

Tween Bridge Solar Farm

Environmental Statement Chapter 10: Water Resource

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms
and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

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August 2025

Revision 1

Table of Contents:

Table of Contents:.....	1
List of Tables:	1
10. Water Resources	2
10.1. Introduction	2
10.2. Consultation	3
10.3. Assessment Approach.....	31
10.4. Baseline Conditions	45
10.5. Assessment of Likely Significant Effects	53
10.6. Mitigation, Enhancement and Residual Effects.....	56
10.7. Summary	64
10.8. References	67
10.9. Glossary.....	71

List of Tables:

Table 10-1: Summary of Consultation – Scoping Opinion.....	4
Table 10-2: Summary of Consultation – Statutory Consultation.....	10
Table 10-3: Definition of the receiving environment	34
Table 10-4: Magnitude of change	36
Table 10-5: Significance criteria.....	38
Table 10-6: Mitigation.....	60
Table 10-7: Summary of effects, mitigation and residual effects	62

10. Water Resources

10.1. Introduction

10.1.1. This chapter of the Environmental Statement (ES) identifies the potential impacts on the water environment from the construction, operation and decommissioning of the Scheme. The water environment includes surface waterbodies (e.g. rivers, streams, ditches, canals, lakes and ponds, etc.), groundwater bodies, as well as flood risk and drainage.

10.1.2. The potential impacts on the water environment resulting from the Scheme focuses on four main events:

- Erosion/sediment movement.
- Chemical/pollution events.
- Alteration/interruption of surface water flows.
- Alteration/interruption of ground water flows.

10.1.3. This chapter is supported by the following appendices:

- **ES Appendix 10.1 Flood Risk Assessment [Document Reference: 6.3.10.1]**
- **ES Appendix 10.2 Water Framework Directive Assessment [Document Reference: 6.3.10.2]**

10.1.4. This chapter is supported by the following figures:

- **ES Figure 10.1 Flood Map for Planning [Document Reference 6.2.10.1]**
- **ES Figure 10.2 Risk of Flooding from Rivers and Sea [Document Reference 6.2.10.2]**
- **ES Figure 10.3 Risk of Flooding from Surface Water Extents [Document Reference 6.2.10.3]**
- **ES Figure 10.4 Risk of Flooding from Surface Water Depths [Document Reference 6.2.10.4]**
- **ES Figure 10.5 BGS Bedrock Geology [Document Reference 6.2.10.5]**

- ES Figure 10.6 Hydrogeology Aquifer Classification [Document Reference 6.2.10.6]
- ES Figure 10.7 Environment Agency Reservoir Flood Extents [Document Reference 6.2.10.7]
- ES Figure 10.8 Environment Agency Historic Flood Map [Document Reference 6.2.10.8]

10.2. Consultation

- 10.2.1. The comments raised within **ES Appendix 1.1 Planning Inspectorate EIA Scoping Opinion [Document Reference 6.3.1.1]** dated 13 March 2023 relating to hydrology and flood risk are summarised in **Table 10.1**, alongside the Applicant's response.
- 10.2.2. A summary of statutory consultation comments is included in **Table 10.3** alongside the Applicant's response.

Table 10–1: Summary of Consultation – Scoping Opinion

Id	Ref	Matter	Planning Inspectorate Comments	Applicant's Response
3.9.2	Paras 8.3 and 8.25; Figure 8.1	Flood Risk	<p>The ES and Flood Risk Assessment (FRA) including accompanying figures should distinguish between areas of Flood Zones 3a and 3b.</p> <p>The scoping consultation response from the Environment Agency (Appendix 2 of this Opinion) states that indicative locations for components including the proposed National Grid substation and BESS are within Flood Zone 3b. Any mitigation</p>	<p>The FRA appended to this ES (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]) includes plans that clearly distinguish between areas of Flood Zone 3a and Flood Zone 3b on site.</p> <p>The impact of the Scheme on existing floodplain storage volume is assessed in detail in the FRA as an appendix to this ES (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]).</p> <p>ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6] includes typical sections of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers and details that all of these will be raised above the ground (minimum 100mm above the 1 in 1,000 year flood level) using small footings which are sat on 300mm of permeable gravel. The impact of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers on floodplain storage will therefore be negligible. Previous advice from the Environment Agency received on the 22</p>

ENVIRONMENTAL STATEMENT

Water Resources

			measures to reduce significant effects from flooding should be described in the ES and their delivery secured through the DCO or other legal mechanism.	January 2025 (included in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]), agreed with this conclusion “providing there is no raising of ground levels and panels and structures can be raised to allow the free flow of floodwater across the floodplain”. Mitigation measures are secured in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1] which also includes the Outline Surface Water Drainage Strategy.
3.9.3	Para 8.7	Underlying Geology	Paragraph 8.7 of the Scoping Report states that “ <i>It is unlikely that Made Ground exists beneath the site boundary</i> ”. This is not consistent with the information provided within Section 7 of the Scoping Report, which identifies manmade working and placement of alluvium.	<p>Potentially significant impacts on hydrological/hydrogeological receptors have been assessed in detail within this ES chapter (see Section 10.5).</p> <p>As detailed in ES Chapter 9: Ground Conditions [Document Reference 6.2.9], there is low potential for contaminants to be present in any shallow depth Made Ground. The impacts resulting from disturbance of any made ground on hydrological pollution events are therefore considered to be negligible. Disturbance of made ground is also not considered to significantly impact erosion/sediment movement, surface water flows or ground water flows (see Section 5 for further details).</p>

ENVIRONMENTAL STATEMENT

Water Resources

			The ES should present consistent baseline information across relevant aspect chapters. Impacts resulting from disturbance of any made ground which are likely to result in significant effects on hydrological/hydrogeological receptors should be assessed in the ES.	
3.9.4	Para 8.18	Surface Water Management Strategy	A draft/ outline copy of the Surface Water Management Strategy (proposed for the operational phase) should be appended to the ES.	The proposed Outline Surface Water Drainage Strategy is included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). The exact details of the surface water drainage strategy will be confirmed during detailed design stage, post-consent of the DCO application.
3.9.5	Para 8.27	Sensitive Receptors	The table at paragraph 8.27 of the Scoping Report ('Summary of	This ES chapter assesses a full range of hydrological, hydrogeological and flood risk receptors and assesses the likely significant effects on various aspects of Water Resources as listed

ENVIRONMENTAL STATEMENT

Water Resources

			<p>Potential Environmental Receptors') lists only a single receptor type (groundwater) with no reference to flood risk, surface water or other specific receptors.</p> <p>The ES should present a complete list of hydrological, hydrogeological and flood risk receptors which are likely to be impacted by the Proposed Development and assess any likely significant effects on those receptors.</p> <p>Paragraph 7.15 of the Scoping Report describes overall groundwater vulnerability to pollution as <i>"Low or Medium"</i>,</p>	<p>in Paragraph 10.1.2. Receptors assessed include watercourses, surface water, groundwater and areas of predicted flood risk (see Paragraph 10.3.8). Table 10 3: Definition of the receiving environment sets out how the sensitivity/ vulnerability of identified receptors has been defined.</p> <p>The Order Limits are located above a Total Catchment Source Protection Zone. In accordance with the Design Manual for Roads and Bridges guidance LA103 documents, these zones are classified as having Low sensitivity (see Table 10.3). ES Chapter 9: Ground Conditions [Document Reference 6.2.9], details the presence of a Secondary Superficial Aquifer below the Order Limits (see Section 9.4) which is defined as having Medium vulnerability. This ES chapter considers this classification.</p>
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ENVIRONMENTAL STATEMENT

Water Resources

			<p>while the table at paragraph 8.27 describes the Source Protection Zone (SPZ) below Thorne as “low” sensitivity. In some places, groundwater should be considered highly vulnerable due to the presence of SPZ3. The approach to determining the sensitivity/ vulnerability of identified receptors should be explained in the ES and clearly and consistently cross referenced across the Ground Conditions and Hydrology and Flood Risk ES assessments.</p>	
3.9.6	n/a	Water Framework	<p>The Scoping Report identifies the potential for contamination of surface water and</p>	<p>ES Appendix 10.2 Water Framework Directive Assessment [Document Reference: 6.3.10.2] includes a full assessment of the potential impacts on WFD bodies. The WFD Assessment (ES Appendix 10.2 Water Framework Directive Assessment</p>

ENVIRONMENTAL STATEMENT

Water Resources

		Directive (WFD)	groundwater bodies. Given the geographic location of the Proposed Development, the ES should consider the potential impacts on WFD water bodies. The Applicant's attention is drawn to the Inspectorate's Advice Note Eighteen: The WFD in this regard. The ES should explain the relationship between the Proposed Development and any relevant water bodies in relation to the current relevant River Basin Management Plan.	[Document Reference: 6.3.10.2]) concludes that "Overall, the assessment concluded that none of the activities associated with the Scheme have the potential to cause a deterioration in status of WFD surface water bodies or groundwater bodies or impact hydrologically connected protected areas. The Scheme was not considered to jeopardise the attainment of 'good' overall status of WFD water bodies". The assessment also notes that "A positive effect on River Basin Management Plan objectives was identified within this assessment. The cessation of agricultural activities was considered to have an overall benefit to the status of WFD water bodies, and a positive improvement in biodiversity was identified through the proposed creation of species-rich grassland in place of cultivated land. The avoidance and management of riparian zones of all watercourses was considered to promote biodiversity. Additionally, the Scheme was considered to help combat climate change by helping reduce reliance on fossil fuels."
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Table 10-2: Summary of Consultation – Statutory Consultation

Consultee	Summary Of Statutory Consultation Responses	How Response Has Been Addressed By Applicant
Yorkshire Humber Drainage	“Having reviewed the documents, the proposals do not fall within a drainage district of any of the Internal Drainage Boards we manage, and will not affect the surface water network in our Board areas. As such we have no comment to make at this stage. We would recommend consulting the various other Internal Drainage Boards in the vicinity of the proposed development if you have not already done so.”	The Order Limits are located within the Isle of Axholme & North Nottinghamshire Water Level Management Board and Doncaster East Internal Drainage Board, both of which have been consulted on the Scheme, with their comments included in this table.
UK Health Security Agency	<p>“We note that there is the potential for the Environment Agency’s flooding dataset to be updated in Spring 2025, if this is the case and the development is impacted by any changes there will be an update to the flood risk assessment”.</p> <p>“Several plans, strategies and design details remain outstanding which we had hoped to review prior to the submission of the</p>	This ES chapter and the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]) include that latest national flood risk data, including National Flood Risk Assessment data released in January 2025 and the updated Flood Map for Planning released in

ENVIRONMENTAL STATEMENT

Water Resources

	Environmental Statement at the next stage." This included a Flooding Emergency Management Plan.	<p>March 2025. Section 10.4 Baseline Conditions includes the latest flood data.</p> <p>A Flood Emergency Management Plan has been prepared and is included within the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]).</p>
Doncaster East Internal Drainage Board and Isle of Axholme and North Nottinghamshire Water Level Management Board	<p>"All Board watercourses are subject to Byelaws, which are intended to protect the watercourses and the Board's ability to maintain them."</p> <p>The IDB advised of various Byelaw requirements that have been briefly summarised below:</p> <ul style="list-style-type: none"> • Byelaw 3 – ensuring the flow or volume of water in any watercourse in the District is not increased without consent of the Board • Byelaw 10 – ensuring no buildings or structures are proposed within 9m of watercourse bank. • Byelaw 17 – details that consent is required for various actions that may impact watercourses such as: 	<ul style="list-style-type: none"> • Byelaw 3: details of the proposed Outline Surface Water Drainage Strategy are included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). The proposed Outline Surface Water Drainage Strategy will ensure there is not an increase in flow or volume in any watercourse, with Sustainable Drainage

ENVIRONMENTAL STATEMENT

Water Resources		
	<p>installation of electrical cable, damage to watercourse banks, culverting, installation of fencing or bridges over or across watercourses, installation of a mechanical device.</p> <p>The IDB also advised that “the Board will require all watercourses to be crossed by means of HDD at a depth no less than 2 metres PLUS the cable safety distance below the hard bed level of all watercourses (to ODN if EA or IDB maintained). This will apply to the primary cable route and any interconnecting cables between array sites.”</p>	<p>Systems (SuDS) implemented to restrict the surface water outfall rate to greenfield runoff rates. The exact details of the Outline Surface Water Drainage Strategy will be confirmed during detailed design stage, post-consent of the DCO application.</p> <ul style="list-style-type: none">• Byelaw 10: all Internal Drainage Board maintained watercourses have a 9m buffer that has been left undeveloped. Full details of the watercourse buffers are included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]).• Byelaw 17: The provisions of any byelaws made under

ENVIRONMENTAL STATEMENT

		Water Resources
		<p>section 66 of the Land Drainage Act 1991 and paragraphs 5, 6 or 6A of Schedule 25 to the Water Resources Act are disappplied under article 9 of the draft DCO [Document Reference 3.1] with protective provisions included in Schedule 14 of the draft DCO for the drainage authorities. This means that byelaw consents will not be required to be obtained post-consent.</p> <p>ES Figure 2.4 Indicative HDD Crossing Plan [Document Reference 6.4.2.4]” highlights where HDD is proposed within the Order Limits. Directional drilling is proposed for Main Rivers, Internal Drainage Board Watercourses and the Canal. Where HDD is not used, the proposed culverting</p>

ENVIRONMENTAL STATEMENT

Water Resources

		methodology will ensure flood risk is not negatively impacted. The proposed culverting does not pose any engineering concerns.
South Yorkshire Fire and Rescue (SYFR)	"In the event of a fire involving BESS, it is likely that SYFR will need to apply a higher than average volume of water to restrict fire spread. Please ensure that there is an adequate water supply within 90m to allow continuous firefighting operations to take place; please also ensure due consideration has been given to containing fire water run-off."	<p>ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6] includes a "Typical 100MW BESS Layout". The typical Battery Energy Storage Systems (BESS) layout shows four water tanks which are to supply fire suppression water. During detailed design post-consent of the DCO application, the BESS design will be reviewed and updated as needed to ensure water supply is within 90m of each battery.</p> <p>The proposed BESS Outline Surface Water Drainage Strategy included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document</p>

ENVIRONMENTAL STATEMENT

Water Resources

		<p>Reference 6.3.10.1]) details provisions to containing fire water run-off.</p> <p>An Outline Battery Safety Management Plan [Document Reference 7.9.4] is included as a standalone document as part of the DCO application and details both the provision of fire water supply and containment.</p>
Natural England (NE)	<p>"Natural England notes from Section 10.6 of Chapter 10: Water Resources that a Sustainable Drainage System (SuDS) scheme is proposed. Natural England would welcome the opportunity to provide further advice on SuDS design, linking with any Biodiversity Net Gain (BNG) and/or ecological enhancement proposals".</p>	<p>The proposed Outline Surface Water Drainage Strategy is included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1])). The exact details of the surface water drainage strategy will be confirmed during detailed design stage, post-consent of the DCO application. It is at detailed design where BNG and ecology enhancements could be considered.</p>

ENVIRONMENTAL STATEMENT

Water Resources

<p>Environment Agency (EA)</p>	<p>“No WFD assessment has been provided as part of the PEIR and the Report has not considered the potential effects on water bodies with regard to the relevant River Basin Management Plan (RBMP). We advise that further consideration of the potential impact on water quality and geomorphological disturbances is required and would expect a WFD assessment to be submitted with the ES”.</p> <p>“As noted in Section 5.23 of the submitted FRA, a residual flood risk affecting the site arises from the network of Internal Drainage Board drains linking into the wider river/drain system in the Isle of Axholme (IoA). There is a risk that in the event of a breakdown in the pumping network, the drain network in the IoA would begin to flood. This risk is accounted for by the Critical Flood Level (CFL) for the IoA, as set out in the Strategic Flood Risk Assessments of North Lincolnshire and City of Doncaster. North Lincolnshire SFRA (2021) outlines that the CFL is 3.8m above Ordnance Datum for the IoA and that critical equipment should be raised 0.3m above this”. “We advise that the FRA should consider the impacts of CFL being reached on the development.” “The FRA does not propose to raise critical equipment above the CFL. In terms of meeting the requirement of the National Policy Statements in relation to the development remaining operational during times of flood it would be for the</p>	<p>A WFD assessment is included in ES Appendix 10.2 Flood Risk Assessment [Document Reference 6.3.10.2]. The WFD Assessment (ES Appendix 10.2 – Water Framework Directive Assessment [Document Reference: 6.3.10.2]) concludes that “Overall, the assessment concluded that none of the activities associated with the Scheme have the potential to cause a deterioration in status of WFD surface water bodies or groundwater bodies or impact hydrologically connected protected areas. The Scheme was not considered to jeopardise the attainment of ‘good’ overall status of WFD water bodies”. The assessment also notes that “A positive effect on River Basin Management Plan objectives was identified within this assessment.</p>
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ENVIRONMENTAL STATEMENT

Water Resources

	<p>Inspector to determine whether this would be acceptable.”</p> <p>“We previously advised that providing there is no raising of ground levels and structures can be raised to allow the free flow of floodwater, the development would be acceptable in Flood Zone 3b. Section 5.18 and 5.19 of the FRA considers the requirement for floodplain compensation, although only for Flood Zone 3b; however, floodplain compensation is also required for Flood Zone 3a. We are satisfied that the impact of the solar panel legs will have a negligible impact on floodplain storage and flood flows as they are small and dispersed. However, we consider that the 300mm gravel bases for the inverter buildings, battery containers, customer switchgear containers and spares containers will impact the flow of floodwater and therefore result in a loss of floodplain storage. This loss of floodplain storage must be fully compensated for.”</p> <p>“We note that Section 7.4 of the FRA refers to the containment of potentially contaminated fire water for the proposed battery energy storage systems. If the containment system is in the form of a bund, it must be ensured that any loss of floodplain storage is compensated for”.</p>	<p>The cessation of agricultural activities was considered to have an overall benefit to the status of WFD water bodies, and a positive improvement in biodiversity was identified through the proposed creation of species-rich grassland in place of cultivated land. The avoidance and management of riparian zones of all watercourses was considered to promote biodiversity. Additionally, the Scheme was considered to help combat climate change by helping reduce reliance on fossil fuels.”</p> <p>As detailed in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]), it is not feasible or proportionate to raise solar PV modules and associated infrastructure above the IoA critical flood level. To ensure the Site remains safe and operational over</p>
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ENVIRONMENTAL STATEMENT

Water Resources

	<p>“Please note that any fencing in the floodplain should be post and wire with a minimum 10mm aperture to allow the free flow of floodwater and minimise the collection of flood debris.”</p> <p>“We note that the Flood Map for Planning in Appendix D of the FRA should be updated with the new Flood Map for Planning, published in March 2025, from the Environment Agency website. There have been some small changes to the Flood Zones.”</p>	<p>its lifetime, solar PV modules and infrastructure proposed on site will be raised above the modelled 1 in 1,000 year flood depths plus a 100mm allowance for freeboard (see ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6]). This is considered suitable flood risk mitigation on site as is detailed in full in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1].</p> <p>ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6] includes typical sections of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers and details that all of these will be raised above the ground (minimum 100mm above the 1 in 1,000 year flood level) using</p>
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ENVIRONMENTAL STATEMENT

Water Resources

		<p>small footings which are sat on 300mm of permeable gravel. The impact of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers on floodplain storage will therefore be negligible and floodplain compensation is not considered necessary. Previous advice for the Environment Agency received on the 22 January 2025 (included in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]), agreed with this conclusion “providing there is no raising of ground levels and panels and structures can be raised to allow the free flow of floodwater across the floodplain”. There is no ground level raising proposed on site.</p> <p>The proposed Outline Surface Water Drainage Strategy is</p>
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ENVIRONMENTAL STATEMENT

Water Resources		
		<p>included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). The exact details of the surface water drainage strategy will be confirmed during detailed design stage, post-consent of the DCO application but it is not expected that containment of fire water is in the form of a bund, with the indicative strategy shown to utilise below ground crates to contain this water.</p> <p>ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6] includes typical fence details which comprise post and wire. The provision of a 10mm aperture would be considered at detailed design stage post-consent of the DCO application.</p>

ENVIRONMENTAL STATEMENT

Water Resources

		<p>This ES chapter and the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]) include that latest national flood risk data, including National Flood Risk Assessment data released in January 2025 and the updated Flood Map for Planning released in March 2025. Section 10.4 Baseline Conditions includes the latest flood data.</p>
<p>City of Doncaster Council (CDC)</p>	<p>"In the absence of a drainage strategy at this time, CDC's response can only be exclusively based on the FRA, and is as follows:</p> <ul style="list-style-type: none"> • CDC has collated some best practice for solar farms and have the following on our website CDC Document Title, which may be helpful guidance. • The Applicant should consider CDC local requirements when the drainage strategy is produced – <p>https://www.doncaster.gov.uk/services/planning/development-and-floodrisk</p>	<p>The proposed Outline Surface Water Drainage Strategy is included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). CDC local requirements have been considered when preparing this strategy.</p> <p>Updated Strategic Flood Risk Assessment (SFRA) information will be assessed as the DCO process</p>

ENVIRONMENTAL STATEMENT

Water Resources

	<p>https://www.doncaster.gov.uk/services/planning/ldf-supplementary-planning-documents</p> <ul style="list-style-type: none"> • An outdated SFRA (CDC) has been referenced, although it should be noted that this has not yet been updated. Once this is updated, the Critical Flood Level may change and this should be checked as the process continues. • Humber 2100 strategy baseline modelling may not have been considered. There is a risk that without this information, tidal risk may not have been fully considered. • Recommend that a robust Flood Evacuation Plan is produced and submitted to CDC Emergency Planning team for consideration. • Flood plain compensation should be considered for any ground raising in flood zone 3 as described in the FRA. • Applicant should review the appropriateness of their easements requirements which may affect the proposed layout. The Internal Drainage Board (IDB) 9m easement is required regardless of whether the watercourse is board maintained. This should be confirmed with the IDB. 	<p>continues if it becomes available. CDC note that their SFRA “has not yet been updated”. It is noted however that as detailed in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]), it is not feasible or proportionate to raise solar PV modules and associated infrastructure above the loA critical flood level.</p> <p>The Environment Agency are responsible for tidal flood risk and are generally content with the tidal flood risk mitigation measures proposed on site (see Environment Agency comments in this table). The Environment Agency did not provide results of the Humber 2100 strategy baseline modelling or raise assessment of this modelling as a concern in their statutory consultation comments. With a design life of 40 years,</p>
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ENVIRONMENTAL STATEMENT

Water Resources

	<ul style="list-style-type: none"> • When a suitable surface water strategy is provided, the LLFA request that they are consulted on the proposals at the very earliest opportunity in order to ensure meaningful input. • It is advised that CDC LLFA preference is to store surface water above ground and not in underground tanks. This is to observe the four pillars of SuDS. This should be considered going forward. • Use of post and rail fencing encroaching into the cross-sectional area of the watercourse shown drawing no. 0309 should be reviewed. This is likely to be prone to blinding but that will be up to the IDB to determine whether they would support it through the consenting process.” 	<p>consideration of the Humber 2100 strategy baseline modelling is also considered disproportionate.</p> <p>A Flood Emergency Management Plan has been prepared and is included within the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]).</p> <p>Ground raising is not proposed. Ground raising had intentionally been avoided to ensure the impact of the Scheme of flood risk is minimised. Suitable flood risk mitigation measures are to be implemented on site that do not require ground level raising (see full details in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1] and also in Section 10.6</p> <p>If required by the Internal Drainage Board, watercourse buffers for</p>
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ENVIRONMENTAL STATEMENT

Water Resources

		<p>Ordinary Watercourses/non-IDB maintained watercourses that are not Main Rivers will be reviewed at detailed design post-consent of the DCO application.</p> <p>We welcome comments from the LLFA on the proposed Outline Surface Water Drainage Strategy included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). Full details of the proposed drainage will be confirmed during detailed design post-consents of the DCO application. During this stage, an assessment on the suitability of above ground SuDS will be carried out when full details of the proposals are available. Above ground SuDS have been ruled out at this outline stage on the basis that available space for SuDS on Site is not presently known, with SuDS</p>
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ENVIRONMENTAL STATEMENT

Water Resources

		<p>instead contained within the typical infrastructure layouts available (the Outline Surface Water Drainage Strategy is included in (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1].</p> <p>Suggested maintenance of the fencing proposed across watercourses is detailed in the Operation and Maintenance Manual included in ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1].</p>
North Lincolnshire Council (NLC)	<p>"The proposed solar farm and associated infrastructure are located to the west and south of Crowle, within the Isle of Axholme Critical Flood Level (CFL) zone. The site also falls within Flood Zones 3a and 3b, and as such, appropriate flood risk mitigation measures are essential. The Preliminary Environmental Information Report (Appendix 10.1 – FRA) suggests raising development above the 1 in 1000-year flood level with a 100mm freeboard. However, given the site's location in the CFL zone which is set at 3.8m AOD with a recommended</p>	<p>Raising infrastructure within the Order Limits to a level of 4.1mAOD (the CFL inclusive of 300mm of freeboard) would comprise raising of over 4m above ground level at the lowest point of the infrastructure, with parts of the Order Limits situated below 0mAOD in elevation. This would</p>

ENVIRONMENTAL STATEMENT

Water Resources

	<p>300mm freeboard (total 4.1m AOD). The LLFA expects developments to be protected to this level. This level reflects a worst-case scenario where prolonged flooding may occur due to pump failures, leading to semi-permanent or permanent inundation. The FRA indicates that raising the solar panels to meet the CFL is unfeasible due to site topography. However, the LLFA would like to see evidence of why this is not achievable as it could enhance both energy due to increased exposure to the sun and allow the ground to recharge at a better rate due to the distance between panels and the ground as well as protect from potential flood events.</p> <p>Developments in Flood Zone 3b must not alter ground levels in a way that reduces flood storage. Battery storage infrastructure should be elevated, and structures designed to allow water to pass freely underneath and preferably be located outside of areas of low topography which would potentially be deemed Flood Zone 3b.</p> <p>The LLFA supports the use of above-ground attenuation features such as swales and basins, which not only assist in managing runoff but also offer biodiversity benefits and align with SuDS best practice. All drainage designs must be site-specific, with hydraulic modelling to reflect changes in</p>	<p>take solar PV modules for example notably above the maximum of 3.6m AOD at the top edge as defined in ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6]. Raising infrastructure above the CFL would have significant structural and visual impact implications. The significant raising already proposed is considered appropriately conservative.</p> <p>Ground levels in Flood Zone 3b are not proposed to be altered. ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6] includes typical sections of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers and details that all of these will be raised above the ground (minimum 100mm above the 1 in 1,000 year flood level)</p>
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ENVIRONMENTAL STATEMENT

Water Resources

	<p>impermeable areas and ensure greenfield runoff rates are achieved. The design should avoid extensive underground systems and instead favour open, maintainable features.</p> <p>Construction activities pose a risk of disrupting surface water flows and introducing organic material and sediment into watercourses. Regular inspections should be carried out on affected watercourses. Any use of culverts or bridges will require agreement with the IDB, who prefer bridges. The LLFA supports this and emphasises that all bridges must be structurally assessed during and after construction to ensure they are not compromised by heavy vehicle use.</p> <p>The drainage strategy must also account for the Battery Energy Storage System (BESS) and include provisions for containing contaminated fire water, in line with Fire Service guidance. The required containment volume should be determined in consultation with the Fire Service and justified within the final application to ensure compliance with flood and environmental protection standards.</p> <p>Flood Risk Activity Permits may be required for any directional drilling beneath main rivers or watercourses.</p> <p>Fencing that crosses watercourses must be maintained to avoid debris build-up, which can obstruct flow. A maintenance plan should be established to ensure regular inspections."</p>	<p>using small footings which are sat on 300mm of permeable gravel. The impact of the proposed inverter buildings, battery containers, customer switchgear containers and spares containers on floodplain storage will therefore be negligible, with water able to pass freely underneath.</p> <p>In accordance with standard practice, an Outline Surface Water Drainage Strategy has been provided at this stage. A fully detailed drainage design will be prepared prior to construction. The proposed Outline Surface Water Drainage Strategy is included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]). Full details of the proposed drainage will be confirmed during detailed design post-consent of the DCO application. During this</p>
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ENVIRONMENTAL STATEMENT

Water Resources

		<p>stage, an assessment on the suitability of above ground SuDS will be carried out when full details of the proposals are available. More detailed network calculations would also be prepared during detailed design.</p> <p>The Outline Construction Environmental Management Plan [Document Reference 7.1] has been prepared as a stand alone document to assess the impact of construction activities.</p> <p>Construction details of proposed access crossing will be confirmed at detailed design stage post consent of the DCO application, ensuring the design does not impact current flow patterns.</p> <p>The proposed Outline Surface Water Drainage Strategy is included in the appended FRA (ES Appendix 10.1 Flood Risk Assessment</p>
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ENVIRONMENTAL STATEMENT

		Water Resources
		<p>[Document Reference 6.3.10.1] includes provisions for containing contaminated fire water. The containment volume is in accordance with the National Fire Chiefs Council Guidance on Grid Scale Battery Energy Storage System [Ref. 10-1].</p> <p>An Outline Battery Safety Management Plan [Document Reference 7.9.4] is included as a standalone document as part of the DCO application and details both the provision of fire water supply and containment. Flood Risk Activity Permits are to be disapplied, with protective measures included in the draft DCO [Document Reference 3.1].</p> <p>An Operation and Maintenance Manual has been prepared and is included within the appended FRA (ES Appendix 10.1 Flood Risk</p>

ENVIRONMENTAL STATEMENT

Water Resources

		Assessment [Document Reference 6.3.10.1]). The manual includes management of fencing across watercourses.
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10.3. Assessment Approach

Methodology

- 10.3.1. The Overarching National Policy Statement for Energy (NPS EN-1) requires that development is designed to remain safe over its lifetime without increasing flood risk elsewhere (taking into account climate change). A full assessment of flood risk in accordance with NPS EN-1 is included in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**.
- 10.3.2. The technical guidance of the National Planning Policy Framework NPPF **[Ref. 10-2]** requires assessment of all potential sources of flooding with respect to new development. This has been carried out in a separate FRA by Pegasus Group and is included as a Technical Appendix of this ES (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**). The FRA appended to this ES assesses the risk of flooding from the following sources:
- Fluvial
 - Tidal
 - Surface Water Flooding
 - Groundwater
 - Flooding from Sewers
 - Artificial Sources (Canals and Reservoirs).
- 10.3.3. This ES Chapter has been informed by the following assessment stages:
- Assessment of the Site's baseline conditions.
 - Assessment of the potential effects of the Proposed Development.
 - Provision of mitigation measures to minimise the potential effects of the Proposed Development.
 - Review of residual effects.
- 10.3.4. The assessment of the Site's baseline conditions has been informed by the following data:
- The Flood Map for Planning **[Ref. 10-3]**
 - Risk of Flooding from Rivers and Sea **[Ref. 10-4]**

- Internal Drainage Board (IDB) Mapping
- British Geological Survey Mapping of Bedrock and Superficial Deposits [Ref. 10–5]
- SoilScapes Soil Mapping [Ref. 10–6]
- Environment Agency Tidal Trent (2023) Flood Model Data
- Environment Agency River Torne Flood Hazard Mapping Study (2018)
- Hydrogeology 625K Digital Hydrogeological Map of the UK [Ref. 10–7]
- National Flood Risk Assessment Risk of Flooding from Surface Water data (extents and depths) [Ref. 10–8]
- The Doncaster MBC Level 1 Strategic Flood Risk Assessment (2015)
- The North and North East Lincolnshire Strategic Flood Risk Assessment (2022)
- Environment Agency Reservoir Flood Extents [Ref. 10–9]
- Environment Agency Recorded Flood Outlines [Ref. 10–10]
- Site Specific Topographic Survey Data
- Light Detection and Ranging (LiDAR) Data [Ref. 10–11]

10.3.5. An Outline Surface Water Drainage Strategy has been prepared and is included in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**. This strategy highlights how surface water runoff from the Proposed Development will be managed.

10.3.6. The Sequential Test and Exception Tests have been undertaken in accordance with NPS EN-1. The Sequential Test is included in **[Document Reference 7.11]**, whilst the Exception Test assessment is included in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**.

10.3.7. A WFD Assessment has been prepared and is included in **ES Appendix 10.2 Water Framework Directive Assessment [Document Reference: 6.3.10.2]**.

10.3.8. The following receptors have been assessed with this chapter:

- Watercourses (includes Main Rivers, IDB maintained watercourses and Ordinary Watercourses).
- Surface Water.
- Groundwater.
- Areas of predicted flood risk (fluvial, tidal and surface water).

Zone of Influence

- 10.3.9. A 2km Zone of Influence has been assessed within the chapter. No additional receptors or potential for significant effects have been identified within this 2km extent which are considered to require any further assessment.
- 10.3.10. A 2km Zone of Influence is considered appropriate due to the notable reduction in magnitude of impact beyond this distance from the Site. Any contaminants would be diluted 2km from the Site and any flood water would be dispersed 2km from the Site.
- 10.3.11. The 2km Zone of is considered a conservative approach. The Department of Transport's Design Manual for Roads and Bridges states "for assessment of impacts associated with soluble pollutants, outfalls within 1km (measured along the watercourse) shall be aggregated for purposes of cumulative assessment" [Ref. 10–12].

Assessment of Significance

- 10.3.12. The approach followed during the assessment considered the degree (or the 'significance') of the potential effects upon the hydrological and hydrogeological characteristics of the Order Limits. The significance has been defined taking into account the sensitivity of the receiving environment and the potential magnitude of the impact, consistent with the broad methodology set out in **ES Chapter 4 Approach to Environmental Impact Assessment [Document Reference 6.1.4]** of this report. For this chapter, the definition of the receiving environment is set out in **Table 10–3** below taken from the Design Manual for Roads and Bridges guidance LA103 documents [Ref. 10–3]. The Design Manual for Roads and Bridges guidance provides standards and guidance for assessing and managing the impacts of road construction and operation on water resources including surface water, groundwater and flood risk and in the absence of guidance specific so solar farm developments, is considered appropriate to guide this assessment.

Table 10-3: Definition of the receiving environment

Sensitivity	Definition
High	<p>Receptor with a high quality and rarity, regional or national scale and limited potential for substitution/replacement</p> <p>Inner Source Protection zone (Zone 1)</p> <p>Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC)</p> <p>Excellent water quality</p> <p>Large scale industrial agricultural abstractions >1000m³/day within 2km downstream, or abstractions for public drinking water supply</p> <p>Designated salmonid fishery and/or salmonid spawning grounds present</p> <p>Watercourse widely used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.) within 2km downstream</p> <p>Conveyance of flow and material, main river >10m wide</p> <p>Active floodplain area (important in relation to flood defence)</p>
Medium	<p>Receptor with a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a medium quality and rarity, regional or national scale and limited potential for substitution/replacement</p> <p>Outer Source Protection Zone (Zone 2)</p> <p>Nitrate Vulnerable Zone</p> <p>Principal Aquifer</p> <p>Good water quality</p>

	<p>Large scale industrial agricultural abstractions 500–1000m³/day within 2km downstream</p> <p>Surface water abstractions for private water supply for more than 15 people</p> <p>Designated salmonid fishery and/or cyprinid fishery</p> <p>Watercourse used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.)</p> <p>Conveyance of flow and material, main river >10m wide</p> <p>Active floodplain area (important in relation to flood defence)</p>
Low	<p>Receptor with a low quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution/replacement</p> <p>Total Catchment Source Protection Zone (Zone 3)</p> <p>Secondary Aquifer</p> <p>Fair water quality</p> <p>Industrial/agricultural abstractions 50–499m³/day within 2km downstream</p> <p>Designated cyprinid fishery or undesignated for fisheries – Occasional or local recreation (e.g. local angling clubs)</p> <p>Groundwater abstractions 50–500m³/day – Private water supplies present</p> <p>Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries</p> <p>Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality</p>
Negligible	<p>Receptor with a negligible quality and rarity, local scale and limited potential for substitution/replacement</p>

	<p>No SPZ</p> <p>Unproductive Strata</p> <p>Environmental equilibrium stable and resilient to changes that are greater than natural fluctuations, without detriment to its present character</p> <p>Polluted/poor water quality</p> <p>Industrial/agricultural abstractions < 50m³/day within 2km downstream</p> <p>Fish sporadically present or restricted, no designated fisheries; not used for recreation</p> <p>Watercourse < 5m wide</p> <p>Area does not flood/is located in Environment Agency Flood Zone 1</p> <p>Receptor heavily engineered or artificially modified and may dry up during summer months</p>
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- 10.3.13. The magnitude of the impact/change includes the timing, scale, size and duration of the potential impact. For the purposes of this assessment, the magnitude criteria are defined in **Table 10-4** below taken from the Design Manual for Roads and Bridges guidance LA103 document [Ref. 10-12].

Table 10-4: Magnitude of change

Magnitude	Criteria	Description and example
High	Results in loss of attribute	<p>Fundamental (long term or permanent) changes to the hydrology/hydrogeology:</p> <ul style="list-style-type: none"> • Loss of EC designated Salmonid fishery • Loss of designated species/habitats • Change in water quality status of river reach • Compromise employment source

		<ul style="list-style-type: none"> • Pollution of potable source of abstraction • Loss of flood storage/increased flood risk
Medium	Results in impact on integrity of attribute or loss of part of attribute	<ul style="list-style-type: none"> • Material but non-fundamental and short to medium term changes to the hydrogeology or water quality: • Loss in productivity of a fishery • Contribution of a significant proportion of the effluent in the receiving water, but insufficient to change its water quality status • Reduction in the economic value of the feature • Reduced reliability and quality of a supply at a groundwater abstraction source
Low	Result in minor impact on attribute	<ul style="list-style-type: none"> • Detectable but non-material and transitory changes to the hydrogeology or water quality: • Measurable change in attribute, but of limited size and/or proportion • Measurable but limited change in a groundwater supply reliability and quality
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	<ul style="list-style-type: none"> • No perceptible changes to hydrogeology or water quality: • No significant effect on the economic value of the receptor • No change in a groundwater supply reliability and quality • No increase in flood risk

10.3.14. Consistent with the methodology set out in **ES Chapter 4 Approach to Environmental Impact Assessment [Document Reference 6.1.4]** of this report,

the sensitivity of the receiving environment together with the magnitude of the change/impact defines the significance of the effect prior to the application of mitigation measures. So, for the purposes of assessing effects on the water environment, **Table 10-5** sets out the relevant significance criteria.

Table 10-5: Significance criteria

Magnitude of Change	Sensitivity of Receptor				
		High	Medium	Low	Negligible
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

- 10.3.15. Therefore, potential effects are concluded to be of Major, Moderate, Minor or Negligible. Effects denoted as 'Moderate' or 'Major' are considered as significant effects for the purpose of this assessment.

Legislative and Policy Framework

- 10.3.16. This assessment is based on the following legislation, policy and guidance:

Legislation

Water Resources Act 1991 [Ref. 10-13]

- 10.3.17. The Water Resources Act 1991 regulates water resources, water quality and flood defence. The Water Resources Act 1991 defines 'Main Rivers' and highlights the requirement for EA consent for any works or structures in, over, under, or within 8m of any Main River. The Act includes provisions for controlling pollution.

Land Drainage Act 1991 [Ref. 10-14]

- 10.3.18. The Land Drainage Act 1991 defines the responsibilities of Local Authorities and Internal Drainage Boards related to land drainage. The Act emphasises the responsibility of landowners to maintain watercourses on their land to ensure the free flow of water.

The Groundwater (England and Wales) Regulations 2009 [Ref. 10-15]

- 10.3.19. The Groundwater (England and Wales) Regulations 2009 aim to prevent pollution of groundwater in England and Wales and make it an offence to cause or knowingly permit the discharge of hazardous substances or non-hazardous pollutants to groundwater (unless permitted by the EA).

Control of Pollution (Oil Storage) (England) Regulations 2001 [Ref. 10-16]

- 10.3.20. These regulations detail the requirements for safe above ground storage of oil and also include obligations with regard to pipework, fittings and pumps serving oil bowlers.

Water Industry Act 1991 [Ref. 10-17]

- 10.3.21. The Water Industry Act 1991 sets out the main powers and duties of water and sewerage companies, replacing those set out in the Water Act 1989. The Water Act 2003 and the Water Act 2024 have each modified the framework set out in the Water Industry Act 1991. The Act relates to water supply and the provision of wastewater services.

Environmental Permitting (England and Wales) Regulations 2016 [Ref. 10-18]

- 10.3.22. The Environmental Permitting (England and Wales) Regulations 2016 establish a permitting structure for activities that may cause harm to human health or the environment. Environmental permits are required from the EA for certain installations and to abstract or discharge surface water or groundwater.

Nitrate Pollution Prevention Regulations 2015 [Ref. 10-19]

- 10.3.23. The Nitrate Pollution Prevention Regulations 2015 define the designations of nitrate vulnerable zones and restrict the annual amount of nitrogen from organic manure that can be applied to a crop in a nitrate vulnerable zone.

Flood Risk Regulations 2009 [Ref. 10-20]

- 10.3.24. The Flood Risk Regulations 2009 implement the EU Floods Directive 2007/60/EC and require Lead Local Flood Authorities to prepare Preliminary Flood Risk Assessments, flood hazard mapping, flood maps and Flood Risk Management Plans.

Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 [Ref. 10-21]

- 10.3.25. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD Regulations 2017) consolidate, revoke and replace the

Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, which transpose the European Union (EU) Water Framework Directive (WFD) into national law. The WFD is a wide-ranging piece of European legislation that establishes a new legal framework for the protection, improvement and sustainable use of surface waters, coastal waters and groundwater across Europe in order to:

- Promote sustainable water use.
- Contribute to the mitigation of floods and droughts.
- Prevent deterioration and enhance status of aquatic ecosystems, including groundwater; and
- Reduce pollution.

- 10.3.26. Water management has historically been co-ordinated according to administrative or political boundaries. The WFD promotes a new approach based upon management by river basin – the natural geographical and hydrological unit. River basin management plans, published by the Environment Agency and the Department for Environment Food & Rural Affairs (Defra), include clear objectives in respect of water quality and pollution control and a detailed account of how objectives are to be met within a prescribed timeframe.

Flood and Water Management Act 2010 [Ref. 10-22]

- 10.3.27. The Flood and Water Management Act (FWMA) 2010 takes forward some of the proposals set out in three previous strategy documents published by the UK Government: Future Water, Making Space for Water and the UK Government's response to the Sir Michael Pitt Review of the summer 2007 floods. In doing so, it gives the EA a strategic overview of flood risk and gives local authorities responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas.
- 10.3.28. The FWMA 2010 (Schedule 3) proposed the establishment of SuDS Approval Bodies (the SAB) at county or unitary local authority levels. The role of the SAB was envisaged as implementing the recommendations of the Pitt Review (2008) in promoting the use of SuDS within future development.
- 10.3.29. Following a period of consultation, the proposed role of the SAB has been amended, with the promotion of SuDS being incorporated into the planning process. This has been achieved by designating LLFA's as statutory consultees with regards to 'local' sources of flood risk and surface water management. The

Ministerial Written Statement HCWS161 details this change in policy, which came into effect in April 2015.

National Policy

National Policy Statements

- 10.3.30. The National Policy Statements (NPS) comprise the Government's objectives for the development of nationally significant infrastructure in a particular sector and state. The NPSs of relevance to the project with specific reference to water-related requirements are as follows.

Overarching National Policy Statement for Energy (NPS EN-1) [Ref. 10-23]

- 10.3.31. In relation to flood risk, this NPS sets out the requirements for the application of the Sequential and Exception Tests (paragraphs 5.8.9 to 5.8.10 and paragraphs 5.8.21 to 5.8.23), as well as a sequential approach within the application boundary (paragraph 5.8.29). It describes policy aims to make development safe for its lifetime without increasing flood risk elsewhere (taking account of climate change) and, where possible, reducing flood risk overall (paragraph 5.8.36). Specifically, development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage, and any deflection or constriction of flood flow routes should be safely managed within the site (paragraph 5.8.12). The NPS sets out the minimum requirements for FRAs (paragraph 5.8.15).
- 10.3.32. In relation to climate change, paragraph 4.10.11 of this NPS states that *"applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario"*. However, it goes on to state in paragraph 4.10.12 that the credible maximum climate change scenario should be applied *"where energy infrastructure has safety critical elements"*. The NPS advises that the resilience of the Scheme to climate change should be assessed in the EIA, for example, the impact of increased risk of drought as a result of higher temperatures should be covered in the water quality and resources section of the EIA.
- 10.3.33. In relation to water quality and resources, paragraph 5.16.3 of the NPS states that *"where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical*

characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment". It sets out how existing water resources, and impacts on those resources, should be described within the EIA (paragraph 5.16.7).

- 10.3.34. The requirements of NPS EN-1 relating to flood risk are addressed within **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**, and within a separate Flood Risk Sequential Assessment and Exception Test **[Document Reference 7.11]**. The FRA describes the measures taken to ensure the Scheme will be safe without increasing flood risk elsewhere. The applicable climate change allowances are considered within the FRA. The potential impacts of the Scheme on water quality and water resources, taking account of climate change, are considered within this chapter.

The National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2024) [Ref. 10-24]

- 10.3.35. The NPS EN-3 considers matters specific to renewable energy infrastructure, including solar PV. With regards to flooding, NPS EN-3 details that where solar sites are proposed in low lying exposed sites, that applicants must show how the site will be resilient to increased risk of flooding and the impacts of climate change.
- 10.3.36. NPS EN-3 also states that *"where a Flood Risk Assessment has been carried out this must be submitted alongside the Applicant's ES. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant."* (paragraph 2.10.84).
- 10.3.37. Paragraph 2.10.85 states that permeable access tracks should be used, as well as localised SuDS such as swales and infiltration trenches, to control any runoff where recommended.
- 10.3.38. Paragraph 2.10.86 of the NPS states that *"sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses"*. Paragraphs 2.10.87 to 2.10.88 state that culverting existing watercourses or drainage ditches should be avoided but where culverting is necessary for access, *"applicants should demonstrate that no reasonable alternatives exist and where necessary will only be in place for the construction period"*.
- 10.3.39. Paragraph 2.10.154 of the NPS states that *"where previous management of the site has involved intensive agricultural practice, solar sites can deliver*

significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management”.

The National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (2023) [Ref. 10-25]

- 10.3.40. This National Policy Statement (NPS), taken together with the Overarching NPS for Energy (EN-1), provides the primary policy for decisions taken by the Secretary of State on applications it receives for electricity networks infrastructure.
- 10.3.41. With reference to flood risk and drainage, NPS EN-5 details that applicants are required to set out how developments have been designed to be resilient to flooding, particularly for substations that are vital to the network (paragraph 2.3.2).

The National Planning Policy Framework (2024) [Ref. 10-2]

- 10.3.42. The National Planning Policy Framework, although not forming the basis of the Secretary of State’s decision on a DCO application, provides important and relevant requirements with regards to flood risk.
- 10.3.43. Chapter 14 of the National Planning Policy Framework “Meeting the challenge of climate change, flooding and coastal change” highlights the requirements on planning applications in relation to taking a proactive approach to mitigating and adapting to climate change, moving development away from flood risk areas where possible and considering marine and coastal management where applicable.

25 Year Environment Plan [Ref. 10-26]

- 10.3.44. The 25 Year Environment Plan is a UK government 25 year plan to improve the environment, including water quality. Goals included in the plan comprise reducing damaging extraction of water, reaching or exceeding objectives for rivers, lakes, coastal and ground water that are specially protected, minimising water lost through leakage and minimising the harmful bacteria in designated bathing waters.

The Planning Policy Guidance (PPG) (2022) [Ref. 10-27]

- 10.3.45. The PPG for “Flood risk and coastal change” advises how to take account of and address the risks associated with flooding and coastal change in the planning process.

Local Planning PolicyNorth and North East Lincolnshire Strategic Flood Risk Assessment (SFRA) (2022)
[Ref. 10-28]

- 10.3.46. This Strategic Flood Risk Assessment (SFRA) is an update of the original report, which was published in 2011. The main purpose of a SFRA is to provide the information needed for a planning authority to take flood risk into account when making land use allocations and determining planning applications.
- 10.3.47. The purpose of this update is to ensure the SFRA provides a comprehensive and robust evidence base to inform the preparation and production of the North Lincolnshire Local Plan to 2038 and the future review of the North East Lincolnshire Local Plan.
- 10.3.48. This revised SFRA will be used by both North and North East Lincolnshire Councils in decision making and to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk taking into account the latest and most up to date information.

Doncaster Metropolitan Borough Council (MBC) Level 1 Strategic Flood Risk Assessment (2015) **[Ref. 10-29]**

- 10.3.49. This SFRA updates the previous report issued in 2009 and assessment the level of flood risk, at a strategic level, within Doncaster MBC. Doncaster MBC as Lead Local Flood Authority required an SFRA to develop the evidence base for their Local Plan.

North Lincolnshire Council Development and Flood Risk Guidance Note (April 2013) **[Ref. 10-30]**

- 10.3.50. This guidance note provides local advice to developers, applicants and council officers on the application of national planning policy contained within the NPPF which aims to avoid inappropriate development in areas of flooding by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

North Lincolnshire Local Flood Risk Management Strategy (August 2016) **[Ref. 10-31]**

- 10.3.51. Much of North Lincolnshire is flat and low lying and is therefore susceptible to flooding from a range of sources. Therefore, whilst this document focuses on

local flood risks, it also sets out how all of the Risk Management Authorities covering North Lincolnshire have agreed to work together to consider risks from all potential sources of flooding. The EA is currently developing a Flood Risk Management Plan for the Humber catchment, within which North Lincolnshire is located, which will consider flooding from non-local sources, such as rivers and the sea.

The CIRIA SUDS Manual (CIRIA 753) [Ref. 10-32]

- 10.3.52. The SuDS Manual (2015) expands upon the framework set out by the Government's Non-Statutory Technical Standards for SuDS and sets out the latest industry practice and guidance regarding the planning, design, construction, management and maintenance of SuDS.

Limitations to the Assessment

- 10.3.53. This chapter is limited to the effects from rainfall falling on the Site as well as increase in sea levels and its management in flow and quality in relation to the receiving watercourses. It does not consider the ecology of the habitats, which is covered in **ES Chapter 7: Ecology and Nature Conservative [Document Reference 6.2.7]** of this ES.
- 10.3.54. By its nature, rainfall, antecedent conditions and characteristics vary, as well as conditions related to normal rainfall standards; exceedance events could potentially cause nuisance, which are beyond the scope of this assessment.
- 10.3.55. The FRA (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**) and ES chapter are reliant on publicly available data and additional data provided by consultees; it is assumed that this information is correct and complete.
- 10.3.56. This ES assesses two option layouts, one which includes both fixed and tracker solar PV modules and one that includes only fixed solar PV modules. The layout optionality does not materially impact the assessment within this chapter or within the FRA (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**). The assessment of impacts, significant effects and mitigation measures provided is applicable to both design options and there is no material difference.

10.4. Baseline Conditions

Site Description and Context

- 10.4.1. The Site broadly lies between the settlements of Thorne and Crowle, occupying separate parcels of land within a relatively flat agricultural landscape predominantly in arable use for the cultivation of cereal crops with some areas of modified grassland and short rotation coppice. Many of the field boundaries are subdivided into rectilinear parcels by long linear drainage ditches, some with partial or sporadic hedgerows. The Scheme's Land Parcels are dissected by several major roads and routes, including the M180 motorway, the A18, the South Humberside Main Line railway route and Stainforth & Keadby Canal (see **ES Figure 1.2 Land Parcel Plan [Document Reference 6.4.1.2]**).
- 10.4.2. There are many field drain ditches running across the Order Limits, assumed to be used for agricultural drainage. The closest Main Rivers noted by the EA are the two drains running adjacent to the canal crossing the midsection of the Order Limits and the Hatfield Waste Drain at the southern end of the Order Limits.
- 10.4.3. Numerous other minor roads cross the landscape connecting scattered residential properties and farmsteads, many of which lie adjacent or in proximity to the Order Limits. Overhead power lines and lattice pylons runs across the northern part of the Scheme which creates other vertical elements within the landscape. There are wooden pole lines and masts within the Order Limits.
- 10.4.4. Bar the two areas of significant woodland to the north and south of the Order Limits associated with former peat extraction at Hatfield Moors and Thorn Moors, the landscape contains relatively limited areas of vegetation, largely limited to field boundaries in the form of hedgerows, which many are incomplete and gappy. There are occasional scattered trees or groups of trees and some small woodland copses.
- 10.4.5. There are four Public Rights of Way (PRoW) that are located within or close to the Scheme. Public Footpath FP19 (Thorne) lies in the central northern part of the Order Limits forming part of the access to the Scheme. Public Footpath FP15 (Thorne) lies just beyond the most northwestern boundary of the Scheme. In the northeastern part of the Scheme PRoW (Footpath 17) lies beyond the Scheme area forming a continuation of an unnamed north-east/southwest Byway. Footpath 18 runs from the unnamed byway south eastwards into the western side of Crowe.
- 10.4.6. For the purposes of reporting, a parcel and parcel number have been created to divide areas of the Order Limits for the Scheme to assist with reporting and to aid the reader. The Land Parcels plan is provided at **ES Figure 1.2 Land Parcel Plan [Document Reference 6.4.1.2]** and a breakdown of the Land Parcels into

field development parcels within the Order Limits is shown on **ES Figure 1.3 Development Parcel Plan [Document Reference 6.4.1.3]** to assist with the identification of particular fields with Scheme in relation to the EIA findings

Baseline Survey Information

- 10.4.7. There are many field drain ditches running across the Order Limits, assumed to be used for agricultural drainage. The closest Main Rivers noted by the EA are the two drains running adjacent to the canal crossing the midsection of the Order Limits and the Hatfield Waste Drain at the southern end of the Order Limits. The Internal Drainage Board map provided shows a large number of drainage ditches across the Order Limits that will be a key asset of the Internal Drainage Board requiring 9m buffers from the top of bank on both sides, where appropriate. Mapping of watercourses on site is included in Appendix A and B of **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**.
- 10.4.8. The land within the Order Limits is currently agricultural greenfield area, typically there should not be pipework under the fields however it has been identified from the Internal Drainage Board mapping that there are culverted pipes owned and maintained by the Internal Drainage Board.
- 10.4.9. Geological data held by the British Geological Survey (BGS) indicates that the bedrock geology underlying the Order Limits is Sherwood Sandstone Group – Sandstone in the west (Land Parcels A, C, D and E) and Mercia Mudstone Group – Mudstone in the east (Land Parcels B and E). BGS Bedrock Geology across the Site is shown in **ES Figure 10.5 BGS Bedrock Geology [Document Reference 6.4.10.5]**.
- 10.4.10. Soilscape soils data **[Ref. 10-6]** shows the Order Limits to comprise 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' and 'Loamy and clayey soils of coastal flats with naturally high groundwater'. Therefore, it can be considered that the Order Limits does not benefit from a high rate of infiltration. A comprehensive review of ground conditions is included in **ES Chapter 9: Ground Conditions [Document Reference 6.2.9]**.

Fluvial (River) Flooding

- 10.4.11. The Flood Map for Planning (updated March 2025) **[Ref. 10-3]** generally defines the entire Order Limits as Flood Zone 3, at High risk of flooding, predicted to be impacted by a 1 in 100 year fluvial flood event. The Flood Map for Planning is shown in **Figure 10.1 Flood Map for Planning [Document Reference 6.2.10.1]**.

- 10.4.12. The Risk of Flooding from Rivers and Seas dataset released in January 2025 [**Ref. 10-4**] is included in **Figure 10.2 Risk of Flooding from Rivers and Seas [Document Reference 6.2.10.2]** and also predicts flood risk across the Order Limits ranging from Very Low to High.
- 10.4.13. As detailed in the EA correspondence included in the FRA appendices (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**), parts of the Order Limits are also defined as Flood Zone 3b, the functional floodplain predicted to be impacted by a 1 in 30 year fluvial flood event. A plan of Flood Zone 3a and Flood Zone 3b is included in the FRA appended to this ES (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 10.4.14. There are a large number of watercourses within the Order Limits and in the surrounding area, many of which are managed by the Internal Drainage Board.
- 10.4.15. Correspondence with the EA highlights that the Order Limits is at risk of flooding from the tidal River Trent, the River Torne and associated Drains. The River Trent is located approximately 5km east of the eastern end of the Order Limits, whilst the River Torne flows through the Site just west of land parcel E12, E15 and E18 before flowing along the northern edge of the Order Limits toward the River Trent. The EA also highlight that land drainage represents the dominant flood risk at the Order Limits and that the Order Limits is located in the Isle of Axholme Critical Drainage Area which has a reported critical flood level of 4.1mAOD.
- 10.4.16. Overall, the fluvial flood risk to the Scheme is considered to be Low to Medium.

Tidal (Sea) Flooding

- 10.4.17. The Flood Map for Planning (2025) [**Ref. 10-3**] generally defines the entire Order Limits as Flood Zone 3, at High risk of flooding, impacted by a 1 in 200 year tidal flood event. Tidal flood risk at the Order Limits is associated with the tidally influenced River Trent (there are also fluvial sources of flooding to consider – see Fluvial Flooding section above).
- 10.4.18. The Flood Map for Planning also highlights flood defences at the Order Limits and defines the Order Limits as an area that benefits from a ‘reduction in risk of flooding from rivers and sea due to defences’. The Flood Map for Planning is shown in **Figure 10.1. Flood Map for Planning [Document Reference 6.2.10.1]**.
- 10.4.19. The Risk of Flooding from Rivers and Seas dataset was released in January 2025 [**Ref. 10-4**]. A plan of the Risk of Flooding from Rivers and Seas dataset is included in **Figure 10.2 Risk of Flooding from Rivers and Seas [Document**

Reference 6.2.10.] The dataset predicts the vast majority of the Order Limits to be at risk of flooding, ranging from Very Low to High risk.

- 10.4.20. In addition to the datasets discussed above, the EA has provided detailed hydraulic model data for the Tidal Trent. Information provided by the EA is included in the FRA appended to this ES (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 10.4.21. During a worst-case 1 in 1000 year flood event, the Tidal Trent model predicts flood levels within the Order Limits to range from approximately -1mAOD to 2.2mAOD. Ground levels within the Order Limits as defined by the topographic survey are generally in the approximate range of -0.2mAOD and 2.6mAOD.

Surface Water Flooding

- 10.4.22. Surface water flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 10.4.23. The new National Flood Risk Assessment (NaFRA2), published in January 2025 **[Ref. 10-8]** has updated the Risk of Flooding from Surface Water (RoFSW) products which show the chance of flooding from surface water to areas of land.
- 10.4.24. The RoFSW products are an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. It includes information about flooding extents and depths including the potential impact of climate change on flood risk, based on the latest UK Climate Projections (UKCP18).
- 10.4.25. Risk is displayed as one of three likelihood categories in the RoFSW dataset:
- 'High Risk' (High Likelihood); >3.3% AEP (annual probability greater than 1 in 30).
 - 'Medium Risk' (Medium Likelihood); 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
 - 'Low Risk' (Low Likelihood); 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).

- 10.4.26. The latest RoFSW depth mapping shows the annual chance of flooding (based on the three risk categories listed above) beyond a specific depth, for depths at several intervals from 20cm to 120cm (i.e. 0.2m, 0.3m, 0.6m, 0.9m, and 1.20m).
- 10.4.27. The Risk of Flooding from Surface Water (RoFSW) dataset shows that some areas of the Order Limits are not predicted to be impacted by a 1 in 1000 year rainfall event and have a Very Low Risk likelihood of surface water flooding. The dataset also highlights areas at the Order Limits with a High to Low likelihood, predicted to be impacted by a 1 in 30 and 1 in 1000 year rainfall event, respectively, spread across the Order Limits and impacting all Land Parcels A to E inclusive. These at-risk areas are generally isolated and associated with surface water arising within the Order Limits boundary itself.

Groundwater Flooding

- 10.4.28. BGS data show that the bedrock geology within the Order Limits is split between 'Sherwood Sandstone Group – Sandstone' in the west (Land Parcels A, C, D and E) and 'Mercia Mudstone Group – Mudstone' in the east (Land Parcels B and E) (see **ES Figure 10.5 BGS Bedrock Geology [Document Reference 6.2.10.5]**). It is considered likely that the sandstone in the west will be permeable, whilst the mudstone in the east is expected to be impermeable. There is potential for groundwater emergence where these two bedrocks meet.
- 10.4.29. The hydrogeology aquifer classification defines the western half of the Order Limits (Land Parcels A, C, D and E where sandstone is generally the underlying bedrock) as a highly productive aquifer, whilst the eastern half (Land Parcels B, and E which are generally underlain by mudstone) is defined as a low productivity aquifer (see **ES Figure 10.6 Hydrogeology Aquifer Classification [Document Reference 6.2.10.6]**). As with having two different bedrocks, there is potential for groundwater emergence where these two aquifer types meet.
- 10.4.30. BGS also record a wide range of superficial deposits at the Order Limits. These deposits include: 'Alluvium – Clay, Silt, Sand and Gravel', 'Hemingbrough Glaciolacustrine Formation – Clay, Silty', 'Warp – Clay and Silt', 'Peat', 'Glaciofluvial Deposits, Devensian – Sand and Gravel', 'Brighton Sand Formation – Sand, Silty' and 'Sutton Sand Formation – Sand'. Any clay superficial deposits across the Order Limits are expected to restrict groundwater emergence.
- 10.4.31. Given the significant number of watercourses on site and in the surrounding area, it is considered unlikely that groundwater would rise above the fluvial/tidally influenced flood levels on site.

- 10.4.32. Site topography is also not considered conducive to groundwater flooding – any ground water to emerge is generally expected to follow site topography and fall towards the watercourses on site without accumulating to significant depths.
- 10.4.33. Overall, given the above, although there is potential for groundwater emergence on site, the risk is considered to be Low.

Sewer Flooding

- 10.4.34. The Doncaster MBC Level 1 Strategic Flood Risk Assessment (2015) **[Ref. 10–29]** interactive mapping does not show any recorded flood events from the Severn Trent Water Floods Register that impact the Order Limits.
- 10.4.35. The North and North East Lincolnshire Strategic Flood Risk Assessment (2022) **[Ref. 10–28]** states that ‘sewerage drainage problems’ have been mapped on their ‘interactive maps’. These interactive maps have not been found freely available to view online at the time of writing this report (July 2025) and as such, no records of sewer flooding at the site have been found.
- 10.4.36. As the Order Limits is entirely greenfield, it is unlikely that there is an existing underground drainage network located within the Order Limits. Additionally, any flood water from sewers in the close vicinity of the Order Limits would follow local topography and would not be expected to accumulate within the Order Limits.
- 10.4.37. The risk of flooding from sewers to the Order Limits is therefore considered to be Low.

Flooding from Artificial Sources

- 10.4.38. The EA’s Reservoir Flood Extents **[Ref. 10–9]** shows the extent of flooding should a catastrophic breach occur during a ‘wet day’ when local rivers had already overflowed their banks and highlights parts of the Order Limits to be at risk during a ‘wet day’ (see **ES Figure 10.7 Environment Agency Reservoir Flood Extents [Document Reference 6.2.10.7]**). The Order Limits is not shown to be at risk during a ‘dry day’ when local rivers are not overflowing their banks.
- 10.4.39. Details of the reservoirs predicted to pose a risk to the Site during a wet day are provided in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**.
- 10.4.40. The North and North East Lincolnshire Strategic Flood Risk Assessment (2022) states that “reservoir flooding is extremely rare in the UK due to very strict

regulations and mandatory assessments". As such, the likelihood and risk of a catastrophic reservoir breach occurring at the Order Limits is considered to be Very Low.

- 10.4.41. The Stainforth and Keadby Canal runs through the centre of the Order Limits, roughly in line with the South Humberside Main Railway Line. The North and North East Lincolnshire Strategic Flood Risk Assessment (2022) advises that this canal is managed by British Waterways and only highlights flood risk associated with the canal where it is influenced by the River Ouse and River Don, which are both located a notable distance from the Order Limits.
- 10.4.42. There are no other artificial sources of flooding or canals located in the vicinity of the Order Limits that would present a flood risk.
- 10.4.43. The Order Limits is therefore considered to be at Low risk of flooding from artificial sources.

Historic Flooding

- 10.4.44. The EA's Recorded Flood Outlines dataset **[Ref. 10-10]** does not record any historic flood events impacting the Order Limits. The nearest recorded historical events are located approximately 1.5km north of the northern end of the Order Limits, 5km east of Land Parcel E and 0.9km west of the Order Limits (see **ES Figure 10.8 Environment Agency Historic Flood Mapping [Document Reference 6.2.10.8]**).
- 10.4.45. The Doncaster MBC Level 1 Strategic Flood Risk Assessment (2015) **[Ref. 10-29]** (covering the western half of the Site – Land Parcels A, C, D and E) states that "DMBC have limited records regarding any flood incidents related to fluvial or tidal flooding" and do not record any historic flood events impacting the Order Limits. The Local Planning Authority Boundary is included in many of the figures included in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]** and shows the divide of the site, with Doncaster MBC covering the western half of the site.
- 10.4.46. The North and North East Lincolnshire Strategic Flood Risk Assessment (2022) (covering the eastern part of the site) refers to the EA's mapping discussed above when discussing historical flooding in the region and as such, does not highlight any site specific historic flood events. The Local Planning Authority Boundary is included in many of the figures included in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]** and shows the divide of the site, with North Lincolnshire covering the eastern half of the site.

10.4.47. Overall, the historic flood risk to the Order Limits is considered to be Low.

10.5. Assessment of Likely Significant Effects

10.5.1. The likely significant effects of the Scheme during decommissioning are likely to be similar to those encountered during the construction phase due to the operations being the same. Therefore, those effects considered for construction below are similarly expected during the decommissioning phase.

10.5.2. Full details of the construction and operational timeframes for the Scheme are provided in **ES Chapter 2: Scheme Description [Document Reference 6.1.2]**. The Environmental Statement assumes that the construction of the Scheme will be build out in either a single phased approach or through multiple phases. There is also the potential for a phased start to operational generation whereby each Land Parcel would connect to the RWE on-site 400kV substation when construction of the Land Parcel was complete.

Construction

10.5.3. This ES chapter has based the assessment of construction based on up to a 54 month build out period where multiple land parcels are developed concurrently (up to two at the same time) as the worst case scenario for the water resources assessment.

10.5.4. The development of land parcels concurrently is considered to be a worse case compared to developing land parcels one after the other as a wider area of land would be impacted at once. This concurrent development would have a greater potential impact on mud and debris arising, include larger areas of temporary hardstanding and access tracks used at once and yield more opportunity for spillages for example.

10.5.5. The construction stage is discussed in further detail below.

Effects on Flood Risk and Drainage

10.5.6. A full assessment of the effects on Flood Risk and Drainage is included in in **ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**.

10.5.7. There is the potential for mud and debris arising from the construction works to enter the existing surface water / land drainage system, causing blockages and restricting flow. This could result in localised flooding at the Order Limits, especially after heavy or prolonged rainfall resulting in a potential risk to people and property.

- 10.5.8. The sensitivity of construction workers and equipment to mud and debris blockages is considered to be Medium. The potential for mud and debris to block drainage networks is considered to have an effect of Low Adverse magnitude on flooding to the Site itself and surrounding area. The significance of effect is **Minor to Moderate Adverse (Not Significant)**.
- 10.5.9. Temporary increases in impermeable area at the Order Limits during construction has the potential to increase flooding both on and off site. Temporary hard standing such as construction compounds, could result in rapid surface water runoff to local watercourses or cause an increase in overland flow and localised flooding.
- 10.5.10. The effects of construction on the impermeable area on site would be temporary and short term. The sensitivity of construction workers and equipment is considered to be Medium with the temporary effects considered to have an effect of Medium Adverse magnitude to people working within the Site. A Medium Adverse magnitude has been defined as the effects of additional temporary hardstanding on site during construction could occur at a time as high flood risk on site (e.g. during a large storm event). The significance of effect is **Moderate Adverse (Significant)**.
- 10.5.11. Culverts installed during construction have the potential to impact existing flow patterns of watercourses within the Order Limits and as a result, may cause increased flood risk. The sensitivity of construction workers and equipment to increased flood risk associated with culvert installation is considered to be Medium, with the effects considered to be Medium Adverse in magnitude, with the potential for culverting to impact flood risk if not managed correctly (mitigation is discussed later in the chapter). The significance of effect is **Moderate Adverse (Significant)**.

Effects on Water Resources

- 10.5.12. During construction, temporary access tracks are required for the Scheme. These access tracks will be constructed with compacted self-binding aggregate fill materials. Access tracks would therefore form long linear features that, in the event of rainfall, could become temporary drainage routes for surface water.
- 10.5.13. There is also the potential for soil erosion and movement of sediment from shallow road excavations. It would therefore be necessary to ensure that pollution prevention measures within the Order Limits are appropriate to prevent migration of silt to surface watercourses and groundwater bodies during construction.

- 10.5.14. The sensitivity of surface water and groundwater bodies to silt contamination is considered to be Medium. Without mitigation, potential effects are considered of a Medium magnitude. The significance of the effect is **Moderate Adverse (Significant)** on a temporary short-term basis.
- 10.5.15. During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and / or used on the Order Limits. Leaks and spillages could pollute groundwater bodies through infiltration and pollute surface watercourses via overland flow. To allow such substances to enter a watercourse could be in breach of regulation 38(1) of the Environmental Permitting (England and Wales) Regulations 2016, therefore, measures to control the storage, handling and disposal of such substances will be put in place prior to and during construction. The proposed construction compound locations are shown on **ES Figure 2.1 – Indicative Construction Layout Plan [Document Reference 6.4.2.1]**.
- 10.5.16. The sensitivity of surface water and groundwater bodies to spillages, leakages and pollutants is considered to be Medium (covers up to good water quality as defined for some of the groundwater bodies and watercourses within the Order Limits as detailed in the WFD assessment (**ES Appendix 10.2 Water Framework Directive Assessment [Document Reference: 6.3.10.2]**)). Without mitigation measures spillages of chemicals/fuel stored could cause short term, temporary effects of a Medium magnitude on the local watercourses (medium importance). The significance of effect is **Moderate Adverse (Significant)** on a temporary short-term basis.
- 10.5.17. As detailed in **ES Chapter 9: Ground Conditions [Document Reference 6.2.9]**, there is low potential for contaminants to be present in any shallow depth Made Ground. The impacts resulting from disturbance of any made ground on hydrological pollution events are therefore considered to be negligible. Disturbance of made ground is not considered to impact erosion/sediment movement, surface water flows or ground water flows.

Operation

- 10.5.18. The assessment presented in this ES chapter covers both the option for a phased start to operational generation or for full operational generation. In either connection scenario there will be full operational generation for 40 years. Full details of the operational timeframes for the Scheme are provided in **ES Chapter 2: Scheme Description [Document Reference 6.1.2]**.

Effects on Flood Risk and Drainage

- 10.5.19. An increase in the volume of water discharged to local watercourses as a result of increased hard standing areas has the potential to increase the flood risk to areas downstream of the Scheme. Increased impermeable areas on site are generally associated with the following proposed infrastructure:
- 100MW BESS areas.
 - TX Substation
 - 400KV Substation
- 10.5.20. Proposed solar PV modules are generally considered to have a negligible impact on surface water drainage patterns.
- 10.5.21. The sensitivity of people and property to increased flood risk during operation is considered Medium. Whilst the effects would be temporary and short term, this is considered to have an effect of Medium Adverse magnitude to people and property (considered to be up to very high importance) occurring at time of high flood risk (e.g. during a large storm event). The significance of effect is **Moderate Adverse (Significant)**.
- 10.5.22. Culverts installed within the Order Limits have the potential to impact existing flow patterns of watercourses within the Order Limits and as a result, may cause increased flood risk. The sensitivity of people and property to increased flood risk associated with culvert installation is considered to be Medium, with the effects considered to be Medium Adverse in magnitude, with the potential for culverting to impact flood risk if not managed correctly (mitigation is discussed later in the chapter). The significance of effect is **Moderate Adverse (Significant)**.

Effects on Water Resources

- 10.5.23. Spillages of pollutants (e.g. oil) on access tracks from maintenance vehicles could be transported to watercourses via runoff, where they could impact upon ecological life, or infiltrate into the ground.
- 10.5.24. The receptors at risk are surface watercourses and groundwater bodies which are considered to be of Medium sensitivity to operational pollutants. Without mitigation the increase in highway spillage risk is considered to have an effect of a Low Adverse magnitude. The significance of effect is **Minor Adverse (Not Significant)** which is considered permanent if left unmitigated.

10.6. Mitigation, Enhancement and Residual Effects

- 10.6.1. This section considers the mitigation and enhancement relevant to the operation phase. Measures considered for construction and decommissioning are included in **Outline Construction Environmental Management Plan [Document Reference 7.1]** and **Outline Decommissioning Environmental Management Plan [Document Reference 7.3]**, respectively.

Mitigation by Design

- 10.6.2. As noted above, there are several adverse effects that may occur during the construction and operational phases of the Scheme. These effects could impact water resources and flood risk and drainage on site and elsewhere. In order to mitigate these potential effects, mitigation measures are proposed on site. Details of mitigation by design measures proposed on site are discussed below.

Effects on Water Resources – Operation

- 10.6.3. Surface water runoff from proposed infrastructure on site will be directed towards SuDS features that would provide water quality treatment to mitigate the risk of water pollution on site. Contributions could be made from permeable surfacing and wildflower planting for example. High level surface water drainage proposals are included in the appended FRA (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**), with full details to be confirmed during details design post-consent of the DCO application.
- 10.6.4. Future maintenance of any proposed SuDS on site will be managed by the Applicant. An overview of possible SuDS features on site, and indicative future maintenance is provided in the FRA and Outline Surface Water Drainage Strategy for the development (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**). It is concluded that the SuDS expected to be implemented on site (to be confirmed during detailed design) would provide sufficient water quality treatment to mitigate the risk of surface water pollution on site.

Effects on Flood Risk and Drainage – Operation

- 10.6.5. A surface water drainage strategy will be implemented on site, with and Outline Surface Water Drainage Strategy included in the appended FRA (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 10.6.6. Full details of the proposed surface water drainage strategy will be confirmed during detailed design, but the strategy will be designed to ensure surface water runoff rates the Order Limits do not increase as a result of the Scheme.

- 10.6.7. It's also noted that solar PV modules proposed on site will have their lowest edge raised above the ground a minimum of 800mm, and at least 100mm above the modelled tidal 1 in 1,000 year flood levels (whichever is greater), as detailed in **ES Figure 2.6 Indicative Layouts and Cross Section Plans [Document Reference 6.4.2.6]**. Full details of the proposed raising are included in the FRA and Outline Surface Water Drainage Strategy for the development which is appended to this ES (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**). The minimum panel level will be achieved by raising the panels rather than altering the ground level.
- 10.6.8. The predicted tidal flood levels vary within the Order Limits and as such, the level to which solar PV modules and infrastructure are raised across the Order Limits will vary. Proposed raising has been defined in mAOD as requested by the EA. A plan of the proposed raising is included in the FRA appended to this ES (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 10.6.9. With the proposed mitigation measures in place, the Scheme will be designed to remain safe and operational during a 1 in 1000 year tidal flood event, as informed by detailed hydraulic data from the EA, plus an allowance for freeboard. As the proposed solar PV modules will be raised, surface water across the vast majority of the Order Limits will continue to drain as per the existing conditions.
- 10.6.10. The outputs of river modelling predict significantly reduced flood risk within the Order Limits compared to the tidal modelling results discussed above and as such, proposed mitigation measures designed against the tidal outputs will suitably protect the development from the fluvial flood risk. Full details of the model data reviewed are included in the appended FRA (**ES Appendix 10.1 Flood Risk Assessment [Document Reference 6.3.10.1]**).
- 10.6.11. Surface water flood depths on site are generally not predicted to exceed 300mm on site. The lowest edge of proposed solar PV modules and infrastructure in areas at risk of surface water flooding will be raised above the predicted depths. This will ensure that the proposed panels will be safe over their lifetime and that surface water flow patterns on site will not be impacted.
- 10.6.12. The Risk of Flooding from Surface Water extents and depths datasets are included in the **ES Figure 10.3 Risk of Flooding from Surface Water Extents [Document Reference 6.3.10.3]** and **ES Figure 10.4 Risk of Flooding from Surface Water Depths [Document Reference 6.3.10.4]**.
- 10.6.13. Any culverts proposed within the Order Limits will be designed to ensure existing flow patterns and associated flood risk do not change. Culvert design

will be confirmed during detailed design but will ensure the capacity of the watercourses do not change.

- 10.6.14. Overall, following the allocation of the mitigation measures through the DCO, the residual effects of the Scheme during operation are considered to be **Negligible**, and therefore **Not Significant**.

Additional Mitigation

Effects on Water Resources, Flood Risk and Drainage – Construction

- 10.6.15. Where necessary a temporary drainage network will be installed prior to the commencement of construction and a maintenance plan, confirmed through a Construction Environmental Management Plan (CEMP), and should be maintained throughout the duration of construction works at the Order Limits. The drainage systems will be designed to good practice standards detailed within the CIRIA SuDS manual C753. An **Outline Construction Environmental Management Plan** is included as a standalone document as part of the DCO application [**Document Reference 7.1**], and the final CEMP will be broadly in line with guiding principles set out in the **Outline Construction Environmental Management Plan** [**Document Reference 7.1**],
- 10.6.16. A temporary construction drainage system will be developed to prevent silt-laden runoff from entering surface water drains, watercourses and ponds without treatment (e.g. earth bunds, silt fences, straw bales, or proprietary treatment) under any circumstances. Details of the construction drainage system will be included in the final CEMP.
- 10.6.17. Construction SuDS (such as temporary attenuation) may also be used during construction if necessary.
- 10.6.18. During the construction phase, buffers of 9m on both bank sides will be preserved adjacent to Main Rivers and IDB maintained watercourses, with a 5m buffer provided for Ordinary Watercourses. These buffers will ensure that there is a sufficient buffer from the watercourses to the construction stages of development. These buffers will be confirmed in the final CEMP.
- 10.6.19. Following the implementation of mitigation measures the residual effects during construction are considered to be **Negligible**, and therefore **Not Significant**.
- 10.6.20. Mitigation is summarised in **Table 10-6**.
- 10.6.21. Other additional mitigation measures include the following:

- The **Outline Operational Environmental Management Plan** (and the subsequent Operational Environmental Management Plan) [**Document Reference 7.9.2**].;
- The **Outline Decommissioning Environmental Management Plan** (and the subsequent Decommissioning Environmental Management Plan) [**Document Reference 7.9.3**].;
- The **Outline Landscape and Ecological Management Plan** (and the subsequent Landscape and Ecological Management Plan) [**Document Reference 7.9.6**].;
- The **Outline Soils Management Plan** (and the subsequent Soils Management Plan) [**Document Reference 7.9.8**].;
- The **Outline Construction Traffic Management Plan** (and the subsequent Traffic Management Plan) [**Document Reference 7.9.7**].;
- The **Outline Battery Safety Management Plan** (and the subsequent Outline Battery Safety Management Plan) [**Document Reference 7.9.4**].

Table 10-6: Mitigation

Ref	Measures to avoid, reduce or manage any adverse effects and/or deliver beneficial effects	How measures is proposed to be secured	
		By Design	By Requirement within the DCO
1	Include silt management and control measures in the CEMP.		X
2	Ensure measures to control the storage, handling and disposal of pollutants are put in place prior to and during construction included in the CEMP.		X
3	Any proposed drainage features such as permeable surfacing, infiltration trenches and wildflower planting should	X	

	be designed to good practice standards.		
4	Maintaining the existing surface water run-off regime by utilising permeable surfacing for the Site access, by raising proposed solar PV modules and infrastructure and by maintaining species rich grassland below the proposed solar PV modules.		X
5	Raising panels above the design event flood water levels plus an allowance for freeboard.	X	

Residual Effects

- 10.6.22. With the embedded design and additional mitigation measures described above for the construction, operational and decommissioning phases and those within the **Outline CEMP [Document Reference 7.1]**, all identified potential effects have been assessed as being of **Negligible** Significance, and therefore **Not Significant** in terms of the EIA Regulations. No further mitigation is proposed.

Table 10-7: Summary of effects, mitigation and residual effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Watercourse / Ground	Mud and debris Flood Risk	Temporary	Medium	Low	Minor / Moderate Adverse (Not Significant)	Detailed in the CEMP	Negligible (Not Significant)
Watercourse	Impermeable area increasing Flood Risk	Temporary	Medium	Medium	Moderate Adverse (Significant)	Detailed in the CEMP	Negligible (Not Significant)
Watercourse / Ground	Pollutants (oils, etc)	Temporary	Medium	Medium	Moderate Adverse (Significant)	Detailed in the CEMP	Negligible (Not Significant)

ENVIRONMENTAL STATEMENT

Water Resources

Watercourse	Sediment movement	Temporary	Medium	Medium	Moderate Adverse (Significant)	Detailed in the CEMP	Negligible (Not Significant)
Watercourse	Impermeable area increasing Flood Risk	Permanent	Medium	Medium	Moderate Adverse (Significant)	Detailed in the FRA / Outline Surface Water Drainage Strategy including O&M Manual for maintenance	Negligible (Not Significant)
Watercourse / Ground	Pollutants (oils, etc)	Permanent	Medium	Medium	Moderate Adverse (Significant)	Detailed in the FRA/ Outline Surface Water Drainage Strategy including O&M Manual for maintenance	Negligible (Not Significant)

10.7. Summary

Introduction

- 10.7.1. This chapter identifies the potential impacts on the water environment from the construction, operation and decommissioning of the Scheme. The water environment includes surface waterbodies (e.g. rivers, streams, ditches, canals, lakes and ponds, etc.), groundwater bodies, as well as flood risk and drainage.
- 10.7.2. The potential impacts on the water environment resulting from the Scheme focus on four main events:
- Erosion/sediment movement.
 - Chemical/pollution events.
 - Alteration/interruption of surface water flows.
 - Alteration/interruption of ground water flows.

Baseline Conditions

- 10.7.3. There are many field drain ditches running across the Order Limits, assumed to be used for agricultural drainage. There are a large number of watercourses located on site and in the immediate vicinity. These include several Main Rivers which are managed by the Environment Agency. In addition, there are a large number of Ordinary Watercourses running through the Order Limits, some of which fall under the control of two Internal Drainage Boards.
- 10.7.4. The Scheme's Land Parcels are dissected by several major roads and routes, including the M180 motorway, the A18, the South Humberside Main Line railway route and Stainforth & Keadby Canal (see **ES Figure 1.2 Land Parcel Plan [Document Reference 6.4.1.2]**).
- 10.7.5. There are many field drain ditches running across the Order Limits, assumed to be used for agricultural drainage. The closest Main Rivers noted by the EA are the two drains running adjacent to the canal crossing the midsection of the Order Limits and the Hatfield Waste Drain at the southern end of the Order Limits.
- 10.7.6. The Order Limits is currently agricultural greenfield area. The bedrock geology underlying the Site is Sherwood Sandstone Group – Sandstone in the west and Mercia Mudstone Group – Mudstone in the east. The soils on Site are 'Slowly

permeable seasonally wet slightly acid but base-rich loamy and clayey soils' and 'Raised bog peat soils' and 'Loamy and clayey soils of coastal flats with naturally high groundwater'.

- 10.7.7. The Flood Map for Planning (2025) generally defines the entire Order Limits as Flood Zone 3, at High risk of flooding, predicted to be impacted by a 1 in 100 year fluvial flood event or 1 in 200 year tidal flood event. The Risk of Flooding from Rivers and Seas dataset, also predicts the vast majority of the site to be at risk of flooding.
- 10.7.8. Correspondence with the Environment Agency highlights that the Order Limits is at risk of flooding from the tidal River Trent, the River Torne and associated Drains. The Environment Agency also highlight that land drainage represents the dominant flood risk at the site.
- 10.7.9. The Risk of Flooding from Surface Water dataset highlights areas at the site with a High to Low likelihood, predicted to be impacted by a 1 in 30 and 1 in 1000 year rainfall event, respectively, spread across the Order Limits. These at-risk areas are generally isolated and associated with surface water arising within the Order Limits boundary itself. Surface water flood depths on site are generally not predicted to exceed 300mm on site.
- 10.7.10. The site has a low risk of flooding from groundwater, sewers, artificial sources and historical flooding.

Likely Significant Effects

- 10.7.11. The likely significant effects of the Scheme during decommissioning are similar to those encountered during the construction phase due to the operations being the same. Therefore, those effects considered for construction are expected during the decommissioning phase.
- 10.7.12. The likely significant effects during construction includes the effects on Flood Risk and Drainage and water resources. The effects of construction on the impermeable area on site would be temporary and short term. Without mitigation measures spillages of chemicals/fuel stored could cause short term, temporary effects on the local watercourses. The significance of effects is **Moderate Adverse (Significant)**
- 10.7.13. The likely significant effect during operation includes the effects on Flood Risk and Drainage and water resources. Increased impermeable areas on site are generally associated with proposed infrastructure on site rather than proposed solar PV

modules which are generally considered to have a negligible impact on surface water drainage patterns. The sensitivity of people and property to increased flood risk during operation is considered medium and the significance of effect is Major Adverse. Surface watercourses and groundwater bodies are considered to be at risk to operational pollutants. Without mitigation the increase in highway spillage risk is considered to have an effect of a Low Adverse magnitude. The significance of effect is **Minor Adverse (Not Significant)** which is considered permanent if left unmitigated.

Mitigation

- 10.7.14. As noted above, there are several adverse effects that may occur during the construction and operational phases of the Scheme. These effects could impact water resources and flood risk and drainage on site and elsewhere. In order to mitigate these potential effects, mitigation measures are proposed on site.
- 10.7.15. Mitigation measures to reduce the effects on water resources and flood risk and drainage during the operation phase include
- Surface water runoff from proposed equipment and access tracks will be directed towards SuDS features that would provide water quality treatment to mitigate the risk of water pollution on site.
 - Contributions could be made from permeable surfacing, wildflower planting and linear infiltration trenches.
 - Future maintenance of any proposed SuDS on Site will be privately managed by the Applicant.
 - A surface water drainage strategy will be implemented on site.
 - Solar PV modules proposed on Site will have their lowest edge raised above the ground (above the 1 in 1000 year tidal Trent flood level plus an allowance for 100mm of freeboard), to ensure surface water across the vast majority of the site will continue to drain as per the existing conditions.
- 10.7.16. Overall, following the allocation of the mitigation measures through the DCO, the residual effects of the Scheme during operation are considered to be **Negligible (Not Significant)**.

Enhancement and Residual Effects

- 10.7.17. During the construction phase, additional mitigation measures will be implemented to reduce effects on Water Resources, Flood Risk and Drainage which includes:
- Where necessary a temporary drainage network will be installed prior to the commencement of construction and a maintenance plan, confirmed through a Construction Environmental Management Plan (CEMP).
 - A temporary construction drainage system will be developed to prevent silt-laden runoff from entering surface water drains, watercourses and ponds without treatment (e.g. earth bunds, silt fences, straw bales, or proprietary treatment) under any circumstances.
 - Construction SuDS (such as temporary attenuation) may also be used during construction if necessary.
 - Buffers of 9m on both bank sides will be preserved adjacent to all receptors to ensure that there is a sufficient buffer from the sensitive receptor.
- 10.7.18. Following the implementation of mitigation measures the residual effects during construction are considered to be **Negligible (Not Significant)**.
- 10.7.19. Other additional mitigation measures include the are secured through management plans submitted with the DCO application and to be finalised post consent.

Conclusion

- 10.7.20. With the embedded design and additional mitigation measures described above for the construction, operational and decommissioning phases all identified potential effects have been assessed as being of **Negligible** significance, and therefore **Not Significant**.

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10.9. Glossary

Term	Definition
BESS	Battery Energy Storage System. This comprises battery energy storage units, transformers, inverters, switchgear, power conversion systems, monitoring and control system, heating ventilation and air conditioning, electric cables and fire infrastructure to assist in providing peak generation and grid balancing services to the national grid.
BGS	British Geological Society
BNG	Biodiversity Net Gain
Byelaw	Local laws made by a local authority under an enabling power contained in a public general act or a local act requiring something to be done – or not done – in a specified area.
CDC	City of Doncaster Council
CEMP	Construction Environmental Management Plan
CFL	Critical Flood Level
DCO	Development Consent Order
DMBC	Doncaster Metropolitan Borough Council
EA	Environment Agency
EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
ES	Environmental Statement
Exception Test	<p>The Exception Test requires two elements to be satisfied before allowing development to be allocated or permitted in situations where suitable sites at lower risk of flooding are not available following application of the sequential test. These include:</p> <ul style="list-style-type: none"> development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and

	<ul style="list-style-type: none"> the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
FRA	Flood Risk Assessment
Greenfield	Land which has not been developed.
HDD	Horizontal Directional Drilling
IDB	Internal Drainage Board
IoA	Isle of Axholme
LLFA	Lead Local Flood Authority
Main River	Defined by the Environment Agency as any watercourse that contributes significantly to the hydrology of a catchment.
mAOD	Meters Above Ordnance Datum
NPPF	National Planning Policy Framework
Order Limits	The boundary for the Scheme.
Ordinary Watercourse	Defined by the Environment Agency as any watercourse including every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.
PEIR	Preliminary Environmental Information Report
PRoW	Public Right of Way.
RWE	The Applicant "RWE Renewables UK Solar and Storage Ltd"
Sequential Test	A sequential test is carried out to ensure development is sited on land that has the lowest risk of flooding within the Local Council area.
SFRA	Strategic Flood Risk Assessment
Solar PV Development	This comprises ground mounted solar photovoltaic (PV) generating station (solar PV modules and mounting structure), inverters, transformers and switchgear, and

	low voltage distribution cables, access tracks and ancillary infrastructure works.
SuDS	Sustainable Drainage System
The Applicant	RWE Renewables UK Solar and Storage Ltd
The Scheme	Tween Bridge Solar Farm
WFD	Water Framework Directive
Zone of Influence	The area around the site that may be affected by the proposed changes within the site.