BEACON FEN ENERGY PARK

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Chapter 11 – Water Resources and Flood Risk
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The Planning Act 2008
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(q)

Revision History

Revision	Revision date	Details	Authorized	Name	Position

List of Outstanding Issues and Information

Outstanding issue/info.	Section/Paragraph	Responsibility	Action

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11. WATER RESOURCES AND FLOOD RISK

11.1 Introduction

11.1.1 This Chapter reports the preliminary assessment of the likely significant effects of the Proposed Development on Water Resources and Flood Risk. In particular it considers the potential for likely significant effects of changes to water quality and the hydrological regime

11.1.2 This Chapter (and its associated figures and appendices) is not intended to be read as a standalone assessment and reference should be made to the front end of this PEIR (Chapters 1 – 5) and particularly to the description of the Proposed Development in Chapter 2 which includes details about the Site, the design parameters and construction methodology, as well as the final chapter, 'Summary of Environmental Effects' (Chapter 17).

11.1.3 This chapter is accompanied by the following Appendices and Figures:

- Appendix 11.1 Flood Risk Assessment for PEIR
- Appendix 11.2 Hydrological Walkover Survey
- Appendix 11.3 Abstractions within 2km of the Site
- Appendix 11.4 Summary of Watercourse Crossings
- Appendix 11.5 Planning Policy & Legislation
- Figure 11.1 Surface Water Catchment
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- Figure 11.3 Superficial Geology
- Figure 11.4 Bedrock Geology
- Figure 11.5 Site Walkover Photograph Locations
- Figure 11.6 Watercourse Crossings

11.1.4 As set out within Chapter 1, the information set out within this Chapter is preliminary and intended to inform consultees (both specialist and non-specialist) about the likely environmental effects of the Proposed Development, helping to inform their consultation responses.

11.1.5 For the purposes of this chapter, the 'Site' is the area shown on Figure 1.2 and within the Site are three areas shown on Figure 1.3: the 'Solar Array Area', where the substation and solar panels are proposed to be located, the 'Access Track Route' and the 'Cable Route Corridor', which is the section of the Site where the cables from the Solar Array Area will connect to the Bicker Fen National Grid Substation.

11.2 Legislation and Policy

11.2.1 The legislation and policy considered relevant to the assessment of water resources and flood risk are listed below, with details provided in Appendix 11.5.

Legislative Framework

11.2.2 The applicable legislation includes:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, which transposes The Water Framework Directive (WFD) (2000/60/EC);
- The Groundwater (England and Wales) Regulations (2009), which transposes The Groundwater Daughter Directive (2006/118/EC);
- The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015, which transposes The Priority Substances Directive (2008/105/EC);
- The Environment Act 2021;
- The Environment Protection Act 1990;
- The Land Drainage Act 1991; and
- The Water Resources Act 1991, Water Act 2003, and the Water Act 2014.

Planning Policy

11.2.3 The applicable planning policy includes:

- National Planning Policy Framework (NPPF), September 2023;
- Planning Practice Guidance (PPG): Flood Risk and Coastal Change, August 2023;
- Planning Practice Guidance (PPG): Water supply, wastewater and water quality, July 2019;
- Emerging Overarching National Policy Statement for Energy (EN-1), November 2023;
- Emerging National Policy Statement for Renewable Energy Infrastructure (EN-3), November 2023;
- Emerging National Policy Statement for Electricity Networks Infrastructure (EN5), November 2023;
- Central Lincolnshire Local Plan 2018 to 2040, adopted in April 2023:
  - Policy S21: Flood Risk and Water Resources;
  - Policy S56: Development on Land Affected by Contamination Development; and
- South East Lincolnshire Local Plan 2011-2036, adopted March 2019:
  - Policy 3: Design of New Development; and
  - Policy 4: Approach to Flood Risk.

11.3 Consultation & Scope of Assessment

Consultation Undertaken to Date

11.3.1 Consultation will be ongoing throughout the preparation of the DCO application; to date, it can broadly be divided into the following key stages:

- EIA Scoping;
- Early Non-Statutory Consultation; and

- Direct Topic-Specific Consultation.

11.3.2 Table 11.1 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 11.1 – Summary of Consultation Undertaken to Date

ORGANISATION	DATE	FORM OF CONSULTATION	SUMMARY OF CONSULTEE RESPONSE	HOW THIS HAS BEEN ADDRESSED
EIA Scoping				
Planning Inspectorate (PINS)	26/05/2023	Scoping Response	Flood Risk Assessment to be provided in the Environmental Statement (ES). Demonstrate that the development will remain operation for a lifespan of 60 years and flood sensitive equipment will remain operational during 1 in 100-year flood.	Appendix 11.1 provides a preliminary FRA, which will be updated and included in the ES. All design guidance will be adhered to. It should be noted that, following this correspondence, the proposed operational lifespan of the Proposed Development was reduced from 60 years down to 40 years. Therefore, the flood risk over the shorted 40 year period is considered in the Flood Risk Assessment
			Confirmation that the solar panels will not increase the rate of runoff from the Site.	Appendix 11.1 provides a preliminary FRA, which will be updated and included in the ES.
			Consider known 'artesian conditions' in the vicinity of the Site.	This response has been considered in Appendix 11.1.
			2km study area is accepted and should be shown on a drawing.	See Figure 11.2.
			As Sustainable Drainage System (SuDS) with applicable climate change allowances will be incorporated in the design of the Proposed Development; the design of such mitigation measures should be informed by relevant and up to date climate change allowances for the project's lifespan.	See Appendix 11.1, which provided details of the drainage strategy including the use of SuDS. The drainage design has taken into account relevant climate change allowances.
			As details of proposed watercourse crossings were not provided in the Scoping Report, without this information	Appendix 11.4 and Figure 11.6 provides a summary of possible proposed watercourse crossings based on with

ORGANISATION	DATE	FORM OF CONSULTATION	SUMMARY OF CONSULTEE RESPONSE	HOW THIS HAS BEEN ADDRESSED
			detail regarding what type of crossings are proposed and the location of these or potential impacts on WFD waterbodies, the Inspectorate cannot agree to scope out the requirements for a WFD assessment.	information available at the PEIR stage. Further survey work will be completed as part of the ES and the confirmed location and type of crossings will be provided in the ES. As part of the ES works the EA will be consulted on the scope of the WFD assessment to focus the assessment on areas of concern.
Environment Agency (EA)	17/05/2023	Scoping Response	Essential infrastructure within Flood Zone 3 will require sequential and exception tests.	See Appendix 11.1, for further details of the sequential and exception tests.
			Aspects of the 'decommissioning statement' may need to be incorporated within the FRA.	See Appendix 11.1 and this will be further developed in the ES.
			Artesian conditions are known in the vicinity of the Beacon Fen development and should be included in the ES.	This response has been considered in Appendix 11.1
			WFD assessment / screening WFD assessment required to consider watercourse crossings.	Appendix 11.4 and Figure 11.6 provides a summary of possible proposed watercourse crossings based on with information available at the PEIR stage. Further survey work will be completed as part of the ES and the confirmed location and type of crossings will be provided in the ES. As part of the ES works the EA will be consulted on the scope of the WFD assessment to focus the assessment on areas of concern
			A buffer zone of 8m from any watercourse or asset would be desirable.	This response has been noted and a buffer of 9m from any watercourse or asset has been incorporated into the design of the Proposed Development.

ORGANISATION	DATE	FORM OF CONSULTATION	SUMMARY OF CONSULTEE RESPONSE	HOW THIS HAS BEEN ADDRESSED
			We welcome the production of a watercourse crossing survey.	See Appendix 11.2. As part of the ES, further survey works will be undertaken with a focus on watercourse crossings.
North Kesteven District Council (NKDC)	18/05/2023	Scoping Response	Requesting a full sequential test for a 15km search area around substations at Bicker, Spalding, Cottam and Ryhall	The request for detailed Sequential Test covering a large search radius around four separate substation is not proportionate to the development proposed and may exceed the scope of a sequential test. Since the Scoping Report was issued the Site boundary has been redefined (smaller) and the substation connection point identified. Appendix 11.1 provides a preliminary FRA and commentary on the Sequential Test, which will be further refined for the ES.
Anglian Water	18/05/2023	Scoping Response	The proposed site boundaries extend into land selected by Anglian Water for the Lincolnshire Reservoir, and they state that the southern array within the site would need to be revised to if the reservoir was to be constructed.	The southern array is no longer planned as part of this scheme.
			Anglian Water are keen to discuss the project to confirm how the reservoir and development can co-exist.	The southern array is no longer planned as part of this scheme.
			Water supply, water recycling effects and sewage capacity may need to be assessed. Anglian Water have assumed that these topics are scoped into the assessment.	The ES will include details of intended water supply and connections. The PEIR provides details of three options for water supply including a private reservoir. The ES will provide details of the proposed foul water discharge arrangement

ORGANISATION	DATE	FORM OF CONSULTATION	SUMMARY OF CONSULTEE RESPONSE	HOW THIS HAS BEEN ADDRESSED
Lincolnshire County Council (LCC)	16/05/2023	Scoping Response	Agrees water resources should be scoped into the ES. A Flood Risk Assessment and drainage strategy are required	The ES will include a Water Resources chapter and an FRA & Drainage Strategy will be provided. This PEIR provides a preliminary assessment for consultation and Appendix 11.1 provides a preliminary FRA.
Early Non-Statutory Consultation				
Not applicable				
Direct Topic-Specific Consultation				
LCC	Data request issued by email 21 June 2023. Final email Response received on 01 August 2023.	Email	Not applicable	Information on private water supplies are not held by LCC.
EA	Data request issued by email 17 June 2023. Final email Response received on 25 August 2023.	Email	Not applicable	Information on locally significant discharges and abstractions provided as per the data request.
NKDC	Data request issued by email 30 August 2023. Final email Response received on 22 September 2023.	Email	Not applicable	Information on locally private water supplies provided as per the data request.
Black Sluice Internal Drainage Board (IDB)	Meeting on 15 August 2023 attended by Black Sluice IDB and Low Carbon	Virtual Meeting	Not applicable	Black Sluice IDB sent shapefiles of IDB drains, culvert and IDB area. Black Sluice IDB confirmed development standoff buffers: 9m Black Sluice IDB's access to onsite access tracks to be retained. Low Carbon provided cable route red line

ORGANISATION	DATE	FORM OF CONSULTATION	SUMMARY OF CONSULTEE RESPONSE	HOW THIS HAS BEEN ADDRESSED
				boundary drawing, example culvert design, and example Planning Performance Agreement (PPA) agreement to IDB. Black Sluice IDB want to be consulted on environmental enhancements. Discussion arounds the required consents required.

Scope of the Assessment

11.3.3 The aims of the assessment are to:

- Establish the water environment baseline condition;
- Identify water environment sensitive receptors;
- Identify potential likely impacts as a result of the Proposed Development and arrive at a conclusion about the likely effect of these;
- Discuss embedded design mitigation and good industry practice that will be implemented as part of the Proposed Development;
- Determine the scale of any potential effects, assuming design mitigation and good industry practise, by assessing the degree of sensitivity of the hydrological and hydrogeological receptors and the potential magnitude of change from the baseline condition;
- Establish if the scale of the effect is considered to be 'Significant' (in EIA terms);
- Identify specific mitigation measures (if/where required);
- Identify the residual effects; and
- Identify any cumulative effects.

Effects not considered within the Scope

11.3.4 At this time no specific effect on the water environment has been scoped out of the assessment.

Limitations & Exclusions

11.3.5 The information within this Chapter is preliminary and intended to inform consultees. As such, this PEIR has been prepared at a point in the design process when parameters of the design are certain enough for an assessment to be based upon, but there is still sufficient flexibility to incorporate feedback from consultees.

11.3.6 At this current stage of the planning process, the following matters are still ongoing:

- Watercourse crossing survey for the Cable Route Corridor and the Access Track Route. A design freeze on the cable route is required and confirming of any new proposed access tracks within the Cable

Route Corridor are required to undertake this survey. The watercourse crossing survey is also required for the WFD assessment and consultation with the EA about the scope of the WFD assessment.

11.3.7 The above matters will be completed in advance of submission and incorporated within the ES, which will be consulted upon as part of the determination process.

11.4 Assessment Methodology & Significance Criteria

Extent of the Study Area

11.4.1 The desktop study has been undertaken to establish the baseline water environment and other relevant features up to 2km from the boundary of the Site.

Assessment Methodology

Receptor Sensitivity

11.4.2 The sensitivity of receptors to hydrological and hydrogeological impacts has been determined using Table 11.2, which documents a hierarchy of factors related to the water environment. Examples of the environmental criteria contained within Table 11.2 include international and national designations, work undertaken by the EA and the professional judgement of the assessment team. When a receptor meets multiple criteria or there is an absence of verified published data, the highest applicable sensitivity category is assigned to allow an assessment of the worst-case scenario.

Table 11.2 – Criteria for Determining Receptor Sensitivity

SENSITIVITY	CRITERIA	TYPICAL EXAMPLES
Very High	Receptor has a high quality and rarity on a national or regional scale and limited potential for substitution. Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long-term or not possible.	Groundwater: Source Protection Zone 1. Abstractions: Abstractions for public drinking water supply.
High	Receptor has a high quality and rarity on a local scale and limited potential for substitution. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly.	Groundwater: Principal Aquifer providing a regionally important resource or supporting a site protected under EU and UK habitat legislation (i.e. Groundwater Dependent terrestrial ecosystems GWDTEs). Source Protection Zone 2 or 3. Surface Water: Protected under EU or UK habitat legislation (e.g. SSSI, SAC, Ramsar Site). Designated Salmonid/Cyprinid Waters and/or fishery present. Surface water providing a regionally important resource or supporting a site protected under EU and UK habitat legislation (i.e. water dependent ecological receptors). Abstractions: Private Water Supplies (potable water). Abstractions for non-potable use >20m^3/d (e.g. industry / process water, spray irrigation, river augmentation). Hydro-ecological receptors: Nationally and internationally designated sites where hydrology / hydrogeology is a key factor in designation (e.g. Ramsar, Sites of Special Scientific

SENSITIVITY	CRITERIA	TYPICAL EXAMPLES
		Interest (SSSI), Special Areas of Concern (SAC), Special Protection Areas (SPA) sites).
Medium	Receptor has a medium quality and rarity, local scale and limited potential for substitution or replacement. Receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high recoverability.	Groundwater: Secondary A Aquifer. Secondary B Aquifer providing water supply to private abstractions. Groundwater in peat deposits. Surface Water: Classified as a main river with no further designations. Large lakes and non-potable reservoirs. Abstractions: Abstractions for non-potable use <20m^3/d (e.g. industry/process water, spray irrigation, river augmentation). Hydro-ecological Receptors: Statutory designated sites where hydrology/hydrogeology is a key factor in designation (National Nature Reserves (NNR), Local Nature Reserves (LNR)).
Low	Receptor with a low quality and rarity, local scale, and limited potential for substitution. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability.	Groundwater: Secondary B Aquifer. Secondary Undifferentiated Aquifer. Aquifers supporting potentially water dependent ecosystems (i.e. Local Wildlife Sites (LWS) wetland). Surface Water: Ordinary watercourse and no designated features. Small lakes and ponds (e.g. non-EA/WFD classified / low ecological importance). Man-made feature not in hydraulic continuity (i.e. canal). Abstractions: Abstractions for industrial use (e.g. dust suppression/washing machinery). Hydro-ecological Receptors: Non-statutory designated sites where hydrology/hydrogeology is a key factor in designation. (Sites of Importance for Nature Conservation (SINC), LWS
Very Low	Attribute has a very low environmental importance and/or rarity on local scale. Receptor is of negligible value, not vulnerable to impacts that may arise from the project and/or has high recoverability.	Surface Water: Man-made feature with no ecological importance (i.e. land drains)

Note - Professional judgement based on the baseline condition of the receptor should be used to determine a receptor's sensitivity.

11.4.3 Table 11.3 describes the guideline criteria used to assess the magnitude of change (i.e. impact) from the baseline condition that may result from the Proposed Development.

Table 11.3 – Criteria for Determining the Magnitude of Change

MAGNITUDE OF CHANGE	TYPICAL EXAMPLE
High	Total loss of, or alteration to, the baseline resource such that post- development characteristics or quality would be fundamentally and irreversibly changed.
Medium	Loss of or alteration to the baseline resource such that post-development characteristics or quality would be partially changed.
Low	Small changes to the baseline resource, which are detectable, but the underlying characteristics or quality of the baseline situation would be similar to pre-development conditions.
Negligible	A very slight change to the baseline conditions, which is barely distinguishable, and approximates to the 'no change' situation.

11.4.4 The scale or level of effects is determined in relation to the sensitivity of the receptor and the potential magnitude of change from baseline conditions, using the matrix shown in Table 11.4.

Table 11.4 – Matrix for Determining Scale of Potential Effects

		RECEPTOR SENSITIVITY				
		Very High	High	Medium	Low	Very Low
MAGNITUDE OF CHANGE FROM BASELINE CONDITION	High	Major	Major	Moderate	Moderate	Minor
	Medium	Major	Moderate	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Significance Criteria

11.4.5 Guideline criteria for categories of significant effects are included in Table 11.5. Effects that have been determined to be Major or Moderate are considered to be 'Significant' in EIA terms. Effects that are identified as Minor or Negligible are considered to be 'Not Significant'.

Table 11.5 – Guideline Criteria for Categories of Significant Effect

SCALE OF EFFECT	SIGNIFICANT EFFECT?	DEFINITION	GUIDELINE CRITERIA
Major	Yes	A fundamental change to the environment	Changes in water quality or quantity affecting widespread catchment or groundwater resources of strategic significance or changes resulting in substantial loss of conservation value to aquatic habitats and designations.
Moderate	Yes	A large, but non-fundamental change to the environment	Changes in water quality or quantity affecting part of a catchment or groundwaters of moderate vulnerability, or changes resulting in loss of conservation value to aquatic habitats or designated areas.
Minor	No	A small but detectable change to the environment	Localised changes in drainage patterns or groundwater flow, or changes resulting in minor and reversible impacts on surface and groundwater quality or aquatic habitats.
Negligible	No	No detectable change to the environment	No impact on drainage patterns, surface and groundwater quality or aquatic habitat.

11.5 Baseline Conditions

Current Baseline Conditions

Rainfall

11.5.1 Average rainfall data has been obtained from the nearest Meteorological Office climate station to the Site (located at RAF Coningsby[1], approximately 10km north-east of the Site at National Grid Reference (NGR) TF 22767 56686) for the stand period 1991-2020, as shown in Table 11.6. The UK Climate Projection (UKCP18) are available on the Met Office website.[2]

[1] Met Office (2023) Coningsby [online]. Accessed September 2023. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcryh17qz

[2] Met Office (2023) Land Projections Maps: Probabilistic Projections [online]. Accessed September 2023. Available at: https://www.metoffice.gov.uk/research/collaboration/ukcp/land-projection-maps.

11.5.2 Table 11.6 presents the percentage change in precipitation for the 90th percentiles for the four emission scenarios for winter and summer periods for the available time slices, referred to in the note in Table 11.6 as Representative Concentration Pathways (RCP). The UKCP18 for the majority of the emission scenarios and time slices predicts wetter winter and summer conditions.

Table 11.6 – Average Rainfall and Climate Change Projections

PROJECTIVE CHANGE IN PRECIPITATION (%) FOR EAST MIDLANDS BASIN WINTER AND SUMMER PERIODS						
Season:	**Winter**			**Summer**		
Time Slice:	2020-2039	2040-2059	2060-2079	2020-2039	2040-2059	2060-2079
RCP2.6*	+10 to +20%	+10 to +20%	+10 to +20%	+10 to +20%	0 to +10%	0 to +10%
RCP4.5*	+10 to +20%	+10 to +20%	+20 to +30%	+10 to +20%	+10 to +20%	0 to +10%
RCP6.0*	+10 to +20%	+10 to +20%	+20 to +30%	+10 to +20%	+10 to +20%	0 to +10%
RCP8.5*	+10 to +20%	+20 to +30%	+30 to +40%	+10 to +20%	0 to +10%	0 to +10%

Month	Average Rainfall (mm)	Average Rainfall (mm) With Projective Change in Precipitation			
		+10%	+20%	+30%	+40%
January	47.61	52.37	57.13	61.89	66.65
February	37.78	41.56	45.34	49.11	52.89
March	34.79	38.27	41.75	45.23	48.71
April	40.23	44.25	48.28	52.30	56.32
May	45.8	50.38	54.96	59.54	64.12
June	57.05	62.76	68.46	74.17	79.87
July	54.77	60.25	65.72	71.20	76.68
August	58.72	64.59	70.46	76.34	82.21
September	51.37	56.51	61.64	66.78	71.92
October	59.47	65.42	71.36	77.31	83.26
November	56.04	61.64	67.25	72.85	78.46
December	50.44	55.48	60.53	65.57	70.62
Annual Total	594.07	653.48	712.88	772.29	831.70

Note
Average rainfall does not include provision for evaporation and evapotranspiration.
Emission Scenarios: RCPs (Representative Concentration Pathways) are scenarios of future concentrations of greenhouse gases and other forcings.
RCP2.6 = 1.6°C (0.9-2.3°C) change in global temperature by 2081-2100.
RCP4.5 = 2.4°C (1.7-3.2°C) change in global temperature by 2081-2100.
RCP6.0 = 2.8°C (2.0-3.7°C) change in global temperature by 2081-2100.
RCP8.5 = 4.3°C (3.2-5.4°C) change in global temperature by 2081-2100.
* 90th Percentile selected -the three percentiles (10th 50th and 90th reflect the likelihood of those temperatures occurring under that emissions scenario.

Surface Water

11.5.3 As shown on Figure 11.1, The Site is located within the EA's Black Sluice IDB, draining to the South Forty Foot Drain surface water catchment.[3] This waterbody is monitored by the EA under the WFD and it was assigned an overall 'poor ecological status' in 2019. The majority of the Site is also located within the Black Sluice IDB area. Only the west of the Solar Array Area is not located within the IDB area.

[3] Environment Agency (2023) Catchment Data Explorer: Black Sluice IDB draining to the South Forty Foot Drain Water Body [online]. Accessed September 2023. Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB205030051515.

11.5.4 A hydrological walkover survey (see Appendix 11.2 and Figure 11.5) was undertaken in July 2023 to record the hydrological characteristics of the watercourses within the Solar Array Area.

11.5.5 There are a number of named watercourses located onsite, including:

- Hodge Dike (Main River);
- Heckington Eau (Main River);
- South Forty Foot Drain (Main River / Local Wildlife Site (LWS));
- Catchwater Drain (Ordinary Watercourse);
- Twelve Drain (Ordinary Watercourse);
- Great Hele Eau (Ordinary Watercourse / LWS); and
- Old Sixteen Foot Drain (Ordinary Watercourse).

11.5.6 The Site also comprises a vast network of unnamed drains (ordinary watercourses), which are either IDB drains, private drains where the IDB takes a supervisory role or those outside of the IDB, where the Lead Local Flood Authority (LLFA) is the supervisor.

11.5.7 Within the areas surrounding the Site, there are a number of named and unnamed watercourses, including Midfodder Dike (adjacent to the northeast of the Solar Array Area), the River Slea (also adjacent the northeastern corner of the Solar Array Area) and Hammond Beck (adjacent to the southwest of the southern section of the Cable Route Corridor). Head Dyke is located approximately 650m to the east of the northern section of the Cable Route Corridor and is formed from the confluence between the Heckington Eau and the Hodge Dike.

11.5.8 In general, the local watercourses drain to the east to south-east, towards The Wash (North Sea).

11.5.9 The IDB's Ewerby Fen Pumping Station is located adjacent to the eastern boundary of the Solar Array Area, which controls the flows within the Midfodder Dike and by extension the downstream section of the Hodge Dike.

11.5.10 The Solar Array Area is bordered by various waterbodies, both onsite and nearby. Relative to the Solar Array Area, the following waterbodies can be found:

- A reservoir situated in the southern central section of the Solar Array Area;
- Small ponds located onsite, south of the Hodge Dike;
- Small ponds at Hall Farm, located approximately 0.02km south;
- Unnamed pond located north of the River Slea, approximately 0.85km north-east;
- Unnamed pond located south of the River Slea, approximately 0.65km north; and
- Haverholme Park Lake, located approximately 1.80km northwest.

11.5.11 For the Cable Route Corridor, there is one pond located onsite at the Bicker Fen substation. There are also several offsite waterbodies, including:

- Six unnamed ponds associated with Ewerby Sewage Treatment Works, located approximately 0.55km west;

- A reservoir located at Walks Farm, located approximately 0.03km west;
- Unnamed pond at Holme House, located approximately 0.18km east;
- An unnamed pond, located approximately 0.17m west at Hall Farm;
- The Great Hale Fen Irrigation Reservoir, located approximately 400m south; and.
- An unnamed pond, located approximately 0.70km south-west.

11.5.12 For the Access Track Route there are a few unnamed watercourses and small ponds located within this area.

11.5.13 The Site is located within the Black Sluice IDB draining to the South Forty Foot Drain surface water Nitrate Vulnerable Zone (NVZ).[4] The Site is not located with a surface water Drinking Water Protective Area or a surface water Drinking Water Safeguard Zone.[4]

Geology and Hydrogeology

11.5.14 Soils across the Site belong to the following Soil Survey of England & Wales (1984) soils associations (see Chapter 14 Soils and Agriculture for further details):

- Wallasea 2 (813g)[5] - stoneless clayey soils, calcareous in places found in the Solar Array Area and Cable Route Corridor;
- Beccles 3 (711t)[6] - slowly permeable seasonally waterlogged fine loamy over clayey soils, associated with similar clayey soils. found in the Solar Array Area and Cable Route Corridor;
- Ruskington (512c)[7] - deep permeable calcareous coarse and fine loamy and sandy soils affected by groundwater found in the Solar Array Area and Cable Route Corridor; and
- Agney (812c)[8] - deep stoneless calcareous fine and coarse silty soils. found in the Cable Route Corridor.

11.5.15 According to the British Geological Survey (BGS) published mapping[9] and shown on Figure 11.3, the superficial deposits that underlie northeastern area of the Solar Array Area and the southern sections of the Cable Route Corridor are Tidal Flat Deposits - clay and silt. The southwestern section of the Solar Array Area, the majority of the Access Track Route and the middle section of the Cable Route Corridor are underlain by Till - diamicton. In and around the Till deposits are Glaciofluvial Ice Contact Deposits – sand and gravel. At the west of the Access Track Route and at the northern area of the Cable Route Corridor is a narrow area of Sleaford Sand and Gravel – sand and gravel.

11.5.16 According to the EA's Aquifer Designation Map[4] the superficial deposits have the following aquifer designation:

[4] MAGIC Partnership (2023) MAGIC [online]. Accessed Stember 2023. Available at: https://magic.defra.gov.uk/MagicMap.aspx.
[5] Landls (2023) Soil Association: 0813g WALLASEA 2 [online]. Accessed September 2023. Available at:https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=81307&sorttype_association=map_unit_name.
[6] Landls (2023) Soil Association: 0711t BECCLES 3 [online]. Accessed September 2023. Available at: https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=71120&sorttype_association=map_unit_name.
[7] Landls (2023) Soil Association: 0512c RUSKINGTON [online]. Accessed September 2023. Available at: https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=51203&sorttype_association=map_unit_name.
[8] Landls (2023) Soil Association: 0812c AGNEY [online]. Accessed September 2023. Available at: https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=81203&sorttype_association=map_unit_name.
[9] British Geological Survey (2023) GeoIndex Onshore [online]. Accessed September 2023. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html.

- Tidal Flat Deposits – Unproductive Strata;[10]
- Till – Secondary Undifferentiated;[11]
- Glaciofluvial Ice Contact Deposits – Secondary A;[12] and
- Sleaford Sand and Gravel - Secondary A.

11.5.17 According to BGS mapping[23], the only recorded made ground onsite relates to the reservoir within the Solar Array Area. According to the BGS published mapping[13] and shown on Figure 11.4, the bedrock geology underlaying the majority of the Site belongs to the Oxford Clay Formation – mudstone. The east of the Solar Array Area, the northern part of the Cable Route Corridor and the northeastern area of the Cable Route Corridor are underlain by the West Walton Formation – mudstone and siltstone. Both the Oxford Clay Formation and the West Walton Formation are classed by the EA are unproductive strata. According the BGS 1:625,000 scale Hydrogeology Map[9], both bedrock formations are classed as "*rocks with essentially no groundwater*." According to the EA Catchment Data Explorer,[14] the Site is not located within groundwater catchment.

11.5.18 The Site is not located within a groundwater NVZ, a groundwater drinking water safeguard zone or a groundwater Source Protection Zone (SPZ).[4]

Flood Risk

11.5.19 Appendix 11.1 presents the findings of the preliminary FRA, which are summarised in the following paragraphs.

11.5.20 The EA Flood Map for Planning shows that northern and eastern areas of the Site are located within fluvial Flood Zone 3 (high probability – land defined as having a greater than 1% chance of flooding each year). Southern and western areas of the Site (including the entirety of the Access Track Route) are largely located within Flood Zone 1. EA modelling shows that flood levels may exceed 2.8m in the east of the Site during a 1 in 1,000 year storm event.

11.5.21 The EA models provide 'in channel' flood levels only and do not estimate the depth of flooding on adjacent land. Owing to the presence of earth flood defence embankments along Main Rivers, it is likely that water levels in the channel could exceed ground levels within the Site without any flooding occurring. It is proposed to undertake detailed flood level modelling as part of future works for the ES.

11.5.22 Southern sections of the Cable Route Corridor and the Bicker Fen National Grid Substation are also located within Flood Zone 3. It would not, therefore,

[10] Defined as "*Unproductive strata are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them*." Taken from Environment Agency (2017) Guidance: Protect groundwater and prevent groundwater pollution [online]. Accessed September 2023. Available at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution#groundwater-definition.

[11] Defined as "*aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value*." Taken from Environment Agency (2017) Guidance: Protect groundwater and prevent groundwater pollution [online]. Accessed September 2023. Available at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution#groundwater-definition.

[12] Defined as "*comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers*." Taken from Environment Agency (2017) Guidance: Protect groundwater and prevent groundwater pollution [online]. Accessed September 2023. Available at: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution#groundwater-definition.

[13] British Geological Survey (2023) GeoIndex Onshore [online]. Accessed September 2023. Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html.

[14] Environment Agency (2023) Catchment Data Explorer: Anglian GW Management Catchment [online]. Accessed September 2023. Available at: https://environment.data.gov.uk/catchment-planning/ManagementCatchment/1000.

be feasible to locate the full development (including Cable Route Corridor) within Flood Zones 1 and 2. As the flood risk can be safely managed and that the proposed renewable energy development will provide significant benefit to the UK, it is considered that the Sequential and Exception Tests would be passed.

11.5.23 The majority of Site areas are shown to be at a very low risk of surface water flooding (a less than 0.1% annual probability of flooding) and any flooding would generally be less than 300mm. Three significant overland flow routes extend through the Solar Array Area that will need to be managed to ensure that these are retained without impacting the Proposed Development. The risk of groundwater flooding is considered to be low to medium and the risk of flooding from sewers and artificial sources is considered to be very low.

11.5.24 Potential loss of floodplain storage as a result of the Proposed Development will be minimal. Solar panels will be mounted on piles, with any flood flows able to pass through unobstructed. There will be few other structures within areas of Flood Zone 3 and it is anticipated that there will be no substantial changes to existing ground levels.

11.5.25 The impermeable area within the Site will increase, potentially causing a small increase in the rate and volume of surface water runoff generated at the local scale. Surface water runoff will be managed within the Site area, using SuDS features, where feasible. Runoff will be dispersed via infiltration or else discharged to watercourses at a restricted rate. Sufficient attenuation will be provided for all storm events up to and including the 1 in 100 year event (plus an allowance for climate change).

Private Water Supply, Discharges, and Abstractions

11.5.26 A request was made to NKDC (see Table 11.1) to provide information on private water supplies within 5km of the Site. There are no private water supplies within 2km of the Site. Lincolnshire County Council has also been contacted (see Table 11.1) and it has been confirmed that the Council does not hold records of private water supplies.

11.5.27 The EA have provided data on abstractions within 2km of the Site, which are presented in Appendix 11.3 and shown on Figure 11.2. There are 25 licensed abstractions (although there are more abstraction points) within the search area the predominated water use being spray and trickle irrigation. There are two licences for general agriculture (water transfer). Abstraction A25 is for groundwater but is located approximately 1km up hydraulic gradient of the Site and is likely is likely to be an abstraction from deep Lincolnshire Limestone Formation (limestone) aquifer, which is likely to confined under the Oxford Clay Formation (mudstone) and the West Walton Formation (mudstone and siltstone).

11.5.28 A 2km search from the Site of the Public Register for Environmental Permits (discharges to water and groundwater)[15] identified 22 discharge consents, all of the discharges relate to domestic or water company sewage discharge (see Table 11.7). There are no discharges located onsite.

[15] Environment Agency (2023), Public Register: Environmental Permitting Regulations – Discharges to water and groundwater [online]. Accessed September 2023. Available at: https://environment.data.gov.uk/public-register/view/search-water-discharge-consents

Table 11.7 – Discharges within 2km of the Site

ID	CONSENT NUMBER	OPERATOR	SITE NAME	DISCHARGE TYPE	NGR	DISTANCE FROM THE SITE
D1	EPRVP3521GJ	Private Individual	Ewerby Thorpe	Sewage - not water company	TF 13316 47728	0.19km west
D2	PRNNF18587	Private Individual	Court Row Farm Barn	Sewage - not water company	TF 15550 45110	0.23km west
D3	ANNNF1099	Anglian Water Services Ltd	Heckington STW	Sewage - water company	TF 15000 45400	0.64km west
D4	ANNNF13364	Anglian Water Services Ltd	Swineshead STW	Wastewater Treatment Works (WwTW) / Sewage Treatment Works (water company)	TF 22738 41946	0.71km south-east
D5	ANNNF2372	Anglian Water Services Ltd	Cso&eo at Heckington WRC	Emergency sewage overflow Sewage - water company	TF 14950 45420	0.72km west
D6	PR3LFU1179	Private Individual	Staithe Cottage	Domestic property (multiple) (including farm houses)	TF 21868 39062	1.50km east
D7	PRNNF09979	Private Individual	Swineshead Bridge Stw	WwTW (not water co) (not STP at a private premises)	TF 22050 43000	0.73km north
D8	PR3LFU16	Private Individual	No 1 Cottage at Bridge Farm	Domestic property (single) (including farm house)	TF 21620 43007	0.82km north
D9	EPREP3925GY	Private Individual	35 Houses at Old Station Yard	Domestic property (multiple) (including farm houses)	TF 2211042990	0.69km north
D10	ANNNF13039	Anglian Water Services Ltd	South Kyme WRC	Sewage - water company	TF 16240 49710	0.81km north-east
D11	PR3LF686	Private Individual	Bargate Cottage	Domestic property (multiple) (including farm houses)	TF 22460 41540	0.80km south-east
D12	AW3NF483	Anglian Water Services Limited	Great Hale Pumping Station	Sewage - water company	TF 15020 42600	1.30km west
D13	PR3LFU1714	Private Individual	The Manor Farm	Sewage - not water company	TF 16915 49601	1.40km north-east
D14	PR3NF890	Private Individual	Council Houses (No.8)	Domestic property (multiple) (including farm houses)	TF 20320 44200	1.51km north-east
D15	AW3NFF410	Anglian Water Services Limited	Housing - Great Hale Rd	Emergency sewage overflow	TF 14650 43300	1.58km west
D16	ANNNF2300	Anglian Water Services Limited	Ferry Lane North Kyme	Emergency sewage overflow Sewage - water company	TF 15550 51300	1.43km northeast
D17	AW3NF482	Anglian Water Services Limited	Great Hale Pumping Station	Emergency sewage overflow Sewage - water company	TF 14740 42710	1.58km west
D18	PR3LFU5558	Private Individual	Carre Dyke Farm	Sewage - not water company	TF 15900 41200	1.70km southwest
D19	AW3NF785	Anglian Water Services Limited	Low road ps South Kyme	Emergency sewage overflow Sewage - water company	TF 17533 49708	2.00km north-east
D20	PR3LFU5542	Private Individual	Asgarby Hall	Domestic property (single) (including farm house)	TF 11661 45306	0.25km south

ID	CONSENT NUMBER	OPERATOR	SITE NAME	DISCHARGE TYPE	NGR	DISTANCE FROM THE SITE
D21	PR3LFU293	Private Individual	Meads Farm	Domestic property (single) (including farm house)	TF 11851 44670	0.70km south-east
D22	PR3LFU1229	Private Individual	White House	Domestic property (single) (including farm house)	TF 22408 38294	1.86km east

Hydro-ecology and Designated Sites

11.5.29 According to the MAGIC website,[4] there are no statutory designated sites (e.g. Ramsar, SPA, SAC or SSSI sites) present within 2km of the Site.

11.5.30 Within 2km there are a number of LWS related to waterbodies, see Chapter 7 and Figure 7.3 for further information.

Future Baseline Conditions

11.5.31 The UK Climate Projections have predicted a +10 to +40% change in rainfall values. An increase in rainfall could affect runoff across the Site and may alter river processes (e.g. erosion, deposition and the frequency and intensity of river flooding and ponding in depressions). This may correspond with an increase in groundwater levels and associated groundwater flooding.

11.5.32 In a scenario where the Proposed Development is not constructed, the water flows through the Site are likely to continue as per the baseline in the short term, although the frequency and intensity of flooding may increase due to climate change over time. This Chapter is supported by Appendix 11.1 which provides a preliminary FRA that takes account of the climate change allowances.

11.6 Conceptual Site Hydrogeological Model

11.6.1 The Conceptual Site Hydrogeological Model (CSHM) illustrates water movement pathways from the ground surface to the bedrock. The baseline CSHM describes the pathways for the water environment baseline. Information on the water related components of the Proposed Development is then provided and the construction phase CSHM, operational phase CSHM and decommissioning phase CSHM are described.

11.6.2 The CSHM forms the basis of the assessment of effects in Section 11.7 and provides an explanation of how the Proposed Development can affect the baseline water environment. The evolution of the conceptual relationship between potential sources, pathways and receptors in the context of the water environment through the construction, operational and decommissioning phases of the Proposed Development is described in the following section.

Baseline Conceptual Site Hydrogeological Model

11.6.3 The Site is located within South Forty Foot Drain surface water catchment and also within the Black Sluice IDB area. Precipitation falls on the arable land and runs off into the onsite watercourses, a portion of water is intercepted by vegetation or the onsite above ground reservoir (used to supply water for irrigation purposes). Precipitation also falls directing into onsite watercourses,

such as the Hodge Dike, Heckington Eau, South Forty Foot Drain, Catchwater Drain, Twelve Drain, Great Hele Eau and Old Sixteen Foot Drain (and their tributaries).

11.6.4 During periods of intensified rainfall, the proportion of direct runoff to surface water features is increased. These storm events create a more direct, faster pathway from a potential source to receptor. If surface water were present due to intensified rainfall, runoff would travel down the topographic gradient across both the onsite and offsite surface waterbodies and watercourses.

11.6.5 Where loamy and sandy soils or fine and coarse silty soils (Ruskington (512c) and Agney (812c) soils associations) are present, water will relatively easily infiltrate through the unsaturated zone soils into the underlaying superficial geology. Where stoneless clayey soils and fine loamy over clayey soils (Wallasea 2 (813g) and (Beccles 3 (711t) soil associations) are present, clayey soils are likely to inhibit infiltration and lead to seasonal waterlogged soils.

11.6.6 Superficial deposits onsite comprise of Secondary A aquifers (Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel), Secondary Undifferentiated aquifer (Till) and Unproductive strata (Tidal Flat Deposits). The Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel may be providing baseflow to watercourses in certain hydrological settings onsite and water is likely to percolate through these deposits relatively unhindered. Water in the Till is likely to be perched where water bearing deposits (e.g. sand and gravel) occur between more impermeable deposits such as clay. The Tidal Flat Deposits (clay and silt) and the clay component of Till are likely to inhibit percolation into the bedrock aquifer.

11.6.7 The bedrock underlaying the Site is comprised of Oxford Clay Formation (mudstone) and West Walton Formation (mudstone and siltstone), which are classed as unproductive strata and rocks with essentially no groundwater and, therefore, not considered a water resource. The regional groundwater would typically be expected to be west to east (down topographic gradient towards the North Sea). However, the presence of public water abstractions (SPZs) offsite to the west of the Site means that any groundwater presence in the bedrock underlaying the Site flows to east to west towards the public water abstractions. The EA have produced a hydrogeological contour, which confirm regional groundwater flow is east to west. The Site is not located within an EA groundwater catchment or a SPZ.

11.6.8 The following surface water abstractions (see Appendix 11.3 and Figure 11.2) are located upstream of the Site: A1, A3, A4a, A4c, A4d, A6a, A6b, A9a, A9b, A9c, A11a, A12, A15a, A15b, A15c, A15d, A15h, A15m, A15n, A15o, A16, A17, A20, A23, A4b, A11b, A13, A15g, A15i, A15j, A18, A21a, and A22. The following surface water abstractions (see Appendix 11.3) are located downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k. Abstraction A25 is for groundwater but is located approximately 1km up hydraulic gradient of the Site and is likely is likely to be an abstraction from deep Lincolnshire Limestone Formation (limestone) aquifer, which is likely to confined under the Oxford Clay Formation (mudstone) and the West Walton Formation (mudstone and siltstone).

11.6.9 There are no hydro-ecological designated sites or private water supplies present within 2km of the Site.

Water Replated Components of the Proposed Development

11.6.10 This section of the CSHM provides information on the water related components of the Proposed Development, see Chapter 2 'Proposed Development' for further details. In terms of design components relating to the water environment these mainly comprise of the drainage strategy (see Appendix 11.1) and proposed watercourse crossings (see Appendix 11.4).

11.6.11 In summary, the drainage strategy comprises the discharge of surface water by infiltration, where feasible. This will be achieved through the use of SuDS design to accommodate a 1 in 100 year plus climate change storm event such as infiltration devices, rainwater harvesting filter stripes, swales, infiltration and detention basins, wet ponds, constructed wetlands and underground attenuation.

11.6.12 The drainage strategy will be confirmed as part of the FRA accompanying the ES. This will confirm the impermeable areas within the Proposed Development, the existing and post-development runoff rates and estimate the required attenuation for storm events up to and including the 1 in 100 year (+ climate change) storm event. A Surface Water Management Plan will be produced, incorporating SuDS features where feasible.

11.6.13 In regard to possible watercourse crossings, Appendix 11.4 and Figure 11.6 presents the identified possible access track and cable watercourse crossings locations and provides information of the type of watercourse (e.g. Main River, Ordinary Watercourse, IDB Drain) and gives an indication on the possible crossing type. As part of the ES, the route for the cabling will be defined and further hydrological survey of watercourses will be undertaken.

11.6.14 In terms of water supply for the Proposed Development, at the time of writing, the following options are being considered:

- Tanks filled by water tanker (to be filled at the commissioning stage / start of construction, which would need to be periodically topped-up) and onsite reservoir as a secondary supply.
- Tanks filled by a mains water supply and topped-up with mains water.
- Tanks filled by onsite reservoir, purified, and reservoir also supplies secondary supply

Construction Phase Conceptual Site Hydrogeological Model

11.6.15 The construction phase (as well as the decommissioning phase) is considered to be the phase of the Proposed Development when the receptors are at higher risk (in comparison to the operational phase) due to the various activities required to construct (and decommission) the Proposed Development. This section details the source, pathways and receptors associated with the main construction activities.

11.6.16 Regarding water quality, there are two key aspects of risk to receptors. These include the issue of increased sedimentation from ground disturbance, which can enter surface waterbodies and cause a degradation of water quality, and contamination from introduced contamination sources (e.g. oil / fuel).

11.6.17 The release and mobilisation of sediment through earthworks during the construction and decommissioning phases may increase sediment contents of surface water flows during storm events within and downstream of the Site. The creation of access roads and the digging of cable trenches are examples of activities that will all cause ground disturbance, exposing soil and increasing the risk of sedimentation to surface flows. This is because these activities cause a temporary reduction of vegetation cover (through soil strips and track laying), reducing interception whilst also exposing soil as a source of sediment.

11.6.18 Rainwater can be channelised via infrastructure, such as access tracks creating shorter pathways for mobilised sediment and contaminants to be carried as runoff down gradient to low lying areas.

11.6.19 Where present, field underdrainage may act as a preferential pathway and, if disrupted or disconnected by construction activities, may lead to localised groundwater flooding.

11.6.20 Potential contamination sources are typically associated with vehicles / machinery, such as fuel and oil that could infiltrate through soils and superficial deposits to contaminate aquifers.

11.6.21 Groundwater is conceptually at low risk from sediment, as the water is filtered as it percolates down, likely removing the fine sediment.

11.6.22 A more detailed list of possible watercourse crossings is available in Appendix 11.4 (to be confirmed in the ES).

11.6.23 Horizontal Directional Drill (HDD) activities (i.e. drilling under a watercourse, channel or roads) are a potential source of contamination. These activities may also result in the localised alteration and possible deterioration of water quality of the superficial deposits groundwater below the watercourse bed through the introduction of bentonite / polymer as a drilling mud additive. Depending on the drilling method, the bore hole and pits themselves could act as a pathway to deeper groundwater from surface, enabling any contamination at the surface to penetrate to greater depth especially during storm events.

Operational Phase Conceptual Site Hydrogeological Model

11.6.24 During the operational phase, there will be a requirement for maintenance visits. Associated with this is the risk of accidental releases of oil / fuel from vehicles. The presence of impermeable surfaces and foundations for the substation could affect local groundwater recharge and lead to an increase in local flooding. The presence of watercourse crossings could overtime lead to disruption / blockage of watercourse flow from watercourse crossing leading to flooding. Potential operational phase effects relate to:

- Pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works;
- Presence of impermeable structures causing a reduction in recharge to the underlying aquifer; thereby locally reducing groundwater levels. This will also increase runoff to surface water drains/ponds and may lead to flooding;

- Presence of solar panels causing rainfall onto the angled panels which may cause erosion beneath the lower edge of each panel, resulting in erosion and sediment laden runoff; and
- Long term use of watercourse crossings leading to disruption / blockage of watercourse flow from watercourse crossing leading to flooding.

Decommissioning Phase

11.6.25 The decommissioning phase will have similar risks associated with it as the construction phase due to vehicle movements and removal of infrastructure, introducing potential sources of contamination (e.g. oil and grease) and disturbance of the ground exposing sediment. Potential decommissioning phase effects related to:

- Removal of principle features e.g. all PV modules, mounting structure, cabling, inverters, and transformers, which would lead to a decrease in impermeable area and obstructions to baseline flow pathways leading to pre-development runoff conditions and pre-development rainfall-runoff response time;
- Re-vegetation may lead to pre-development interception and evapotranspiration rates and pre-development runoff conditions;
- Reinstatement of soil profile may lead to pre-development infiltration rates and to pre-development runoff conditions; and
- The use of machinery during the decommissioning activities could cause pollution from spills or leakage of fuel and oil.

Sensitive Receptors

11.6.26 Table 11.8 summarises the potential receptors and the reasons for inclusion or exclusion from the assessment. The water receptors identified within Table 11.8 that are not at risk from the Proposed Development have been scoped out of the assessment and are not considered further.

Table 11.8 – Summary of Receptors and Sensitivity

RECEPTOR	DISTANCE FROM SITE	SUMMARY OF RECEPTOR CHARACTERISTICS	RECEPTORS SENSITIVITY	RECEPTOR AT RISK FROM PROPOSED DEVELOPMENT?
Surface water features (watercourse and waterbodies) within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment.	The Site is within this catchment	Comprised of Main Rivers, Ordinary Watercourses and IDB drains. Within Black Sluice IDB.	Medium	Yes - The Site is within the surface water catchment.
Tidal Flat Deposits, Oxford Clay Formation and West Walton Formation.	Underlies the Site	Unproductive Strata.	None	No - Not considered a water receptors.
Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers.	Underlies the Site	Secondary A Aquifer.	Medium	Yes - Underlies the Site.
Water in Till.	Underlies the Site	Secondary Undifferentiated.	Low	Yes - Underlies the Site.

RECEPTOR	DISTANCE FROM SITE	SUMMARY OF RECEPTOR CHARACTERISTICS	RECEPTORS SENSITIVITY	RECEPTOR AT RISK FROM PROPOSED DEVELOPMENT?
Abstractions Located Upstream / Upgradient of the Site: A1, A3, A4a, A4c, A4d, A6a, A6b, A9a, A9b, A9c, A11a, A12, A15a, A15b, A15c, A15d, A15h, A15m, A15n, A15o, A16, A17, A20, A23, A4b, A11b, A13, A15g, A15i, A15j, A18, A21a, A22 and A25.	Various, see Appendix 11.3	Surface water abstractions and one groundwater abstraction (A25) used for Spray and Trickle Irrigation and general agricultural transfer.	High	No - These abstractions are located upstream / upgradient of the Site / Proposed Development.
Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A21b,A15f, and A15k.	Various, see Appendix 11.3	Surface water abstraction used for Spray and Trickle Irrigation and general agricultural transfer.	High	Yes – These abstraction are located downstream of the Site.

11.7 Assessment of Effects

Embedded Mitigation

11.7.1 Throughout the pre-application design stage, the initial layout and locations of the access tracks and ancillary infrastructure have been designed to avoid hydrologically sensitive areas. A minimum 9m preferred separation distance from built development was applied along or around every watercourse and waterbody and was taken into consideration into the Proposed Development design, as far as possible.

11.7.2 The access tracks within the Site are being routed to make as much use of existing tracks across the Site as possible, upgrading where required, to minimise the requirement for entirely new tracks and watercourse crossings.

11.7.3 Underground cabling will, wherever possible, aim to follow the same route as the access tracks to reduce the ground disturbance across the Site. Where HDD is proposed, the shortest practicable route will be used and where open cut crossing are proposed measures will be implemented to maintain water flows downstream of the crossing during construction and these crossings will be designed to prevent scour of the watercourse bed. The routing of access tracks and cabling will be designed to minimise the overall environmental effect and to limit the number of watercourse crossings.

Assessment of Effects

Construction Phase

11.7.4 Construction impacts can be categorised into the following two types:

- Those that relate to the act of carrying out construction (e.g. earthworks causing sedimentation of watercourses); and

- Those that relate to the construction of the Proposed Development itself (e.g. the creation of impermeable surfaces such as the substation and foundations).

11.7.5 Table 11.9 details potential impacts that may arise from the activities of the Proposed Development during construction.

Table 11.9 – Potential Construction Phase Impacts

PROJECT COMPONENT	ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
Fence Posts	Excavations	Release of sediment from excavations into the water environment.	Pollution prevention measures in a Construction Environmental Management Plan (CEMP) or equivalent, such as sediment management measures (silt fencing, settlement tanks etc.) and emergency response plan.
	Use of cement products	Pollution from spills or leakage of highly alkaline water that has come into contact with cement.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
Solar Panel Installation	Excavations (piling)	Release of sediment from excavations.	Pollution prevention measures in a CEMP or equivalent, such as sediment management measures (silt fencing, settlement tanks etc.) and emergency response plan.
		Disruption / damage to field underdrainage if present. This could lead to localised groundwater flooding.	Measures in a CEMP or equivalent such as redirecting intercepted underdrainage.
	Use of cement products	Pollution from spills or leakage of highly alkaline water that has come into contact with cement.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
	Soil compaction from vehicle plant	Compaction due to use of heavy machinery reduces infiltration, increases runoff, and shortens the rainfall–runoff response and may lead to flooding.	Measures in a CEMP or equivalent, such as decompaction of ground and soil handing and management procedures.
	Vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Use of SuDS to manage and control the movement of water around the Proposed Development and restricting discharges from the Site to greenfield runoff rates.
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
	Installation of solar panels	Interception of rainfall by panels causing an intensification of runoff and reduces interception and evapotranspiration rates.	Use of SuDS to management and control the movement of water around the Proposed Development and restricting discharges from the Site to Greenfield runoff rates.
Construction of Access Track and Underground Cabling	Soil Stripping and vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Use of SuDS to management and control the movement of water around the Proposed Development and restricting discharges from the Site to Greenfield runoff rates.
	Use of access track	Increased sediment mobilisation and transport from road material through surface wash off.	Pollution prevention measures in a CEMP or equivalent, such as sediment management measures (silt fencing, settlement tanks etc.) and emergency response plan.

PROJECT COMPONENT	ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
	Placement of aggregate	Disruption to lateral flow (throughflow in soil and runoff) from the placement of aggregate.	Use of cross drains and road drains to convey water flows and prevent mounding on the upgradient side of the track.
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
	Use of cement bound sand	Pollution from spills or leakage of highly alkaline water that has come into contact with cement bound sand.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
Watercourse Crossings	Construction of watercourse crossing	Disruption/blockage of watercourse flow from watercourse crossing leading to flooding.	Maintenance plan include periodic visual monitoring.
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.
	HDD activities	Pollution from bentonite breakout and local disruption to superficial geology groundwater flows.	Pollution prevention measures in a CEMP or equivalent, such as bentonite breakout plan and emergency response plan.
	Excavations	Release of sediment from excavations into the water environment.	Pollution prevention measures in a CEMP or equivalent, such as sediment management measures (silt fencing, settlement tanks etc.) and emergency response plan.
Substation, inverter, transformers, and impermeable surfaces	Vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Use of SuDS to management and control the movement of water around the Proposed Development and restricting discharges from the Site to Greenfield runoff rates.
	Construction of foundations	Increased impermeable area may lead to increased runoff and shorter rainfall-runoff response time.	Use of SuDS to management and control the movement of water around the Proposed Development and restricting discharges from the Site to Greenfield runoff rates.
		Impermeable underground structure that may disrupt and/or disconnect the hydraulic connectivity of the groundwater in the surrounding area.	Groundwater is likely to redirect its self around impermeant underground structures.
	Use of machinery and use of concrete or equivalent	Pollution from spills or leakage of concrete or equivalent and fuel, and oil from use of machinery.	Pollution prevention measures in a CEMP or equivalent, such as spill kits and emergency response plan.

11.7.6 With mitigation in place, the magnitude of change from the baseline condition caused by the construction activities identified in Table 11.9, above, has been assessed as Negligible or Low for all activities. The potential change to the water environment is likely to be Small or Slight (barely distinguishable from the current baseline condition) with the use of SuDS and the implementation of such measures as pollution incident response plans and sediment runoff containment and treatment. No effect arising from the construction phase was found to be greater than Minor Adverse, which is assessed as Not Significant (see Table 11.12).

Operational Phase

11.7.7 There are two types of operational impacts on the water environment. These are:

- Those that result from the creation of the Proposed Development (e.g. the creation of impermeable surfaces causing changes in the hydrologic regime); and
- Those associated with the use of the Proposed Development (e.g. accidental releases of fuel from a maintenance vehicle).

11.7.8 Table 11.10 details the potential impacts that may arise from the activities of the Proposed Development during operation.

Table 11.10 – Potential Operational Phase Impacts

PROJECT COMPONENT	ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
Maintenance	Use of Motorised Vehicles (when access needed for maintenance works).	Pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works.	Pollution prevention measures in a maintenance plan or equivalent, such as spill kits and emergency respond plan.
Substation inverters, transformers, and impermeable surfaces	Presence of Substation and impermeable surfaces.	Reduction in recharge to the underlying aquifer; thereby locally reducing groundwater levels. This will also increase runoff to surface water drains/ponds and may lead to flooding.	Use of SuDS to management and control the movement of water around the Proposed Development and restricting discharges form the Site to Greenfield runoff rates.
Solar Panels	Presence of solar panels.	Rainfall onto the angled panels may cause erosion beneath the lower edge of each panel, resulting in erosion and sediment laden runoff.	Maintenance plan include periodic visual monitoring and sediment management measures (silt fencing, settlement tanks etc.) and reseeding.
Watercourse Crossings	Long term use of watercourse crossings.	Disruption / blockage of watercourse flow from watercourse crossing leading to flooding.	Maintenance plan include periodic visual monitoring.

11.7.9 With mitigation in place, the magnitude of change from the baseline condition caused by the operations identified in Table 11.10 has been assessed as Negligible or Low for all operations. The potential change to the water environment is likely to be Small or Slight (barely distinguishable from the current baseline condition) with the use of SuDS and the implementation of such measures as pollution incident response plans and sediment runoff containment and treatment. No effect arising from the operation phase was

found to be greater than Minor Adverse, which is assessed as Not Significant (see Table 11.12).

Decommissioning Phase

11.7.10 Decommissioning impacts can be categorised into the following two types:

- Those that relate to the act of carrying out decommissioning activities (e.g. earthworks causing sedimentation of watercourses); and
- Those that relate to the removal of the Development's structures and restoration of the Site (e.g. the removal of impermeable surfaces and revegetation).

11.7.11 Table 11.11 details the potential impacts that may arise from the activities of the Proposed Development during the decommissioning phase.

Table 11.11 – Potential Decommissioning Phase Impacts

PROJECT COMPONENT	ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
Decommissioning of Principle Features and Restoration	Removal of principle features e.g. all PV modules, mounting structure, cabling, inverters, and transformers.	Decrease in impermeable area and obstructions to baseline flow pathways leading to pre-development runoff conditions and pre-development rainfall-runoff response time.	None identified, activity reinstates baseline characteristic, as far as practicable.
	Revegetation	Re-vegetation may lead to pre-development interception and evapotranspiration rates and pre-development runoff conditions.	None identified, activity reinstates baseline characteristic, as far as practicable.
	Backfilling	Reinstatement of soil profile may lead to pre-development infiltration rates and to pre-development runoff conditions.	None identified, activity reinstates baseline characteristic, as far as practicable.
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Pollution presentation measures in a Decommissioning Environmental Management Plan (DEMP) or equivalent, such as spill kits and emergency respond plan.

11.7.12 With mitigation in place, the magnitude of change from the baseline condition caused by the decommissioning operations identified in Table 11.11 has been assessed as Negligible or Low for all operations. The potential change to the water environment is likely to be Small or Slight (barely distinguishable from the current baseline condition) with the use of SuDS and the implementation of such measures as pollution incident response plans and sediment runoff containment and treatment. No effect arising from the decommissioning phase was found to be greater than Minor Adverse, which is assessed as Not Significant (see Table 11.12).

Assessment Of Effects

Table 11.12 – Summary of Assessment with Embedded Mitigation

Project component	Activities	Potential Impact	Nature and geographical relevance of Impact	Receptors	Sensitivity of receptor	Magnitude of change from baseline*	Scale of Effect	Significant / Not Significant**
Construction Phase								
Fence Posts	Excavations	Release of sediment from excavations into the water environment.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
	Use of cement products	Pollution from spills or leakage of highly alkaline water that has come into contact with cement.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
Solar Panel Installation	Excavations (piling)	Release of sediment from excavations.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
		Disruption / damage to field underdrainage if present. This could lead to localised groundwater flooding.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Use of cement products	Pollution from spills or leakage of highly alkaline water that has come into contact with cement.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Low	Minor	Not Significant
	Soil compaction from vehicle plant	Compaction due to use of heavy machinery reduces infiltration, increases runoff, and shortens the rainfall–runoff response and may lead to flooding.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Low	Minor	Not Significant
	Installation of a solar panels	Interception of rainfall by panels causing an intensification of runoff and reduces interception	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant

Project component	Activities	Potential Impact	Nature and geographical relevance of Impact	Receptors	Sensitivity of receptor	Magnitude of change from baseline*	Scale of Effect	Significant / Not Significant**
		and evapotranspiration rates.		Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
Construction of access track and Underground Cabling	Soil stripping and vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Use of access track	Increased sediment mobilisation and transport from road material through surface wash off.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Low	Minor	Not Significant
	Placement of aggregate	Disruption to lateral flow (throughflow in soil and runoff) from the placement of aggregate.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Low	Minor	Not Significant
	Use of cement bound sand	Pollution from spills or leakage of highly alkaline water that has come into contact with cement bound sand.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Low	Minor	Not Significant
Watercourse Crossings	Construction of watercourse crossing	Disruption/blockage of watercourse flow from watercourse crossing leading to flooding.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
	HDD activities	Pollution from bentonite breakout and local		Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant

Project component	Activities	Potential Impact	Nature and geographical relevance of Impact	Receptors	Sensitivity of receptor	Magnitude of change from baseline*	Scale of Effect	Significant / Not Significant**
		disruption to superficial geology groudnwater flows.	Short-term, reversible, adverse, and local	Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
	Excavations	Release of sediment from excavations into the water environment.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
Substation inverters, transformers, and areas of hardstanding	Vegetation removal	Removal of vegetation reduces interception and evapotranspiration rates and increases runoff.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
	Construction of foundations	Increased impermeable area may lead to increased runoff and shorter rainfall-runoff response time.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f, and A15k	High	Negligible	Negligible	Not Significant
		Impermeable underground structure that may disrupt and/or disconnect the hydraulic connectivity of the groundwater in the surrounding area.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
	Use of machinery and use of concrete or equivalent	Pollution from spills or leakage of concrete or equivalent and fuel, and oil from use of machinery.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
Operational Phase								
Maintenance	Use of Motorised Vehicles (when access needed for maintenance works)	Pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant
Substation inverters, transformers, and	Presence of Substation and	Reduction in recharge to the underlying aquifer therefore locally reducing groundwater levels. This	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant

Project component	Activities	Potential Impact	Nature and geographical relevance of Impact	Receptors	Sensitivity of receptor	Magnitude of change from baseline*	Scale of Effect	Significant / Not Significant**
impermeable surfaces	impermeable surfaces	will also increase runoff to surface water drains/ponds and may lead to flooding.		Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
Solar Panels	Presence of solar panels	Rainfall onto the angled panels may cause erosion beneath the lower edge of each panel, resulting in erosion and sediment laden runoff.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
Watercourse Crossings	Long term use of watercourse crossings	Disruption / blockage of watercourse flow from watercourse crossing leading to flooding.	Long-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
Decommissioning Phase								
Decommission of Principle Features and Restoration	Removal of principle features e.g. all PV modules, mounting structure, cabling, inverters, and transformers.	Decrease in impermeable area and obstructions to baseline flow pathways leading to pre-development runoff conditions and pre-development rainfall-runoff response time.	Long-term, Irreversible, neutral, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
	Revegetation	Re-vegetation may lead to pre-development interception and evapotranspiration rates and pre-development runoff conditions.	Long-term, Irreversible, neutral, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
	Backfilling	Reinstatement of soil profile may lead to pre-development infiltration rates and to pre-development runoff conditions.	Long-term, Irreversible, neutral, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Negligible	Negligible	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Negligible	Negligible	Not Significant
				Water in Till	Low	Negligible	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Negligible	Negligible	Not Significant
	Use of machinery	Pollution from spills or leakage of fuel and oil from use of machinery.	Short-term, reversible, adverse, and local	Surface Water Features within the Black Sluice IDB draining to the South Forty Foot Drain surface water catchment	Medium	Low	Minor	Not Significant
				Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel Aquifers	Medium	Low	Minor	Not Significant
				Water in Till	Low	Low	Negligible	Not Significant
				Abstractions Located Downstream of the Site: A2, A5, A8a, A8b, A10a, A10b, A15l, A19, A21b, A24a, A24b, A24c, A24d, A24e, A24f, A7, A14a, A14b, A14c, A15e, A15f and A15k	High	Low	Minor	Not Significant

Note
* The assessment has considered the magnitude of change from the baseline with the embedded mitigation in place.
** Effects that are determined to be Major or Moderate are considered to be Significant. Effects that are determined to be Minor or Negligible are considered to be Not Significant.

11.8 Mitigation

Construction Phase

11.8.1 The Proposed Development will be undertaken in-line with current guidance and codes of best practice. The following documents include details of best practice industry guidance intended to prevent adverse impacts during construction:

- GPP1 Understanding your environmental responsibilities - good environmental practices;[16]
- GPP2 Above Ground Oil Storage Tanks;[16]
- GPP4 Treatment and disposal of wastewater where there is no connection to the public foul sewer;[16]
- GPP5 Works and Maintenance In or Near Water;[16]
- PPG6 Working at Construction and Demolition Sites;[16]
- GPP8 Safe Storage and Disposal of Used Oils;[16]
- GPP13 Vehicle washing and cleaning;[16]
- GPP21 Pollution Incident Response Planning;[16]
- GPP22: Dealing with spills;[16]
- GPP26 Safe storage - drums and intermediate bulk containers;[16]
- Construction Information Research and Information Association (CIRIA) C532 Control of Water Pollution from Construction Sites;[17]
- CIRIA C741 Environmental good practice on site guide;[18]
- CIRIA C750 Groundwater control - design and practice;[19]
- CIRIA C753 The SuDS manual;[20] and
- CIRIA C786 Culvert, screen, and outfall manual.[21]

11.8.2 The measures detailed in these guidance documents will limit the potential for disturbance or contamination of water resources and will be adopted.

11.8.3 It is noted that all Pollution Prevention Guidance (PPGs) have been withdrawn by the EA as the legislative requirements contained within the documents are, in many cases, no longer correct. In Scotland and Northern Ireland, some PPGs have been replaced by Guidance on Pollution Prevention (GPP). The PPGs and GPPs are, however, still considered to be a relevant and effective source of best practice information and are widely used and accepted within the construction industry.

[16] NetRegs Guidance for Pollution Prevention (GPPs) - Full list [online]. Accessed September 2023. Available at: https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

[17] Construction Information Research and Information Association (2001) C532 Control of Water Pollution from Construction Sites [online]. Accessed September 2023. Available at: https://www.ciria.org/ProductExcerpts/C532.aspx.

[18] Construction Information Research and Information Association (2015) C741 Environmental good practice on site guide [online]. Accessed September 2023. Available at: https://www.thenbs.com/PublicationIndex/documents/details?Pub=CIRIA&DocID=309502.

[19] Construction Information Research and Information Association (2016) C750 Groundwater control - design and practice [online]. Accessed September 2023. Available at: https://www.ciria.org/ItemDetail?iProductCode=C750&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91.

[20] Construction Information Research and Information Association (2016) CIRIA C753 The SuDS Manual [online]. Accessed September 2023. Available at: https://www.ciria.org/CIRIA/Memberships/The_SuDs_Manual_C753_Chapters.aspx.

[21] Construction Information Research and Information Association (2019) C786 Culvert, screen and outfall manual [online]. Accessed September 2023. Available at: https://www.thenbs.com/PublicationIndex/documents/details?Pub=CIRIA&DocID=328474

11.8.4 The Construction Environmental Management Plan (CEMP) will incorporate the principles of good practice, legislation, regulations and guidance. With respect to protection of water resources, the CEMP will provide practical measures to avoid and minimise the impact of the Proposed Development on ground and surface waters, as well as providing emergency preparedness and corrective actions together with measures for monitoring, recording**,** and disseminating of information.

11.8.5 Of relevance to this assessment, the CEMP will include the following measures:

- A number of measures will be adopted to prevent and control the release of sediment, with the measures used depending upon the situation encountered onsite. Examples of measures include surface water being directed across vegetated zones or through mesh fencing to capture sediment, as appropriate. Alternatives, such as sediment traps or settlement lagoons, may also be considered if the quantity of sediment laden water is anticipated to be large. The CEMP will specify maintenance measures to ensure that sediment control measures, drains and potholes would be regularly inspected and cleared / infilled / repaired;
- All fuel, oils and other polluting substances would be securely stored in suitably bunded containers on impermeable surfaces. The total quantity and range of potential pollutants to be used on-site is anticipated to be small. Static machinery and plant would, where practicable, have integral drip trays of 110% of the capacity of the fuel tank. The use of biodegradable oils and lubricants will also be used, where practicable. All plant, vehicles and machinery will be inspected regularly for leaks. Refuelling would be undertaken in a designated refuelling area;
- If field underdrainage is encountered, in the first instance, measures to avoid damage or disruption to the underdrainage system will be implemented, by micrositing excavations. Where this is not practicable, field underdrainage would, in consultation with the landowner, be diverted or replaced;
- Confirmation, detailed design, and survey of watercourse crossings required to facilitate access to the Proposed Development will be required prior to construction. EA / IDB will be consulted on the level of authorisation for engineering works in the water environment and appropriate permissions will be sought;
- Pollution incident response plans will be prepared for incorporation into the CEMP and will identify the type and location of onsite resources (e.g. spill kits, absorbent materials, oil booms etc.) available for the control of accidental releases of pollution and other environmental incidents. Cement/concrete mixes will be calculated to ensure that sufficient quantities are supplied (without needing to dispose of any excess), and that the cement/sand mix ratio will be monitored for consistency and suitability;
- The time any excavation is open will be kept to a minimum to avoid ingress and removal of water;
- Where appropriate, temporary cut-off drains will be installed to prevent shallow throughflow entering excavations. Treated / clean

water would be discharged downstream of the excavation and encouraged to infiltrate into the ground mimicking natural flow patterns;

- Excavations will be reinstated as soon as practicable once construction works are complete and will ensure that natural hydrological conditions are restored as far as possible;
- All new and upgraded access tracks will be constructed with a suitable camber and will have a permeable, granular surface;
- Where the access tracks are oriented parallel to the dominant flow direction, transverse drains will be constructed, where appropriate, in the surface of the access track to convey runoff into adjacent drainage ditches. This would help prevent the tracks from acting as a preferential flow path for surface runoff;
- Where access tracks are oriented perpendicular to the dominant flow direction the trackside drainage will include a lateral drainage channel cut along the uphill side of the track to intercept the natural runoff and shallow throughflow and this will be conducted under the track at regular intervals through cross drainage pipes. The trackside drains will be broad and shallow with moderate gradients to prevent scouring;
- Storage of materials and stockpiling to be located outside the fluvial floodplain (Flood Zone 3), flood storage areas and areas known to be at risk of surface water flooding;
- Pouring of concrete for foundations will take place within well shuttered pours to prevent egress of concrete from the pour area;
- Pouring of concrete or cement bound sand during adverse weather conditions will be avoided, where possible;
- Strip soils and vegetation during dry conditions only;
- Use of track mats to prevent unnecessary soils compaction, damage to vegetation, and/or erosion; and
- Grass seeding after installation of panels to encourage grass regrowth.

Operation Phase

11.8.6 Mitigation of effects upon flow rates and volumes of watercourses within the surface water catchments would be achieved through design of a suitable surface water drainage scheme for the Proposed Development, which takes into account climate change (1 in 100 year plus climate change event). The drainage proposals would ensure that the existing greenfield rate of surface water runoff discharged to the adjacent watercourses is maintained and (in the long-term) can take into account and accommodate climatic changes. A drainage strategy has been prepared for the Proposed Development, see Appendix 11.1. In addition, during the operational phase, in order to mitigate the potential for pollution from maintenance activities, there will be a requirement for vehicles and plant to carry a spill kit. This will be secured through operational phase maintenance procedures.

Decommission Phase

11.8.7 Decommissioning phase mitigation will be similar to construction phase mitigation. An outline Decommissioning Environmental Management Plan

(DEMP) will be prepared and adhered to. It is anticipated that the contents of a DEMP would be similar to the CEMP.

11.9 Residual Effects

Construction Phase

11.9.1 As detailed within Table 11.12, all effects are considered to be **Not Significant**. As such, no further additional mitigation measures are required. As no further mitigation measures are required, the residual effects are as per previously identified (i.e. Not Significant).

Operation

11.9.2 As detailed within Table 11.12, all effects are considered to be **Not Significant**. As such, no further additional mitigation measures are required. As no further mitigation measures are required, the residual effects are as per previously identified (i.e. Not Significant).

Decommission

11.9.3 As detailed within Table 11.12, all effects are considered to be **Not Significant**. As such, no further additional mitigation measures are required. As no further mitigation measures are required, the residual effects are as per previously identified (i.e. Not Significant).

Monitoring

11.9.4 The CEMP will include details of water quality monitoring to be undertaken during the construction phase. Owing to the low level of risk posed by the construction works, this will consist of visual and olfactory observations, plus *in-situ* testing using hand held water quality meters only.

11.10 Assessment of Cumulative Effects

Intra-Cumulative Effects

11.10.1 Intra-cumulative effects are the combined action of different environmental topic-specific impacts upon a single resource/receptor. There may be intra-cumulative effects on waterbodies in regard to effects on hydro-ecology which will be considered further in the ES.

Inter-Cumulative Effects

11.10.2 There is a possibility of inter-cumulative effects on the water environment occurring when two or more developments are constructed, are operational and / or have overlapping decommissioning phases within the same catchment at the same time. Potential cumulative effects include deterioration in water quality as a result of pollutants entering waterbodies during construction / decommissioning and alteration to the hydrological regime from inappropriate drainage design resulting in increased flood risk.

11.10.3 As set out in Table 11.13, below, there are 22 schemes that have been scoped-in to this assessment and have the potential to generate inter-cumulative effects with the Proposed Development.

11.10.4 In terms of the water environment, the greatest risk to water receptors generally occurs during the construction and / or decommissioning phases. The scheme is yet to be constructed. As stated, it has been assumed that the scheme will have to be designed and implemented with mitigation measures, such as the use of a SuDS, which would mitigate operational phase effects from the scheme. Therefore, the operational phase cumulative effects of the Proposed Development are not considered further.

Table 11.13 – Cumulative Scheme

SCHEME NAME	APPROX DISTANCE FROM THE SITE	IS DEVELOPMENT WITHIN SURFACE WATER CATCHMENT OF THE SITE? SOUTH FORTY FOOT DRAIN SURFACE WATER CATCHMENT	POTENTIAL FOR CUMULATIVE EFFECTS DURING CONSTRUCTION, OPERATION, AND / OR DECOMMISSIONING?
Triton Knoll Electrical System (EN090019). Granted – 05/09/2016. Correction Order Granted – 23/03/2017.	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in very close proximity to the Proposed Development.
Heckington Fen Solar Park (EN010123). Pre-Examination. Received – 15/02/2023.	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
Outer Dowsing Offshore Wind (Generating Station) (EN010130). Pre-Application. Expected to be submitted – Q4 2023.	3.4km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Lincolnshire Reservoir (WA010003). Pre-Application. Expected to be submitted - 09/2025.	5.8km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Springwell Solar Farm (EN010149). Pre-Application. Expected to be submitted - Q2 2024.	11.6km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Boston Alternative Energy Facility (EN010095). Granted - 06/07/2023.	12.0km	Yes	Yes, the development is in the same surface water catchment
Temple Oaks Renewable Energy Park (EN101126). Pre-Application. Expected to be submitted – 03/2023 (no update to date).	15.9km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Fosse Green Energy (EN010154). Pre-Application. Expected to be submitted – Q4 2024.	27.2km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Mallard Pass (EN010127). Under Examination. Received – 24/11/2022. Examination Began – 21/12/2022.	29.9km	No	No – not in the same surface water catchment as the Proposed Development

SCHEME NAME	APPROX DISTANCE FROM THE SITE	IS DEVELOPMENT WITHIN SURFACE WATER CATCHMENT OF THE SITE? SOUTH FORTY FOOT DRAIN SURFACE WATER CATCHMENT	POTENTIAL FOR CUMULATIVE EFFECTS DURING CONSTRUCTION, OPERATION, AND / OR DECOMMISSIONING?
			therefore no common receptors.
A46 Newark Bypass (EN010065). Pre-Application Expected to be submitted – Summer 2023 (no update to date).	34.1km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
West Burton Solar Project (EN010132). Pre-Examination. Received – 21/03/2023. Examination Began – 18/04/2023.	39.0km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Cottam Solar Project (EN010133). Pre-Examination. Received – 12/01/2023. Examination Began – 10/02/2023.	42.8km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Gate Burton Energy Park (EN010131). Under Examination. Received – 27/01/2023. Examination Began – 22/02/2023.	46.0km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Tillbridge Solar Project (EN010142). Pre-Application. Expected to be submitted – Q4 2023.	46.3km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
West Burton C Power Station (EN010088). Granted (with minor modifications) - 21/10/2020.	50.2km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
Viking CSS Pipeline (EN070008). Pre-Application. Expected to be Submitted – August 2023.	51.4km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
One Earth Solar Farm (EN010159) Pre-Application. Expected to be submitted – Q1 2025	38.3km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
National Grid Viking Link Ltd - B/17/0340 (BBC) Granted – 12/09/2018	0.4km	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
National Grid Viking Link Ltd - H04-0823-17 (SHDC) - Granted – 08/10/2018	0.1km	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.

SCHEME NAME	APPROX DISTANCE FROM THE SITE	IS DEVELOPMENT WITHIN SURFACE WATER CATCHMENT OF THE SITE? SOUTH FORTY FOOT DRAIN SURFACE WATER CATCHMENT	POTENTIAL FOR CUMULATIVE EFFECTS DURING CONSTRUCTION, OPERATION, AND / OR DECOMMISSIONING?
National Grid Viking Link Ltd - 17/1200/FUL (NKDC) - Approved – 18/09/2018	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
13/0498/OUT - 18/0652/RESM (NKDC) - Approved 09/08/2018	7.64km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT - 22/0856/RESM (NKDC) - Pending determination	4.0km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT - 20/0363/RESM (NKDC) - Approved – 09/06/2020	4.5km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT - 21/0669/RESM (NKDC) - Approved – 22/11/2021	4.87km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT -21/1068/RESM (NKDC) - Approved – 17/03/2022	4.6km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT -22/0188/RESM (NKDC) - Approved 06/07/2022	7.52km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
13/0498/OUT -23/0649/RESM (NKDC) - Pending Approval	7.37km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors.
B/21/0121 (BBC) - Not EIA Development – 29/03/2021	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
B/21/0443 (BBC) - Granted – 17/02/2022	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
B/22/0198 (BBC) - Granted – 23/09/2022	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.

SCHEME NAME	APPROX DISTANCE FROM THE SITE	IS DEVELOPMENT WITHIN SURFACE WATER CATCHMENT OF THE SITE? SOUTH FORTY FOOT DRAIN SURFACE WATER CATCHMENT	POTENTIAL FOR CUMULATIVE EFFECTS DURING CONSTRUCTION, OPERATION, AND / OR DECOMMISSIONING?
B/22/0356 (BBC) B/21/0412 (Request for screening Opinion) H04-0849-22 (SHDC) - Resolution to grant planning permission from Planning Committee – 18/07/2023	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
14/1034/EIASCR (NKDC) - Screening Opinion – The proposals do not constitute EIA development – 18/08/2014	Within Site Boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
15/0383/EIASCR (NKDC) - Screening Opinion – 02/04/2015	1.6km	Yes	Yes, the development is in the same surface water catchment.
19/0060/FUL (NKDC) - Approved - 11/04/2019	3km	No	No – not in the same surface water catchment as the Proposed Development therefore no common receptors
22/1596/OHL (NKDC) - No objections – 25/11/2022	0.42km	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
22/1597/OHL (NKDC) - No objections – 25/11/2022	1.82km	Yes	Yes, the development is in the same surface water catchment.
22/1598/OHL (NKDC) - No objections – 25/11/2022	3.70km	Yes	Yes, the development is in the same surface water catchment.
22/1599/OHL (NKDC) - No objections – 25/11/2022	2.9km	Yes	Yes, the development is in the same surface water catchment.
21/1337/EIASCR (NKDC) - Screening Opinion – 06/10/2021	0.9km	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.
23/1021/FUL (NKDC) AND B/23/0300 (BBC) - 23/1021/FUL validated 15/09/2023 B/23/0300 validated 30/08/2023	Within the boundary	Yes	Yes, the development is in the same surface water catchment and is in close proximity to the Proposed Development.

11.10.5 The following assessment considers where there could be an overlap between the Proposed Development's construction and / or decommissioning phases and one or more construction phases for other developments.

11.10.6 All other developments would need to comply with the strict planning guidance and regulation relating to the water environment to be acceptable in planning terms. As such, the design of these other developments would need to incorporate appropriate mitigation measures and drainage design (as is the case for the Proposed Development). Should the other developments require

permitted activities, these would also be subject to control and regulation by the relevant issuing authority.

11.10.7 In addition, pollution prevention measures in a CEMP and DEMP (or equivalent), including emergency response plans, are likely to be implemented during the construction / decommission of the other development. Therefore, on the basis of the implementation of these mitigation measures, the potential construction and decommissioning cumulative effects arising from other developments (or any future other scheme within the same catchment as the Site) with the Proposed Development are considered to be Negligible, which is considered to be **Not Significant**.

11.11 Summary

11.11.1 The Site lies within the South Forty Foot Drain surface water catchment and within the Black Sluice Internal Drainage Board (IDB) area. There are a number of Main Rivers and Ordinary Watercourses, and IDB drains, within the Site. Superficial deposits vary across the Site from those with no groundwater resources (Tidal Flat Deposits) to those considered to be locally important aquifers (Glaciofluvial Ice Contact Deposits and Sleaford Sand and Gravel). The bedrock geology is not considered to be a groundwater resource. Parts of the Site are considered to be at risk of flooding. There are 21 licensed surface water abstraction locations downstream of the Site, which have been considered in the assessment.

11.11.2 Potential effects on the water environment are those that may change the hydrological and hydrogeological flow regime, and those which may cause pollution and a degradation in water quality. The assessment found that, with appropriate mitigation in place, the scale of potential effects on the water environment were no greater than Minor Adverse and, as such, **Not Significant**.

11.11.3 Embedded mitigation measures, such as the avoidance of hydrologically sensitive areas and flood zones where possible, have been incorporated into the design of the Proposed Development. The key principles of the water related components of the CEMP / DEMP for the Proposed Development include the careful design and control of sediment and potential pollutants. The CEMP/ DEMP will draw upon good industry guidance and best practice measures. The assessment has assumed the implementation of good industry guidance and best practice measures, such as pollution prevention plan and sediment management measures, would avoid the likelihood of potentially significant effects occurring.

11.11.4 The assessment identified that all effects were considered to be **Not Significant** therefore no further additional mitigation measures were required. Due to this the residual effects remained as per previously identified (i.e. Not Significant). In regard to monitoring the CEMP / DEMP will include details of water quality monitoring to be undertaken during the construction phase. Owing to the low level of risk posed by the construction works, this will consist of visual and olfactory observations, plus *in-situ* testing using hand held water quality meters only.

11.11.5 The inter-cumulative effect assessment identified that as the other developments will need to comply with the strict planning guidance and regulation relating to the water environment to be acceptable in planning and permitting terms, the potential inter-cumulative effects arising from the Proposed Development and other cumulative development are considered to be Negligible and **Not Significant**.

11.11.6 A summary of the likely significant residual effects of the Proposed Development on the receptors considered within this chapter are summarised in Table 9.12 below.

Table 11.14: Discipline - Summary Assessment Matrix

ISSUE	DESCRIPTION OF IMPACT	GEOGRAPHICAL SIGNIFICANCE							IMPACT	NATURE	SIGNIFICANCE	MITIGATION MEASURES
		I	N	R	C	D	P	L				
Water Resources												
No Significant Effects												
Key: Geographical Significance: I = International N = National R = Regional C = County D = District P = Parish L = Low to Local Nature: St = Short Term Mt = Medium Term Lt = Long Term R = Reversible Ir = Irreversible												

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