significant**)
Potentially polluting construction activities and spillage/leakage of polluting substances affecting groundwater bodies via direct flow	Temporary Short-term	Moderate Adverse – Minor Adverse	Enhanced monitoring measures						X	Moderate Adverse – Minor Adverse (**not significant**)
Cumulative Effects										
Construction Phase										
Potentially polluting construction activities and spillage/leakage of polluting substances affecting surface	Temporary Short-term	Minor Adverse – Negligible	Enhanced monitoring measures						X	Minor Adverse – Negligible (**not significant**)

Potential Effect	Nature of Effect*	Significance **	Secondary Mitigation/ Enhancement Measures	Geographical Importance ***						Residual Effects ****
				I	UK	E	R	UA	L	
water and groundwater bodies										
Operational Phase										
Disruption to drainage regime and resultant (surface water runoff and volume) elevated flood risk	Permanent	Negligible	None required						X	Negligible (**not significant**)
Disruption to flood hazards (combined fluvial and tidal, surface water and emergent groundwater)	Permanent	Negligible	None required						X	Negligible (**not significant**)
Potentially polluting operational activities and spillage/leakage of polluting substances affecting surface water bodies	Permanent	Negligible	None required						X	Negligible (**not significant**)
Nature of Effect * Significance** Geographical Importance *** Residual Effects ****	Permanent or Temporary Short-term, Medium-term, or Long-term Major/ Moderate/ Minor/ Negligible Beneficial/ Adverse I = International; UK = United Kingdom; E = England; R = Regional; UA = Unitary Authority; L = Local Major / Moderate / Minor / Negligible Beneficial / Adverse									