POWER FOR GOOD

Steeple Renewables Project

Appendix 8.1: Flood Risk Assessment

Environmental Statement – Volume 2

March 2026

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Appendix 8.1: Flood Risk Assessment

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STEEPLE SOLAR FARM LIMITED

STEEPLE RENEWABLES PROJECT

Flood Risk Assessment

680819-R5(~~05~~06)-FRA
March 2026

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CIVILS | STRUCTURES | HYDROLOGY
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RSK GENERAL NOTES

Project No.: 680819-R5(~~05~~06)-FRA
Site: Steeple Renewables Project
Title: Flood Risk Assessment
Client: Steeple Solar Farm Limited
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CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

ES.1 This Flood Risk Assessment (FRA) has been produced in accordance with the National Policy Statements for the development of nationally significant infrastructure[1] and in consultation with the Environment Agency (EA), Nottinghamshire County Council as the Lead Local Flood Authority (LLFA), the Trent Valley Internal Drainage Board (IDB), Severn Trent Water (water authority) and the Canal and River Trust (CRT).

ES.2 The aim of the FRA is to establish the flood risk to the Proposed Development from all sources of flooding, taking account of climate change over the lifetime of the development and the vulnerability of the proposed use. The impacts of the Proposed Development on flood risk elsewhere are also assessed. Where applicable, mitigation requirements are identified in order to ensure the safety of the Proposed Development over its lifetime and to demonstrate there will be no increase in flood risk off-site. Opportunities to provide a reduction in flood risk within the wider area are also investigated.

ES.3 According to the published EA Flood Map for Planning, approximately the eastern 30% of the Site falls within Flood Zone 3 (high probability of fluvial flooding), with a further 5% falling within Flood Zone 2 (medium probability of fluvial flooding). However, this mapping does not take into account the presence of flood defences along the River Trent. The defended fluvial 1 in 100 year plus climate change scenario, confirmed by the EA to be the 'design' scenario for the Proposed Development (see correspondence in **Appendix E**), shows that there is no fluvial flood risk from the River Trent to the developable area of the Site. No floodplain compensatory storage is required in relation to fluvial flood risk from the River Trent.

ES.4 There is a residual risk of fluvial flooding occurring should the River Trent flood defences fail (breach). A worse-case breach scenario could result in flooding of the majority of the eastern parcel, with depths of up to 3.83m in the 1 in 100 year plus climate change flood event. As this is a residual risk scenario, there is no requirement for the infrastructure to be designed to withstand such a flood event. Rather, it is proposed that the Proposed Development would be wholly or partially shut down remotely in the unlikely event of a breach of the flood defences causing flooding of the Site. Site closure would be triggered by EA flood warnings in combination with remote CCTV monitoring of the Site. Should shut down be necessary, this can be undertaken remotely with no

[1] https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-national-policy-statements

personnel presence required. Any personnel present would be evacuated on receipt of a Flood Warning. However, the Site will generally be unmanned aside from maintenance visits, which would not be scheduled at times of extreme rainfall or unusually high fluvial flows. The Applicant has advised that in the event site shutdown due to flooding, all electrical connections beyond the rack terminations will no longer be live until the flood has subsided. Given the ingress protection rating (IP rating) of the modules within the BESS enclosure, and the ingress protection rating of the enclosure itself, a short circuit in the event of a flood is unlikely.

ES.5 The Ordinary Watercourses crossing the Site are not included within the EA's Tidal Trent flood model. Therefore, at the request of the EA, a flood modelling exercise has been undertaken for the Catchwater Drain, Mother Drain and New Ings Drain. The 1D modelling exercise undertaken demonstrates that no overtopping is expected for the Mother Drain during the design 1 in 100 year plus climate change event, and only very minor overtopping would occur for the Catchwater Drain and New Ings Drain for the 1 in 100 year plus climate change event. The resulting flooding during overtopping events is expected to be of minimal extent and depth, occurring at only one location on each watercourse and with in-channel water levels only 30mm-40mm higher than the respective bank levels. The sensitive equipment associated with the solar panels will be significantly above the expected flood level for the Catchwater Drain and New Ings Drain, and no compensatory floodplain storage is required in relation to fluvial flooding from any of the modelled Ordinary Watercourses. Sensitivity testing of the model shows that even for increased flows and roughness values within the model for the Catchwater Drain, the flood risk to proposed infrastructure from the this source is low.

ES.6 The FRA identifies a risk of surface water flooding for parts of the Site. However, outside of the watercourse channels and limited areas immediately upstream of railway / road culverts, both the likelihood and depths of surface water flooding are generally assessed as low. For the vast majority of the Site, the likelihood of flood depths reaching 300mm is classed as 'very low' based on the latest EA's surface water flood risk mapping. Flood sensitive equipment (inverters and the BESS and substation equipment) have been directed to areas with a low risk of surface water flooding, and will be raised at least 200mm above ground level to manage residual risks during extreme scenarios. Solar panels located within the medium and high risk areas will be inherently raised above any expected flood levels. Given the very limited footprint of infrastructure located within the medium and high risk surface water flood extents (comprising panel supports only) and given the low likelihood and shallow depths of surface water flooding expected, no

significant impact is anticipated to local flow paths. Any minor deflection of flows around proposed infrastructure would not impact any sensitive receptors or adjacent landowners.

ES.7 Other sources of flooding, comprising tidal, sewer, groundwater and reservoir flooding are only considered to represent a flood risk to the Site during extreme events. Any residual risks from these sources are not considered significant given the nature of the Proposed Development (unmanned facility with much of the infrastructure raised above ground level) and the ability of the facility to be shut down remotely in the event of any flooding.

ES.8 In order to ensure there is no increase in flood risk off-site, a drainage strategy based on the use of Sustainable Drainage Systems has been designed for the Proposed Development. This will limit discharges of runoff to local watercourses to pre-development rates and will control runoff from the development area. All watercourse crossings will be designed to ensure there is no restriction of flows and will gain the appropriate consent.

ES.9 Additional to the mitigation requirements to manage the impacts of the Proposed Development, two large detention basins have been proposed as part of the Proposed Development which aim to reduce the existing surface water flood risk to Sturton le Steeple village. These will aim to intercept and retain runoff from the agricultural land to the west of the village, releasing it to local watercourses at a controlled rate after the peak of the rainfall event has passed.

ES.10 Overall, the FRA has demonstrated that the Proposed Development would be safe from a flood risk perspective over its lifetime and that potential impacts from the development have been mitigated to ensure no off-site increase in flood risk. Additionally, the incorporation of detention basins to the west of Sturton le Steeple village will contribute to a reduction in flood risk to the local area.

ES.11 Flood risk Sequential and Exception Tests are discussed within the separate **Sequential Test** report prepared by Pegasus **[EN010163/APP/7.5]**.

GLOSSARY

Breach flood event	Flooding that occurs as a result of a structural failure of an existing flood defence structure
Canal flooding	Flooding that occurs when the water level in a canal overtops its banks
Flood Zone 1	Area with an annual probability of fluvial or tidal flooding of less than 1 in 1000
Flood Zone 2	Area with an annual probability of fluvial flooding of between 1 in 1 in 100 and 1 in 1000 or an area with an annual probability of tidal flooding of between 1 in 200 and 1 in 1000
Flood Zone 3a	Area with an annual probability of fluvial flooding of greater than 1 in 100, or an annual probability of tidal flooding of greater than 1 in 200
Flood Zone 3b	Also known as functional floodplain. Land where water from rivers or the sea has to be stored at times of flood. Usually defined as areas with a greater than 1 in 30 annual probability of fluvial or tidal flooding
Fluvial flooding	Flooding that occurs when a watercourse overtops its banks and inundates the surrounding land
Groundwater flooding	Flooding that occurs when groundwater levels rise to the ground surface
Main river	Usually large rivers or streams, designated as main rivers on the Environment Agency Statutory Main River Map. These are managed and regulated by the Environment Agency
Ordinary watercourse	Any channel that water flows through, which isn't part of the main river network. These are managed and regulated by the Lead Local Flood Authority or Internal Drainage Boards
Reservoir flooding	Flooding resulting from a failure of a reservoir structure and release of water from the reservoir

Sewer flooding	Flooding that occurs when private or public sewer systems surcharge
Surface water flooding	Flooding that occurs when the capacity of soils to absorb rainfall is exceeded and water ponds or runs off over the surface
Tidal flooding	Flooding originating from coastal bodies or rivers that are influenced by the tides

1 INTRODUCTION

1.1 RSK Land and Development Engineering Ltd were commissioned by Steeple Solar Farm Limited (the Applicant) to provide a Flood Risk Assessment (FRA) to support the Development Consent Order (DCO) application for the installation and operation of a solar farm with the capacity of up to 450 MW of solar energy generation and a 150 MW Battery Energy Storage System (BESS) with associated infrastructure and equipment.

1.2 The purpose of the FRA is to establish the risk associated with the Proposed Development and to propose suitable mitigation, if required, to reduce the flood risk to an acceptable level. The FRA must demonstrate that the Proposed Development will be safe for its lifetime (in this case limited by the Order to 40 years) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

1.3 This document has been produced to assess the flood risk from tidal, fluvial, surface water, groundwater, sewers, reservoirs and artificial sources in line with the National Policy Statements for the development of nationally significant infrastructure[2].

1.4 A **Surface Water Drainage Strategy** has been produced as a separate document as **Appendix 8.2 to the Environmental Statement [EN010163/APP/6.3.8]** and is referenced where applicable in this FRA.

1.5 A flood risk Sequential Test and Exception Test are also submitted as a separate document **Sequential Test [EN010163/APP/7.5]**.

1.6 This assessment has been undertaken in consultation the Environment Agency (EA), Nottinghamshire County Council as the Lead Local Flood Authority (LLFA), the Trent Valley Internal Drainage Board (IDB), Severn Trent Water (water authority) and the Canal and River Trust (CRT).

1.7 The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[2] https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-national-policy-statements

2 SITE DESCRIPTION & PROPOSALS

2.1 Existing site

Site description

2.1.1 The Site is located approximately 5km to the south of Gainsborough in the county of Nottinghamshire and comprises areas of agricultural land to the east and west of Sturton le Steeple and south of West Burton Power Station.

2.1.2 The Site is centred roughly at National Grid Reference 478706E, 383906N and postcode DN22 9HY. A Site location plan is included as **Figure 2.1**.

2.1.3 The Site covers an area of approximately 888.31ha with the majority of the Site comprising of multiple agricultural fields, with the field boundaries defined by hedgerow and individual trees. The Site also includes part of the existing West Burton Power Station Site, covering the area around the existing 400kV substation. The nearest settlement to the Site is Sturton le Steeple. There is a network of roads located both within the Site and adjacent to the boundary. A railway bisects the western part of the Site. The River Trent lies adjacent to the eastern boundary of the Site.

2.1.4 Within the wider surrounding area, settlements include Knaith approximately 250m east on the opposite side of the River Trent, North Leverton with Habblesthorpe and Fenton located adjacent to the southern boundary, South Leverton approximately 1.1km south, Clarborough approximately 850m west, North Wheatley and South Wheatley approximately 1.3km and 1km north-west respectively, and Gainsborough located c. 5km to the north-east of the Site.

2.1.5 A site inspection was undertaken in July 2024 in order to observe local watercourses, flood defences and to gain an understanding of local overland flow routing. Observations from the Site inspection are noted where applicable in this report.

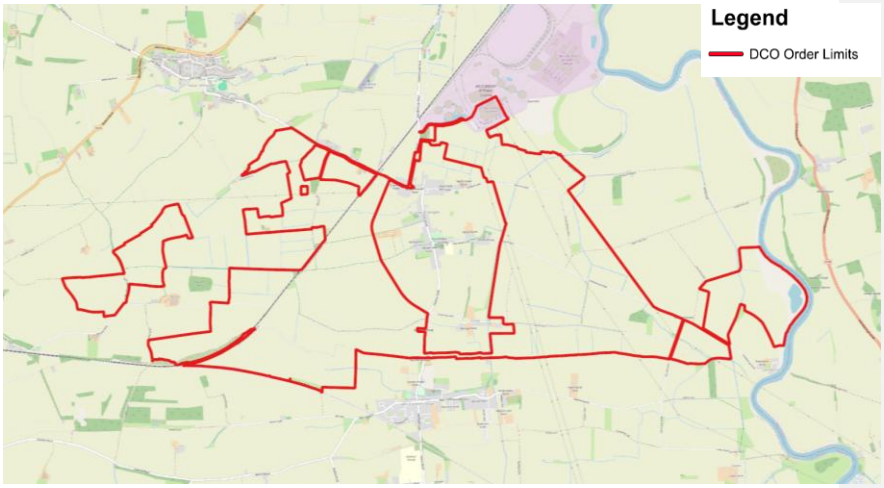

Figure 2.1: Site location plan

Topography

2.1.6 A site-specific topographic survey was carried out in November 2024. This confirms that the Site generally slopes from west to east, towards the River Trent. Levels in the eastern part of the Site are relatively flat, sloping gently from Sturton le Steeple at around 10m AOD down to the eastern boundary at approximately 3m AOD. The western part of the Site has a more significant gradient, sloping from Sturton le Steeple up towards high ground along the western boundary at approximately 75m AOD. A vegetated earth bund (flood defence) runs along the eastern Site boundary with a crest level of approximately 7m AOD and a height 3-4m above adjacent land. The Site is crossed by various drainage ditches with bunds of up to 1m height shown along the banks of the Catchwater Drain in the east of the Site. The topographic survey is included in **Appendix B**.

2.1.7 The lowest area of land proposed for built development (installation of solar panels and inverters) lies at approximately 3.5m AOD and is located immediately to the north of Littleborough Road in the east of the Site. The BESS is proposed within an area with levels of c.6-7m AOD, and the substation is proposed in an area with ground levels between c.7.5-9m AOD.

Existing drainage

Public

2.1.8 Severn Trent Water sewer plans have been obtained for the Site and are included in **Appendix C**. These plans indicate the following network of sewers in the vicinity of the Site:

- A network of foul and surface water sewers within North Wheatley to the northwest of the Site;
- A 150mm diameter foul sewer serving the cluster of residential properties on Wheatley Road immediately to the north of the Site and running to Sturton le Steeple village beneath Wheatley Road;
- A 150mm diameter pressurised foul main running around the eastern edge of the West Burton Power Station to the north of the Site, and passing through the northern part of the Site;
- A pressurised foul main running along the western side of Catchwater Drain crossing the proposed cable corridor in the south of the Site; and
- Foul and surface water sewers within the highways serving Sturton le Steeple village.

2.1.9 The only Severn Trent assets within the Site boundary are the 150mm foul sewer within the northern part of the Site and the foul sewer beneath Wheatley Road.

Private

2.1.10 Currently, runoff from the fields either infiltrates into the ground or is conveyed overland following the local gradients. Overland flow is captured by drainage ditches and conveyed to the Ordinary Watercourses or larger IDB drains and ultimately to the River Trent to the east of the Site. Field drains are likely to serve the fields at a local level.

2.2 Development proposals

2.2.1 The Proposed Development is for an electricity generating station with a capacity over 50 megawatts (MW), comprising the installation of a ground mounted solar photovoltaic (PV) electricity generation with an approximate capacity of 450 MW of energy generation and associated development comprising 150 MW of energy storage, grid connection infrastructure and all other infrastructure integral to the construction, operation and maintenance of

the Scheme including access. Areas are proposed for biodiversity mitigation in the east of the Site close to the River Trent and in the west of the Site. The proposed scheme is shown in **Appendix D**.

2.2.2 The Proposed Development falls within the definition of a 'nationally significant infrastructure project' (NSIP) under Section 14(1)(a) and 15(2) of the Planning Act 2008 (the "Act") as the construction of a generating station in England with a capacity of more than 50MW, with a capacity in the region of 600MW.

2.2.3 The Development is likely to include the following infrastructure:

- Solar PV modules;
- PV module mounting infrastructure;
- Inverters;
- Transformers;
- Onsite underground cabling;
- Underground cabling to point of connection at existing substation at West Burton Power Station;
- Fencing and security measures;
- Access tracks and construction of new accesses onto the highway;
- Energy storage facility;
- A substation and control building; and
- Equipment facilitating the electrical connection to the existing substation at West Burton Power Station.

2.2.4 It is proposed that the lifetime of this scheme will be 40 years.

2.2.5 During the construction phase, one or more temporary construction compound(s) will be required as well as temporary roadways to facilitate access to all parts of the Site.

2.2.6 The construction phase of the Proposed Development is currently anticipated to last up to two years. The types of construction activities that may be required include (but are not limited to):

- Importing of construction materials;
- The establishment of the construction compounds – these will likely move over the course of the construction process as each section is built out;
- Creation of a new access points for the Site;
- Installing the security fencing around the Site;

- Importing the PV panels and the energy storage equipment;
- Erection of PV frames and modules;
- Digging of cable trench and laying cables for connection to the West Burton Power Station substation;
- Installing transformer cabins;
- Construction of onsite electrical infrastructure for the export of generated electricity; and
- New habitat creation.

2.2.7 The Proposed Development will be decommissioned at the end of its approved operational phase. All PV modules, mounting poles, energy storage equipment, inverters, transformers etc would be removed from the Site. These items would be recycled or disposed of in accordance with good practice and market conditions at the time. Decommissioning is expected to take approximately 12 months.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

3.1.1 Ordnance Survey (OS) mapping and the EA's web-based mapping indicates that the nearest EA Main River is the River Trent which runs along the eastern Site boundary. It flows in a northerly direction, eventually discharging into the Humber Estuary at Blacktoft Sands approximately 38km north of the Site. A large flood storage area is located on land adjoining the River Trent approximately 3km north (downstream) of the Site, to the west of Gainsborough.

3.1.2 OS mapping also identifies a number of Ordinary Watercourses crossing the Site, as shown in **Figure 3.1**.

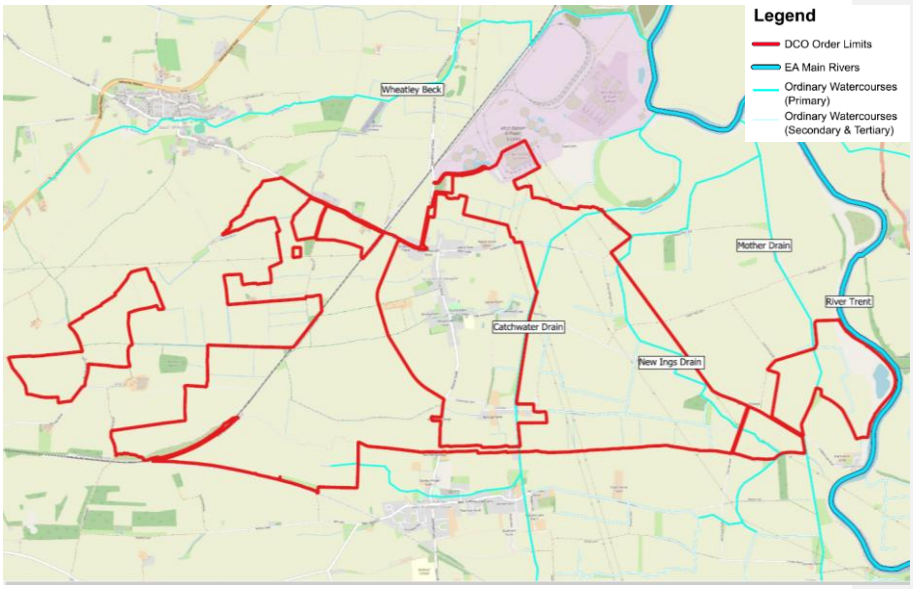

Figure 3.1: On-Site watercourses

3.1.3 The EA categorise these watercourses as primary, secondary and tertiary rivers as shown in **Figure 3.1**. Primary watercourses consist of Main Rivers and major Ordinary Watercourses, secondary watercourses consist of smaller

Ordinary Watercourses, and tertiary watercourses comprise drainage ditches and Ordinary Watercourses receiving limited flows. Two primary rivers are shown within the Site. The first is the Catchwater Drain which flows from south to north through the eastern part of the Site, discharging to the River Trent approximately 1km to the northeast of the Site via a pumped outfall. The second is the Mother Drain which flows from south to north just within the southeastern Site boundary, also discharging into the River Trent to the northeast of the Site. A number of unnamed secondary and tertiary watercourses pass through the Site, generally flowing from west to east, and discharging into the Catchwater Drain or the Mother Drain. Many of these were noted as dry during the Site visit, which was undertaken on a dry sunny day during the summer months (July 2024).

3.1.4 The Ordinary Watercourses in the eastern half of the Site, including and to the east of the Catchwater Drain, are managed by the Trent Valley IDB. Those Ordinary Watercourses that do not fall under the IDB's jurisdiction are the responsibility of Nottinghamshire County Council, the LLFA. The River Trent (Main River) falls within the EA's control, although the Canal and River Trust is the Navigation Authority for the Trent and has freehold landowner interests with respect to the riverbed.

3.2 Geology

3.2.1 Based on published geological records for the area (British Geological Survey (BGS) online mapping), the eastern part of the Site between the Catchment Drain and the River Trent is underlain by Alluvium (clay, silt, sand and gravel) and Holme Pierrepont Sand and Gravel Member (sand and gravels). A small, isolated area of Till is located in the northeast of the Site. The western part of the Site has limited linear areas of Head deposits in the vicinity of Springs Lane and along Oswald Beck.

3.2.2 The bedrock geology for the whole Site is recorded as Mercia Mudstone Group (mudstone, siltstone and sandstone).

3.2.3 BGS borehole logs have been reviewed for geological information as described in **Table 3.1**:

Table 3.1: BGS Borehole Records

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
SK78SE12	Within Site boundary, on Gainsborough Road to the north of Sturton le Steeple	Keuper Marl to at least 10.06m bgl	Yes – rest level 4.9m bgl
SK78SE28	Within Site boundary, immediately west of Leverton Road to the west of Fenton	Keuper Marl to 148m bgl	No
SK78SE27	Within Site boundary, between Northfield Road and Fenton Lane in the east of the Site	River Terrace Deposits to 1.4m bgl, Keuper Marl to at least 3m bgl	No
SK78SE26	Within eastern Site boundary, along existing overhead cable route	River Terrace Deposits to 3.4m bgl, Keuper Marl to at least 5m bgl	No
SK88SW39	Within eastern Site boundary, along existing overhead cable route	Clay, sand and gravel to 8.8m bgl, Keuper Marl to at least 9.75m bgl	Yes – 1.2m bgl
SK88SW38	Within eastern Site boundary, along existing overhead cable route	Sand and gravel to 5.94m bgl, Marl to at least 9.14m bgl	Yes – 1.98m bgl
SK88SW37	Within eastern Site boundary, along existing overhead cable route	Sand and Gravel to 5.49m bgl, Keuper Marl to at least 7.62m bgl	Yes – 1.07m bgl
SK88SW12	Within eastern Site boundary, along existing overhead cable route	Sand, silty sand and clay to 4.5m bgl, Calcareous Mudstone to at least 6m bgl	Yes – 1m bgl
SK88SW36	Within eastern Site boundary, along existing overhead cable route	Sand to 4.88m bgl, Marl to at least 6.71m bgl	Yes – 1.2m bgl

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
SK88SW4	Within Site boundary, in far east of Site 325m west of the River Trent	Alluvium to 7m bgl, River Terrace Deposits to 10m bgl, Keuper Marl to at least 11.5m bgl.	Yes - "H_2O shot to ground level as soon as broke through clay"
SK78NE35	250m north of the Site within West Burton Power Station	Sand and gravel to 7m bgl, Mercia Mudstone Group to a depth of 164m bgl and Sherwood Sandstone to 395m bgl	Yes – 80m bgl
SK78SE53	20m north of Site, on Gainsborough Road	Keuper Marl to at least 10.06m bgl	Yes – 4.9m bgl
SK78NE57	50m north of the Site on Wheatley Road	Keuper Marl to at least 6.4m bgl	Yes – "nearly full of water"
SK78SE13	70m north of the Site on Wheatley Road	Keuper Marl to at least 6.4m bgl	Yes – "nearly full of water"
SK78SE50	450m west of the Site	Keuper Marl to at least 100m bgl	Yes – 37.4m bgl
SK78SW44	800m west of the Site	Keuper Marl to 50.2m bgl	No
SK78SE42	95m south of the Site	Keuper Marl (no measurements given)	No
SK88SW42	70m east of the Site at Toll Bar Cottage	River Terrace sand and gravels to 15m bgl, Keuper Marl to at least 210m bgl	No

3.2.4 All available boreholes within the Site have been included in **Table 3.3** with the exception of any marked as 'confidential' or any that aren't legible due to

their age / scale of scanning. The table also includes any off-site records within 100m of the Site boundary, and selected boreholes within 1km of the Site – these are focussed to the west and south of the Site where there are limited records within the Site boundary.

3.2.5 The BGS borehole logs confirm the presence of Alluvium and Holme Pierrepont sands and gravels in the eastern part of the Site. No superficial deposits are recorded for the remainder of the Site, including for the boreholes closest to the proposed BESS and substation locations in the north of the Site. All boreholes record a bedrock of "Keuper Marl", now known as Mercia Mudstone.

3.2.6 No site-specific intrusive ground investigations have been undertaken for the Site to date.

3.3 Hydrogeology

3.3.1 Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the Alluvium and Holme Pierrepont Sand and Gravel Member are classified as a Secondary A superficial aquifer. The pockets of Till and Head deposits are classified as a Secondary (Undifferentiated) aquifer. The bedrock geology is classified as a Secondary B aquifer.

3.3.2 As shown in **Table 3.3**, groundwater levels within the BGS boreholes vary significantly. Groundwater is absent (or not recorded) in three of the on-site boreholes. Shallow groundwater (<5m bgl) generally correlates with the presence of Alluvium or Holme Pierrepont Sand and Gravel Member (sand and gravels), although shallow groundwater is also recorded within the Mercia Mudstone in some locations. Deeper groundwater (37m bgl and 80m bgl) is also recorded in the Mercia Mudstone at two locations.

3.3.3 The BGS borehole logs suggest isolated pockets of groundwater beneath the Site within bands of permeable deposits (superficial sands and gravels and / or permeable bands within the Mercia Mudstone) rather than a continuous shallow groundwater body. However, it is acknowledged that the BGS borehole logs do not provide sufficient Site coverage to draw firm conclusions. Where present, shallow groundwater is likely to flow locally towards the Ordinary Watercourses crossing the Site, and regionally in an easterly direction towards the River Trent. This is supported by the BGS Hydrogeological Map of the Northern East Midlands which indicates a general west to east direction of groundwater flow.

3.3.4 Defra's MAGIC maps confirm that the Site is not located within 1km of a groundwater Source Protection Zone or within 1km of a Drinking Water

Safeguard Zone (surface water or groundwater). However, the eastern part of the Site (land lying east of the Catchwater Drain) falls within a Drinking Water Protected Area relating to surface water. These are defined as locations where raw water is abstracted for human consumption providing, on average, more than 10 cubic metres per day, or serving more than 50 persons, or is intended for such future use.

4 PLANNING POLICY CONTEXT

4.1 National Policy Statements

4.1.1 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 flood risk requirements are as follows.

Overarching NPS for Energy (EN-1)[3]

4.1.2 In relation to flood risk, this NPS sets out requirements for application of the Sequential and Exception Tests (paragraphs 5.89 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, 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). Paragraph 5.8.14 states that an FRA should "*identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account*". The NPS sets out the minimum requirements for FRAs (paragraph 5.8.15).

4.1.3 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*".

NPS for Renewable Energy Infrastructure (EN-3)[4]

4.1.4 Paragraph 2.10.84 of this NPS states that an FRA "*will need to consider the impact of drainage, but that as solar PV panels will drain to the existing ground, the impact will not, in general, be significant*". 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.

[3] https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1

[4] https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3

4.1.5 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*".

4.1.6 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*".

NPS for Electricity Networks Infrastructure (EN-5)[5]

4.1.7 In relation to climate change, paragraph 2.3.2 of this NPS requires applicants to set out how development has been designed to be resilient to flooding, "*particularly for substations that are vital to the network, and especially in light of changes to groundwater levels as a result of climate change*". Paragraph 2.9.19 of the NPS states that applicants should protect as far as reasonably practicable surface and ground waters.

4.2 Planning Practice Guidance – Flood Risk and Coastal Change

4.2.1 Although national planning policy is not applicable to DCO applications, paragraph 5.8.9 of NPS EN-1 makes specific reference to the Planning Practice Guidance (PPG) on Flood Risk and Coastal Change[6] with respect to application of the Sequential Test and the Exception Test. Paragraph 5.8.16 also makes reference to the PPG for further guidance when preparing a FRA.

4.2.2 Paragraph 24 of the PPG states that "*the Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account*". It goes on to provide guidance on the application of the Sequential Test in relation to planning applications. The Sequential Test has been applied in relation to the Proposed Development, as described in the separate **Sequential Test Report** by Pegasus **[EN010163/APP/7.5].**

[5] https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5

[6] https://www.gov.uk/guidance/flood-risk-and-coastal-change#the-sequential-approach-to-the-location-ofdevelopment

4.2.3 Table 2 of the PPG indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. **Table 4.1** below is reproduced from Table 2 of PPG.

Table 4.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

4.2.4 The EA has confirmed the classification of the proposed use as 'essential infrastructure'. Given that the Proposed Development falls partly within Flood Zone 3a, the Exception Test is required. A description of the application of the Exception Test for the Proposed Development is provided in the separate **Sequential Test Report [EN010163/APP/7.5].**

4.3 Local planning policy

4.3.1 The Bassetlaw Local Plan was adopted on the 29th May 2024. It contains the following policy relating to flood risk, drainage and water quality:

Policy ST50: Flood Risk and Drainage

4.3.2 This policy requires developments to be supported by a FRA which demonstrates that the development will be safe for its lifetime, without increasing flood risk elsewhere and where possible will reduce flood risk overall. Where relevant, proposals must pass the Sequential Test and where appropriate the Exceptions Test. All development where practicable should incorporate Sustainable Drainage Systems (SuDS) in line with national standards.

Policy ST51: Protecting Water Quality and Management

4.3.3 This policy seeks to "*minimise the impact of development on the quality of surface water and the Sherwood Sandstone Principal Aquifer and its ground source protection zones. Surface water flows from areas like car parks or service yards should have appropriate pollution prevention measures built in to protect groundwater and watercourses from pollutants. Proposals that improve or enhance existing waterbodies will be supported. All proposals must ensure that appropriate infrastructure for water supply, sewerage and sewage treatment, is available or can be made available at the right time to meet the needs of the development*".

5 SOURCES OF FLOOD RISK

5.1 Criteria

5.1.1 In accordance with the National Policy Statements and advice from the EA, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the development (in this case to be limited by the Order to 40 years).

5.1.2 The EA's most recent climate change guidance, published in May 2022[7], should be referenced in order to identify the appropriate peak river flow and rainfall intensity allowances for the scheme. The appropriate allowance for peak river flow is based on the location of the Site in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

5.1.3 The flood risk elements that need to be considered for any Site are defined in BS 8533 'Assessing and managing flood risk in development Code of practice'8 as the "Forms of Flooding" and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land (surface water flood risk);
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject Site.

5.2 Flood risk from rivers (fluvial flood risk)

5.2.1 The EA Flood Zone mapping study for England is available on their website at: https://flood-map-for-planning.service.gov.uk.

5.2.2 The latest EA published flood zone map (**Figure 5.1**) shows that the eastern c.40% of the Site lies within Flood Zone 3, with a further c.5% falling within Flood Zone 2 and the remainder (central and western areas) within Flood

[7] Environment Agency, 'Guidance: Flood Risk Assessments: Climate Change Allowances'. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, last updated May 2022.

[8] BSI, 'BS 8533-2017 Assessing and managing flood risk in development Code of practice', December 2017.

Zone 1. However, this mapping does not take into account the presence of flood defences. The flood map indicates that defences are present along the River Trent to the east of the Site (a section of defence runs within the eastern Site boundary).

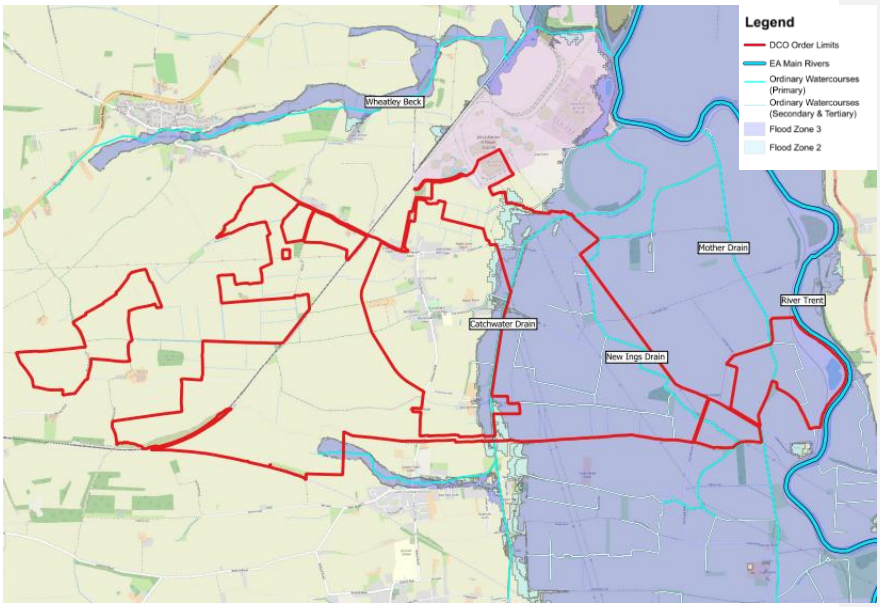

Figure 5.1: Environment Agency 'Flood map for planning'

5.2.3 The EA was consulted for further clarification of the flood risk to the Site. Information was provided by the National Infrastructure Team and the Customers and Engagement Team (East Midlands Area Office). Consultation responses from the National Infrastructure Team are included in **Appendix E**, with the flood data sourced from the Customers and Engagement Team included in **Appendix F**. The flood data was provided in the form of a Product 4 dataset, which gives the results of the EA's latest fluvial and tidal flood modelling for the subject area, including modelled flood extents and flood levels.

5.2.4 The EA has confirmed that fluvial flooding is the dominant source of flooding in this location. They have advised that the EA flood model for this area only takes account of flooding from the River Trent, and not the Ordinary

Watercourses crossing the Site. Therefore, these two sources of fluvial flooding are assessed separately below.

Fluvial Flood Risk from River Trent

5.2.5 The EA has provided undefended fluvial 1 in 100 year and 1 in 1000 year flood outlines, as shown in **Figure 5.2**.

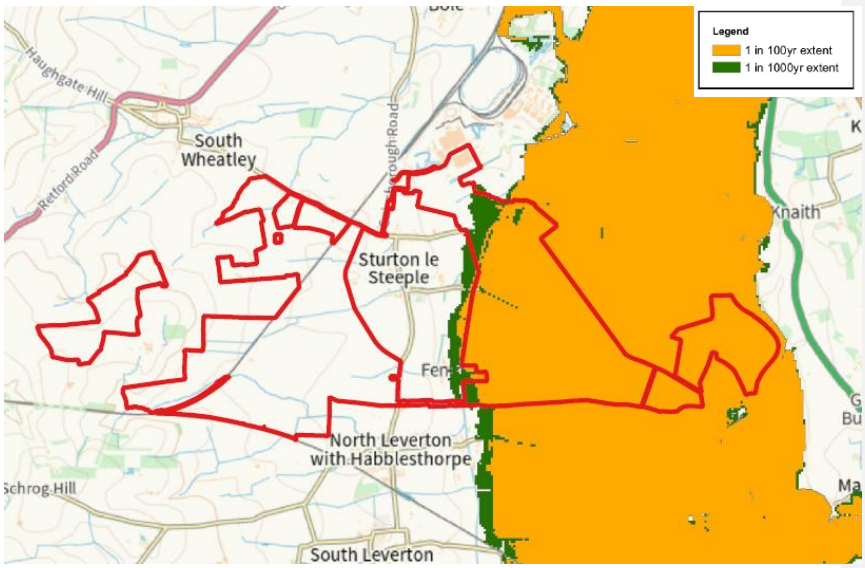

Figure 5.2: Modelled undefended fluvial flood outlines (2023 Jacobs Tidal Trent model)

5.2.6 These flood outlines show the extent of flooding if no defences were present. Similar to the Flood Map for Planning, these show the eastern c.30% of the Site to fall within the 1 in 100 year undefended flood outline, and a further c.5% to fall within the 1 in 1000 year undefended flood outline.

5.2.7 As noted above, the EA flood map shows that flood defences are located along the River Trent. The Product 4 dataset includes modelled defended fluvial flood outlines, i.e. taking into consideration the raised flood defences (flood embankment) along the banks of the River Trent. These model outputs are taken from the Tidal Trent model (Jacobs, 2023). The 1 in 100 year event has been modelled with a range of climate change allowances (29%, 39% and 62% climate change). A range of climate change scenarios were modelled by the EA to inform different types and durations of development. As described

below, the relevant design climate change allowance for the Proposed Development is 29%. Modelled defended fluvial dominated extents for the 1 in 100 year event plus various climate change allowances are shown in **Figure 5.3**. The 1 in 100 year plus 29% defended fluvial outline flood extent is significantly reduced compared to the 1 in 100 year present day undefended scenario (no undefended climate change extents were provided for direct comparison). Additional defended outlines are included in the Product 4 dataset (**Appendix F**). All events up to and including the 1 in 100 year (present day) event are shown to remain on the river-side of the River Trent defence embankment. With a climate change allowance, there is some overtopping of the defences, but the extent of flooding is significantly less than in the undefended 1 in 100 year scenario for events up to the 1 in 100 year plus 39% climate change scenario.

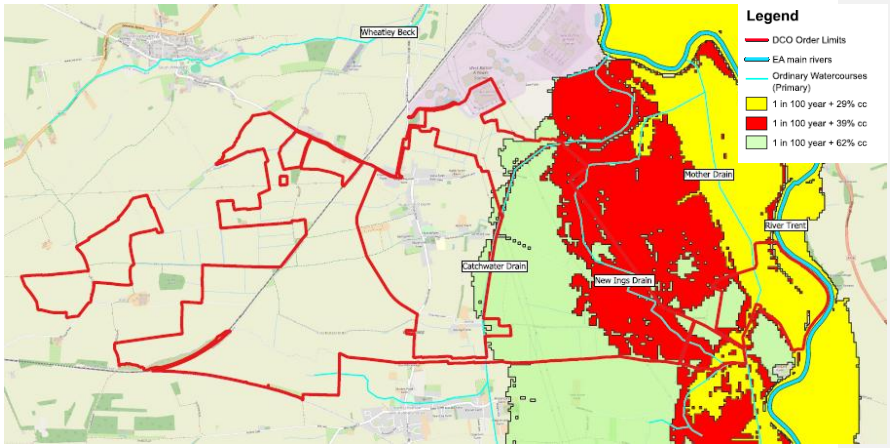

Figure 5.3: Modelled defended 1 in 100 year plus climate change fluvial dominated extents (2023 Jacobs Tidal Trent model)

5.2.8 The EA has also provided a modelled defended 1 in 30 year fluvial flood extent and water levels in order to establish the extent of Flood Zone 3b (functional floodplain) for the River Trent. This is provided in **Figure 5.4**. This mapping confirms that the 1 in 30 year fluvial flood extent remains within the river embankments and does not extend beyond the flood embankment just inside the eastern boundary of the Site. The Bassetlaw District Council Strategic Flood Risk Assessment (SFRA)[9] confirms that the presence of defences is

[9] JBA Consulting, Bassetlaw District Council Strategic Flood Risk Assessment, 2019

considered when mapping Flood Zone 3b. All built development is therefore confirmed to lie outside Flood Zone 3b for the River Trent.

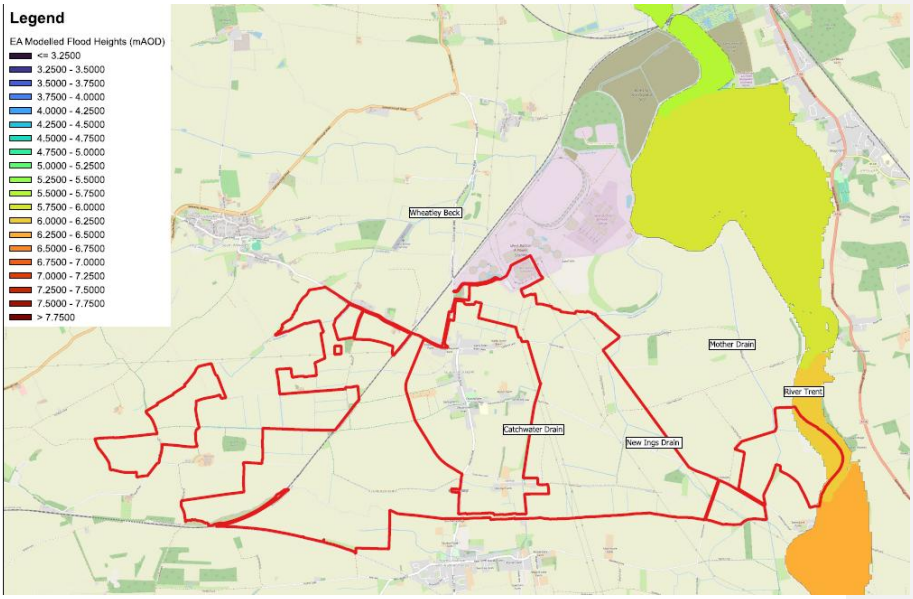

Figure 5.4: Modelled 1 in 30 year defended flood extent (2023 Jacobs Tidal Trent model)

5.2.9 The EA has advised that the 'design' flood event for the Proposed Development is the 1 in 100 year plus climate change defended flood extent. Based on the EA's latest climate change guidance[10], the 'higher central' climate change allowance should be used for 'essential infrastructure' development. The Proposed Development will be operational for a 40 year period from 2029 to 2069, the grid connection date is October 2029 and the 40 year lifespan of operation, which is commenced at the grid connection date, will be specified within the DCO as Requirement 21 of the **draft DCO [APP-041].** As the operational period falls entirely within the 2050s epoch (covering the period 2040 – 2069), the 'higher central' climate change allowance within the Lower Trent and Erewash Management Catchment for the 2050s epoch of 23% is considered appropriate for the operational phase of the

[10] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Development. This has been agreed with the EA (see correspondence in **Appendix F**).

5.2.10 As the EA Tidal Trent model does not include outputs for the 23% climate change allowance, the 29% climate change outputs will be used to inform mitigation requirements as a worse-case scenario. The 1 in 100 year plus 29% climate change extent and flood levels are shown in **Figure 5.5**.

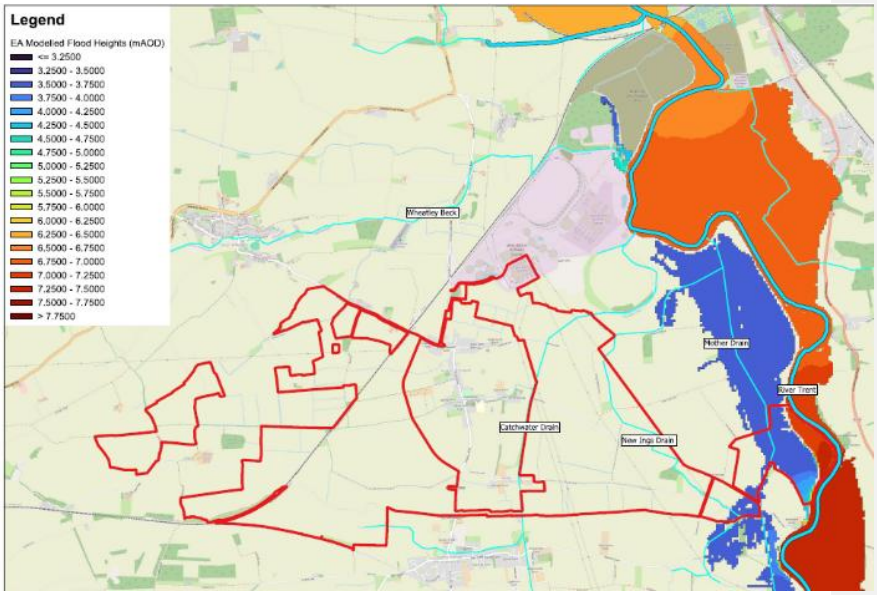

Figure 5.5: Modelled defended fluvial 1 in 100 year plus 29% climate change extent and levels (2023 Jacobs Tidal Trent model)

5.2.11 The modelled extent for the 1 in 100 year plus 29% climate change event occupies only the eastern-most part of the Site, comprising the land proposed for biodiversity mitigation only. The design 1 in 100 year plus 29% climate change flood level is **3.69m AOD**. Although localised parts of the operational part of the Site fall slightly below this flood level, to a minimum ground level of 3.5m AOD, the EA modelled flood extents show there are no pathways for floodwater to reach these areas.

5.2.12 As the decommissioning phase would extend into the 2080s epoch, the 1 in 100 year plus 39% climate change extent requires consideration for the decommissioning works, as requested by the EA. The 1 in 100 year plus climate change extent is shown in **Figure 5.3** and occupies the eastern part

of the Site including areas proposed for solar arrays. The design 1 in 100 year plus 39% climate change flood level for the decommissioning phase of the development is **4.35m AOD** (taken from the Product 4 dataset in **Appendix E**). This could result in flood depths of up to 0.85m in the lowest parts of the operational area of the Site.

5.2.13 As agreed with the EA (see correspondence in **Appendix F**), the 'credible maximum' climate change allowance (upper end) is not applicable for the Proposed Development. As specified within NPS EN-1, the credible maximum climate change allowance should be considered "*when energy infrastructure has safety critical elements*". The Proposed Development will be unmanned aside from maintenance visits and would be monitored via CCTV and safely shut down remotely in the event of extreme flooding. It will not form part of the National Grid, acting as a generating facility rather than a distributor, and there will therefore be no disruption to supply to the wider public in the event the facility needs to be shut down. It is therefore not considered to include 'safety critical elements'.

5.2.14 The EA has provided details of the flooding scenario in a worse-case scenario that a breach occurs in the River Trent flood embankment. A number of breach locations were modelled as part of the EA's Tidal Trent model. The EA has advised that the most appropriate breach location for the Site (i.e. the breach with the greatest impact to the Site) is Breach 29. This breach location is approximately 2km southeast of the Site.

5.2.15 The breach extent associated with Breach 29 during a 1 in 100 year plus 29% climate change event is shown in **Figure 5.6**.

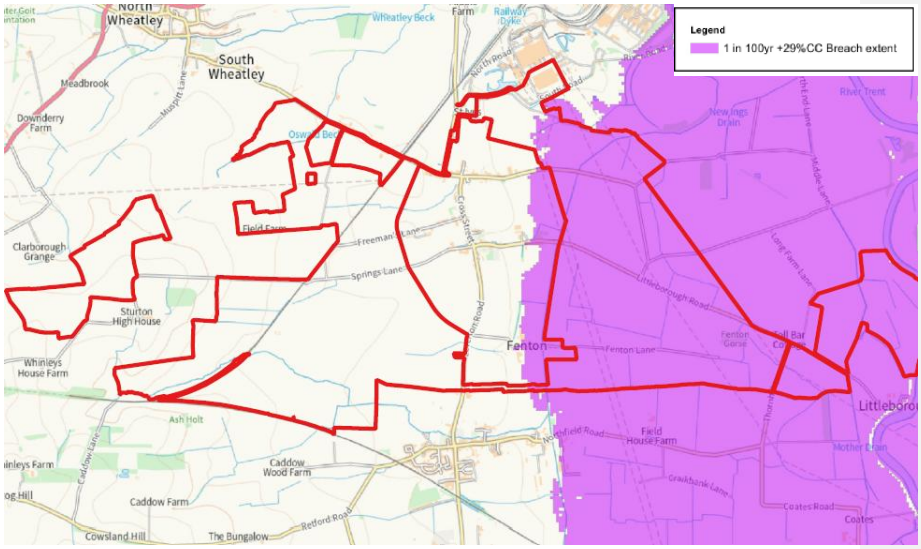

Figure 5.6: Modelled breach flood extent at Breach Location 29, 1 in 100 year plus 29% climate change event (2023 Jacobs Tidal Trent model)

5.2.16 The breach modelling outputs indicate a possible breach flood level of 7.33m AOD during the 1 in 100 year plus 29% climate change event. This could correspond to flooding of the majority of the eastern parcel of the Site, with flood depths of up to 3.83m within the areas for solar arrays and up to c.1.3m within the BESS area. The substation is located outside the breach extent. It is reiterated that this is a worse-case scenario that the flood defences fail, and that this failure occurs in specific the location modelled as Breach 29. A breach in other locations would result in smaller flood extents and lower flood levels on the Site.

5.2.17 The Bassetlaw Dirstrict Council SFRA[11] includes fluvial flood zone mapping, including climate change mapping, but this is considered to be superseded by the 2023 Jacobs Tidal Trent flood model discussed above.

5.2.18 Historical flood outlines have been obtained from the Defra Data Services Platform and are shown in **Figure 5.7**. Flooding to the landward side of the River Trent flood defence bund was recorded during during 1932, 1947, 1977 and 2000 to various extents. None of the historical events would have affected the proposed substation location and the BESS location would have remained

[11] JBA Consulting, Bassetlaw District Council Strategic Flood Risk Assessment, 2019

unaffected in all but one event (1947). The return period of the historical events and the level of the flood defence bund at the time of flooding are not known so it is difficult to estimate the likelihood of a reoccurence. However, should a similar event occur during the operational lifetime of the Proposed Development, the progression of floodwaters would be monitored remotely and it is likely that parts of the Proposed Development would need to be shut down temporarilty until flooding receded.

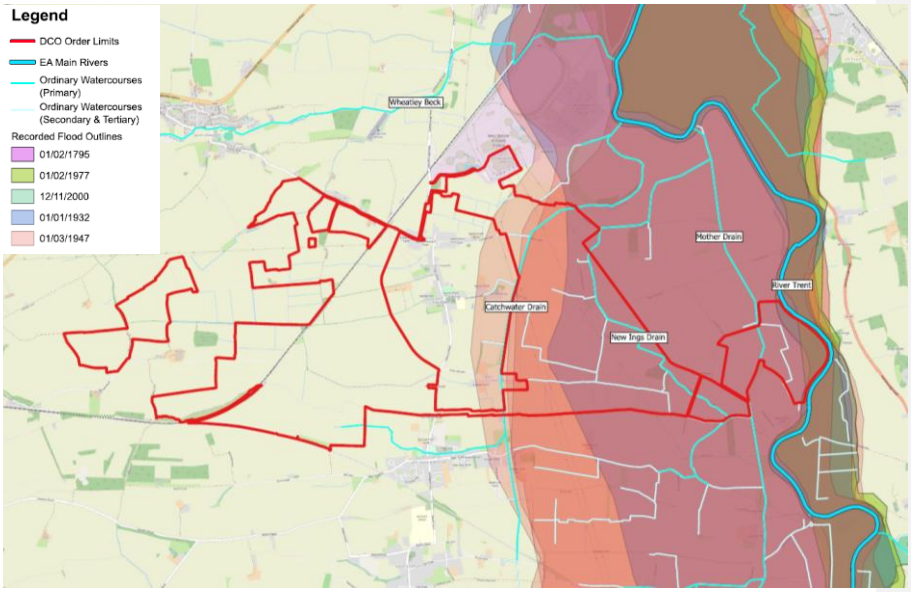

Figure 5.7: Historical recorded flood outlines (Defra Data Services Platform)

Fluvial Flood Risk from Ordinary Watercourses

5.2.19 The has EA advised that the River Trent flood model does not take into account the flood risk from the Ordinary Watercourses within the Site. They have advised that additional assessment should be undertaken in relation to the fluvial flood risk from these watercourses.

5.2.20 For the main IDB watercourses, namely the Catchwater Drain, Mother Drain and New Ings Drain, an assessment of fluvial flood risk was initially

undertaken by RSK using the Mannings approach. The full methodology and findings are provided in **Appendix G**. As the Mannings Assessment identified a possible lack of capacity within the Catchwater Drain and Mother Drain to contain the 1 in 100 year plus climate change event, a 1D modelling exercise was undertaken for all three watercourses, to refine the in-channel water levels. This confirmed that during the 1 in 100 year plus climate change event there was no overtopping of the Mother Drain and only limited overtopping in a single location for both the Catchwater Drain and New Ings Drain. The overtopping for the Catchwater Drain is considered to affect an area of open ground only, with the nearest area of proposed infrastructure being an area of solar panels c.400m away. Sensitivity testing has been undertaken for the Catchwater Drain which confirms that even for increased flows and roughness values within the model for the Catchwater Drain, the flood risk to proposed infrastructure from this source is low. For the New Ings Drain, the overtopping results from a water level only 30mm higher than the bank level in one location, with the nearby infrastructure comprising solar panels that will be inherently raised significantly above the flood level. The IDB watercourses assessed are considered to represent a low risk to the Proposed Development.

5.2.21 The latest EA Flood Map for Planning includes a 1 in 30 year defended fluvial flood extent which indicates a potential flood risk from the Catchwater Drain during this event (see **Figure 5.8**). However, the 1D fluvial flood modelling exercise confirms that for the 1 in 30 year event there is no out of bank flooding from the Catchwater Drain (or the New Ings Drain or Mother Drain). No areas of Flood Zone 3b are therefore considered to exist within the area of the Proposed Development.

Figure 5.8: EA Flood Map for Planning, 1 in 30 year defended fluvial flood extent

5.2.22 The Catchwater Drain and the New Ings Drain / Mother Drain discharge into the River Trent via pumped outfalls approximately 1km and 1.5km northeast of the Site respectively. These outfalls, and the levels within the watercourses, are managed by the IDB. In the unlikely event of a failure of the pumps, the watercourses would be unable to discharge into the River Trent for a period of time until either the pumps were prepared or temporary pumping arrangements were put in place. In this eventuality, the water levels within the IDB watercourses would rise, initially using the available capacity within the river channels (considered to be significant given the well-defined engineered nature of the channels and the raised bunds along the banks of the watercourses). Once the capacity of the channels is exceeded, overtopping of the riverbanks could occur. This is most likely to occur close to the outfall locations, on low-lying land close to the River Trent. Given that the outfalls are both over 1km from the Site boundary, it is considered very unlikely that floodwater would reach the Proposed Development prior to the pumps either being repaired or temporary pumping facilities implemented. However, in the unlikely event of a prolonged pump failure resulting in water backing up to the

Site, the areas most likely to be affected are in the eastern part of the site, comprising solar panels only. The panels will be raised above ground levels, providing protection to associated sensitive equipment against floodwater from the IDB watercourses. Any displacement of floodwater is considered to be negligible given the small footprint occupied by the solar panel supports. The BESS and Substation are located significantly above, and some distance from, the IDB outfall locations and are therefore highly unlikely to be impacted by a pump failure. The fluvial breach flood event described in Section 5.2.16 is more extreme than a flood event resulting from a pump failure, therefore the mitigation measures proposed in relation to a breach flood event would be sufficient to mitigate against a pump failure. This applies to all aspects of the Development including the BESS area. During either event, the Proposed Development can be shut down remotely if required, with all electrical connections beyond the rack terminations no longer live until the flood has subsided. Further discussion is provided in Section 7.2.5. No further modelling or assessment of a pump failure is therefore required.

5.2.23 For the smaller IDB watercourses and the Ordinary Watercourses managed by the LLFA, it is considered appropriate to use the EA's surface water flood risk mapping as a proxy for the fluvial flood risk from these watercourses. This is due to the small catchment of these watercourses, many of which were noted as dry during the Site inspection. Surface water flood risk is discussed in **Section 5.4**, but with reference specifically to the Ordinary Watercourses it is noted that the 'medium' and 'high' probability events are shown to remain within or close to the watercourse channels with the exception of the area immediately to the west of the railway in the west of the Site, where a restriction through the railway culverts results in backing up of water behind the railway. With the exception of the area upstream of the railway culverts, the likelihood of flood depths outside the channels reaching 300mm is shown on the EA mapping to be 'very low'. Within the location of the BESS and substation, the likelihood of flood depths reaching 200mm is shown to be 'very low' outside of the drainage channels.

Fluvial Flood Risk Summary

5.2.24 During the design defended fluvial flooding scenario associated with the River Trent, no flooding is anticipated to the developable area of the Site. A residual risk remains in the unlikely event of a breach of the River Trent defences, which could result in a significant depth of flooding in the eastern part of the Site.

5.2.25 The Ordinary Watercourses (managed by the LLFA and IDB) have a limited associated fluvial flood risk. For the main IDB watercourses, very limited localised overtopping has been shown to occur at one location each for the Catchwater Drain and New Ings Drain (with minor overtopping at locations some distance from proposed sensitive infrastructure during the sensitivity testing exercise), and for the smaller watercourses / ditches any overtopping is considered to remain close to the watercourse channel and associated depths are shown to be minimal (less than 300mm even in the extreme 0.1% annual exceedance probability (AEP) event with the exception of the area immediately upstream of the railway embankments).

5.2.26 The overall risk of fluvial flooding is considered to be **low to medium**.

5.3 Flood risk from the sea (tidal flood risk)

5.3.1 Although the River Trent is dominated by fluvial flows, there is an element of tidal influence. The EA has provided an undefended tidal flood extent from the Tidal Trent model, as shown in **Figure 5.9**. This shows that if flood defences were entirely absent, the eastern part of the Site (including part of the area of proposed solar development) could be impacted by tidal flooding during the 1 in 200 year and 1 in 1000 year events.

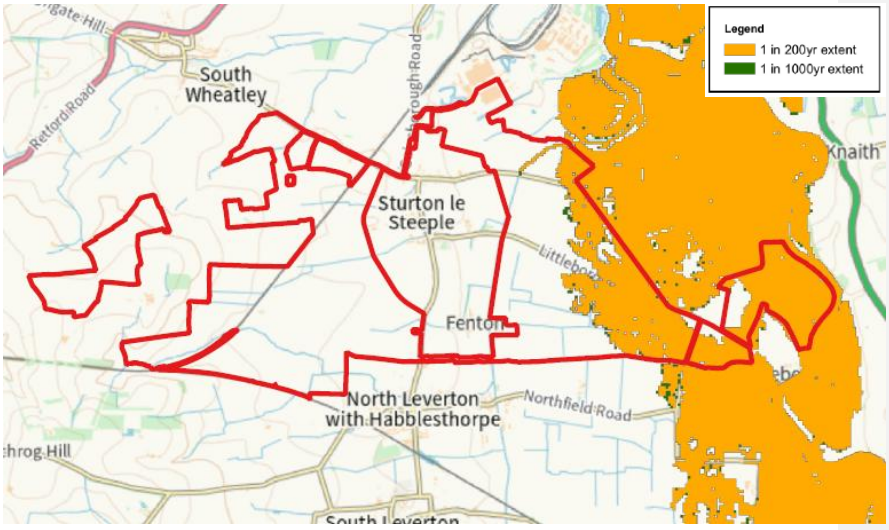

Figure 5.9: Modelled undefended tidal dominated flood extent (2023 Jacobs Tidal Trent model)

5.3.2 The 'design' tidal flood event is the 1 in 200 year event taking account of the presence of flood defences. The EA has provided defended tidal flood outlines for a range of return period events within their Product 4 dataset (**Appendix E**). From the extract in **Figure 5.10** it can be seen that the Site is unaffected by tidal dominated flooding for all return period events. This confirms that the dominant source of flooding in this located is fluvial flood risk.

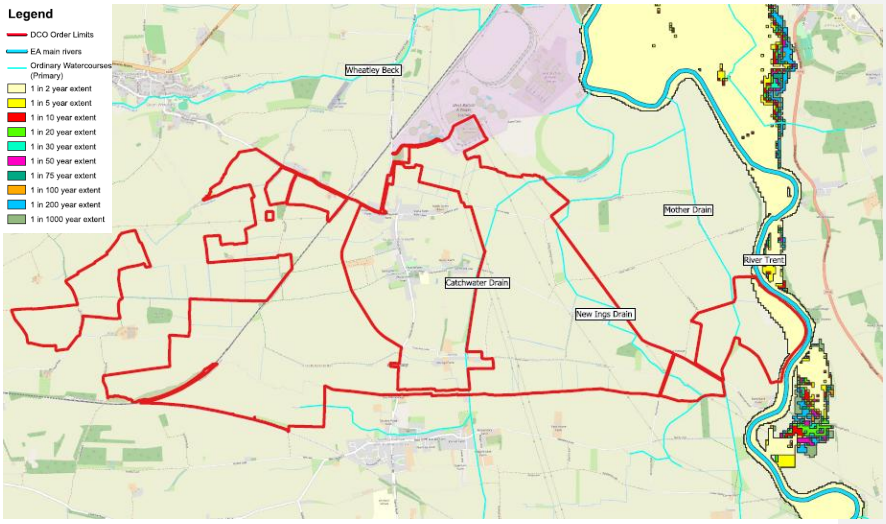

Figure 5.10: Modelled defended tidal flood extents (2023 Jacobs Tidal Trent model)

5.3.3 A tidal breach flood outline is provided within the Product 4 dataset, but is considerably smaller than the fluvial breach extent considered in **Section 5.2** and therefore consideration of a breach event within this FRA will be based on the fluvial breach scenario as a worse-case.

5.3.4 The overall tidal flood risk is considered to be **low**.

5.4 Flood risk from the land (surface water flood risk)

5.4.1 If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

5.4.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water flows from the Site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

5.4.3 The EA's surface water flood map (**Figure 5.11**) shows areas of low, medium and high surface water flood risk throughout the Site. The western and eastern parts of the Site are described in turn below.

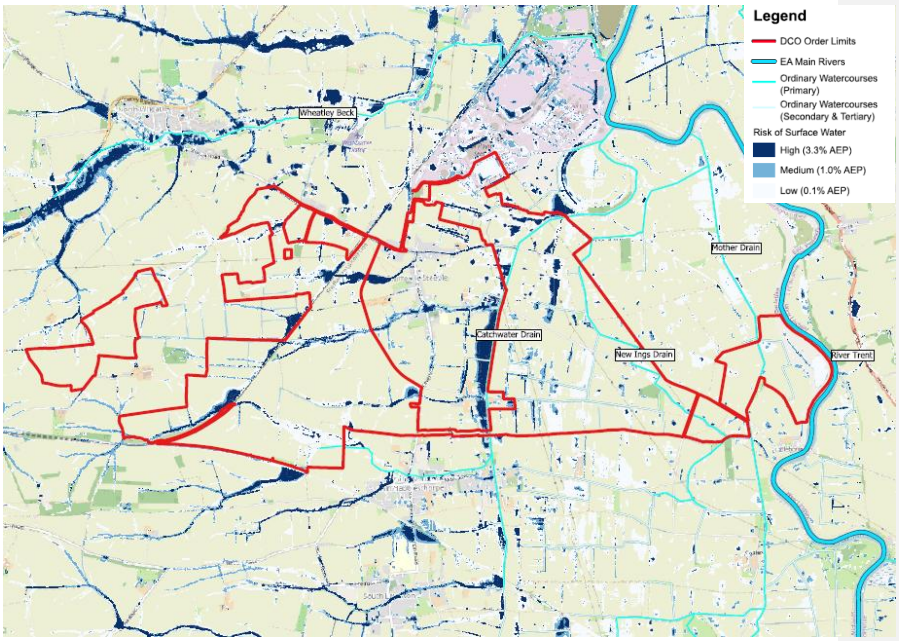

Figure 5.11: EA Risk of Flooding from Surface Water mapping

5.4.4 In the western part of the Site, areas of surface water flood risk broadly correlate to the Ordinary Watercourses within this part of the Site. In this part of the Site, the 'medium' and 'high' risk areas (corresponding to the 3.3% and 1.0% AEP events) largely remain within or close to the Ordinary Watercourse channels. Exceptions to this are:

- An overland flow path immediately to the south of Oswald Beck, representing overland flow across agricultural land rather than flow within a watercourse. Within this area, there is a low to high likelihood of depths of up to 200mm, and a very low to low likelihood of depths up to 300mm. The affected area is proposed for solar arrays only;
- Two locations on the Ordinary Watercourse running from Wood Lane towards Sturton le Steeple, where out of bank flow (flow not wholly contained within the watercourse channel) is shown to occur just upstream of the railway line (likely due to a constriction of flows through the culvert under the railway) and also between the railway and Sturton le Steeple village. Within these areas, there is a medium to high likelihood of depths of up to 300mm. The likelihood of depths up to 600mm is low or very low. The affected areas are proposed for solar arrays in addition to a detention basin which is intended to help attenuate overland flows towards the village of Sturton le Steeple (additional details provided in **Section 8**);
- An area of out of bank flow on the Ordinary Watercourse flowing towards Fenton, immediately upstream of the crossing beneath Leverton Road, likely as a result of restricted flows through the culvert. This area has a low to high likelihood of depths up to 300mm and a very low to low likelihood of depths up to 600mm. This area is largely proposed as open land, with solar arrays at the western edge of the affected area;
- A linear overland flow path connecting the Ordinary Watercourse flowing towards Fenton with the Ordinary Watercourse flowing towards North Leverton with Habblesthorpe. Depths are almost entirely at a very low to low likelihood of reaching up to 200mm, with a very small area with a medium – high likelihood of reaching up to 200mm. This area is proposed for solar arrays only; and
- An area on the Ordinary Watercourse flowing towards North Leverton with Habblesthorpe, immediately upstream of the railway and likely as a result of restriction of flows through the railway culvert. Parts of the affected area have a medium to high likelihood of depths up to 1200mm. Solar arrays are proposed in this area.

5.4.5 Aside from the Ordinary Watercourse channels themselves and the areas identified above, all other areas in the western part of the Site indicated to be at risk of surface water flooding are shown to have a very low to low likelihood of flood depths up to 200mm.

5.4.6 No inverters are proposed within areas of medium or high surface water flood risk within the western part of the Site, these areas are solely proposed for solar arrays.

5.4.7 Within the eastern part of the Site, the areas of surface water flood risk generally relate to overland flows or ponded water within the agricultural fields, or with smaller field ditches, rather than corresponding to larger Ordinary Watercourses. This is due to the flatter nature of the eastern part of the Site, which results in standing water in the fields. In many cases, the patterns of surface water ponding appear to correlate to the plough lines within the fields. Key areas of surface water flood risk in the eastern part of the Site are:

- Localised areas of low to high risk to the west of the Catchwater Drain and to the south of West Burton Power Station. These areas appear to correspond to ponded areas on flat areas of agricultural land, with plough lines picked up by the model outputs. These areas almost entirely have a very low to low likelihood of depths of up to 200mm, with minimal areas with a medium likelihood of depths of up to 200mm. All areas have a very low likelihood of depths up to 300mm. The BESS and substation are proposed within these areas between the Catchwater Drain and the Power Station but are directed to areas almost entirely at a very low to low risk of surface water flooding. Solar arrays are located across the remainder of this area;
- Relatively large areas of low to high risk in the fields to the south of Common Lane. Again, plough lines are evident in the model outputs. These areas largely have a very low to low likelihood of depths of up to 200mm, with small areas showing a medium to high likelihood of depths of up to 200mm. All areas have a very low likelihood of depths of up to 300mm. These areas are proposed for solar arrays.
- Scattered isolated areas of low to high flood risk in the southern part of the eastern parcel (south of Littleborough Road), some areas corresponding to field drains and some to low points within the fields. Outside of the drainage channels and some very small isolated low points, all areas have a very low to low likelihood of depths of up to 200mm. These areas are proposed for solar arrays.

5.4.8 Within the eastern part of the Site, only one inverter is within an area with a medium or high risk of surface water flooding. In this area there is a very low (less than 0.1% AEP) likelihood of flood depths of up to 200mm, therefore the risk in this area is not considered significant.

5.4.9 **Figure 5.12** demonstrates the likelihood of flood depths reaching 300mm across the Site. The likelihood of flooding up to 300mm depth is very low (<0.1% AEP) for almost the entire Site (outside of the watercourse channels), with a greater depth of flooding expected to occur only in the areas immediately to the west (upstream) of the railway and upstream of the Leverton Road culvert, as described above.

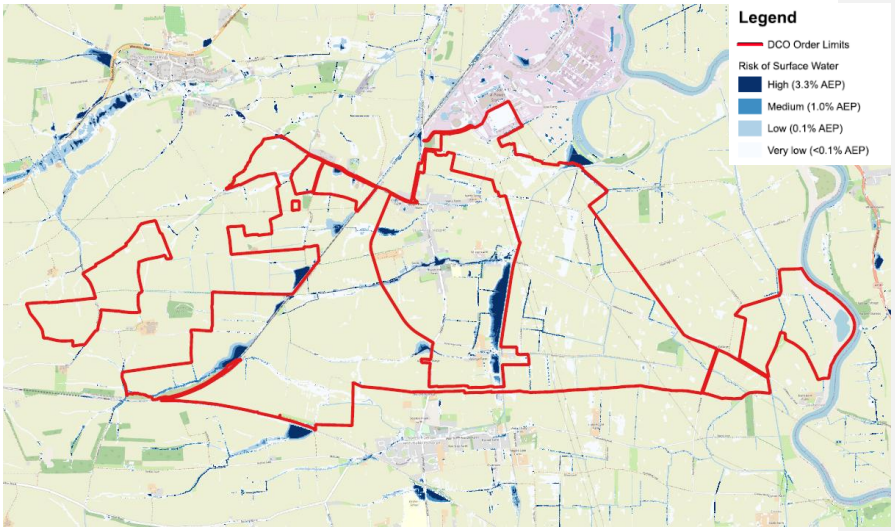

Figure 5.12: EA Risk of Flooding from Surface Water mapping – likelihood of depths up to 300mm

5.4.10 Overall, although areas of surface water flood risk have been identified on-site, these largely correlate to Ordinary Watercourse channels and immediately adjoining land in the western part of the Site, and with areas of low-lying land in the eastern part of the Site. Outside of watercourse channels, a very low to low likelihood of depths of up to 200mm has been identified for most areas. Those areas shown to be at greater depth are associated with isolated areas in the western part of the Site having a medium to high likelihood of depths up to 300mm, and one area upstream of a railway culvert in the west of the Site that has a medium to high likelihood of depths up to 1200mm.

5.4.11 The Bassetlaw District Council SFRA includes surface water flood risk mapping, but this is considered to be superseded by the 2025 mapping released by the EA.

5.4.12 Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. This could lead to locally increased extents and depths of surface water flood risk. However, given the raised nature of flood sensitive aspects of the Proposed Development, any increases in surface water flood risk are not considered significant.

5.4.13 The overall risk of surface water flooding at the Site is considered to be **very low to medium**.

5.5 Flood risk from groundwater

5.5.1 Groundwater flooding tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

5.5.2 BGS borehole logs suggest isolated pockets of shallow groundwater exist beneath the Site within bands of permeable deposits (superficial sands and gravels and / or permeable bands within the Mercia Mudstone) rather than a continuous shallow groundwater body although this has not been confirmed via intrusive investigation. Where recorded, shallow groundwater was generally present at between 1m and 5m bgl.

5.5.3 The Bassetlaw District Council SFRA includes mapping of areas susceptible to groundwater flooding. The mapping is of a strategic scale using a 1km square grid to indicate where geological and hydrogeological conditions suggest groundwater might emerge. The SFRA notes that "*this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding*". The data is indicative and should only be used in combination with other information, for example, local or historical data.

5.5.4 This mapping indicates that the susceptibility varies across the Site, from less than 25% susceptibility in the west of the Site to more than 75% susceptibility in the east of the Site. The SFRA also notes that there is increased risk of

groundwater flooding throughout the district due to a history of mining in Bassetlaw.

5.5.5 Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk as a result of climate change is likely to be low.

5.5.6 The overall groundwater flood risk is considered to be **low to medium,** with the lower lying eastern part of the Site considered to be at the highest risk.

5.6 Flood risk from sewers

5.6.1 Flooding from artificial drainage systems and sewers occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. When exceeded, the surcharged pipe work could lead to flooding from backed up manholes and gully connections.

5.6.2 Severn Trent Water sewer records show the presence of very limited mains sewers beneath the Site, consisting of a 150mm diameter foul sewer within the northern part of the Site and a foul sewer beneath Wheatley Road. Any surcharging of these sewers is likely to be localised to the sewer locations and relatively shallow in depth.

5.6.3 The Bassetlaw District Council SFRA notes that Severn Trent Water hold records of at least 208 incidents of sewer flooding in Bassetlaw District administrative area. The settlements with the most recorded incidents include Retford, Worksop, Costhorpe and North Wheatley.

5.6.4 As the existing mains sewers are foul sewers, climate change impacts are not anticipated.

5.6.5 The overall sewer flood risk to the Site is considered to be **very low.**

5.7 Flood risk from reservoirs

5.7.1 Flood events can occur from a sudden release of large volumes of water from reservoirs.

5.7.2 The EA reservoir flood map (reproduced as **Figure 5.13**) shows the largest area that might be flooded if a reservoir were to fail and release the water it

holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

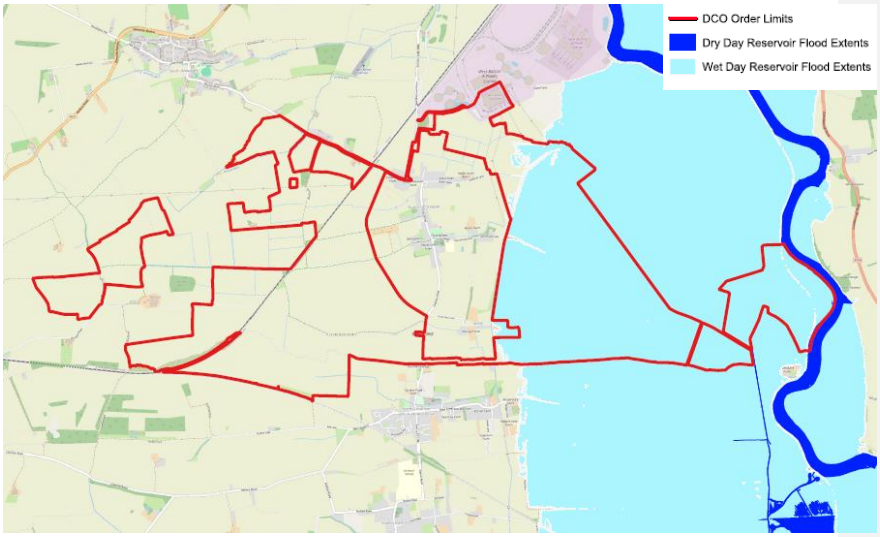

Figure 5.13: Environment Agency 'Flood risk from reservoirs' map

5.7.3 The EA mapping was updated in 2021 to demonstrate the potential maximum extent of flooding for two scenarios - a "dry day scenario" in which river levels are "normal", and a "wet day scenario" where the flooding from the reservoir coincides with flooding from rivers.

5.7.4 The map shows that the Site is not in a location at risk of reservoir flooding when river levels are normal, however, the eastern part of the Site is at risk should fluvial and reservoir flooding occur simultaneously. There is considered to be a residual risk should the peak fluvial event and reservoir failure occur at the same time. However, the reality is a reservoir failure is more likely to occur sometime after the peak of the event.

5.7.5 Reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained.

5.7.6 Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be

minimal. It is unlikely that there will be a substantial change to the risk of flooding for this Site as a result of climate change.

5.7.7 The Bassetlaw District Council SFRA states that there are no records of flooding from reservoirs impacting properties within the district and that the level and standard of inspection and maintenance required under the Reservoir Act means that the risk of flooding from reservoirs is relatively low.

5.7.8 The resultant flood risk is considered to be **low**.

5.8 Other sources of flood risk

Canals

5.8.1 There are no Canal & River Trust owned canals within close proximity to the Site. The nearest canal is the Chesterfield Canal c.2.3km to the west. The Bassetlaw District Council SFRA notes that there are records of historic canal overtopping and breach along the Chesterfield Canal. However, given the controlled nature of flows within the canal and its significant distance from the Site, it is not considered to represent a source of flood risk to the Proposed Development.

Other artificial features

5.8.2 No other artificial features with the potential to result in a flood risk to the Site have been identified.

6 CONSULTATION

6.1 Consultation has been undertaken with a number of key stakeholders, full consultation responses or minutes from stakeholder meetings are provided in the referenced appendices. A summary of the points discussed is provided below.

6.1 Lead Local Flood Authority

6.1.1 A meeting was held with the LLFA on 13th February 2025. Agreed meeting minutes are included in **Appendix H**. Key points agreed were:

- 5m easements for Ordinary Watercourses within LLFA control appear appropriate, but access requirements to be considered.
- Key requirement for crossings is to maintain existing flows. Land Drainage Consent will be required for crossings post-planning.
- Potential for development within surface water flood risk areas to deflect flows to be discussed within FRA, with reference to any sensitive receptors that may be affected;
- Principles of drainage strategy for BESS and substation agreed (climate change allowances, discharge rates and locations, nature of SuDS).
- Linear drainage features requested for access track and at lower edge of fields containing solar panels.

6.2 Trent Valley Internal Drainage Board

6.2.1 A meeting was held with the IDB on 5th March 2025. Agreed meeting minutes are included in **Appendix I**. Key points

- Principles of drainage strategy for BESS and substation agreed.
- IDB consent required for crossings over IDB assets, any new culverts or bridges to maintain existing flows.
- All cable crossings beneath IDB assets should be via HDD and will require IDB consent.
- 9m easements appropriate for IDB watercourses.

6.3 Environment Agency

6.3.1 Consultation undertaken with the National Infrastructure Team of the EA is provided in full in **Appendix E**. A summary of the key points discussed in relation to flood risk is given in **Table 6.1**.

6.3.2 Data requests were additionally made to the East Midlands Area Office. The responses to these data requests are included in **Appendix F**.

Table 6.1: Environment Agency Consultation (National Infrastructure Team)

Date	Form of Consultation	Key EA Comments
22.07.24	Online Meeting	EA was in acceptance of the principal of development within Flood Zone 3, subject to further details of flood risk assessment and mitigation. EA requested that sensitive equipment be raised 300mm above the 'design' 1 in 100 year plus climate change flood level and that consideration be given to sensitivity testing for greater climate change and breach flooding scenarios. EA requested that a high-level assessment was undertaken of the flood risk from the Catchwater Drain and Mother Drain as these are not included in the EA's River Trent flood model. EA requested a high-level assessment of any displacement of floodwater. EA requested a comparison of the Flood Map for Planning with the defended modelled flood outlines.
06.08.24	EIA Scoping Response	River crossings (bridges, culverts and buried cables) should have geomorphologically robust designs that will have minimal impacts on natural fluvial processes operating in the river / floodplain. Any development on the River Trent or its floodplain should be designed to have minimal impact on natural river dynamics and should not restrict future river restoration projects. Infrastructure developments should take account of the likelihood for increased lateral and vertical river dynamics resulting from continued hydro-climatic intensification (i.e. flood-proofed designs that are not just based on present-day baseline geomorphological configuration / behaviour).

Date	Form of Consultation	Key EA Comments
		The Sequential Test will need to be passed and a Sequential Approach taken within the boundary with critical infrastructure positioned in Flood Zone 1. If solar panels are positioned in Flood Zones 2 / 3, the Exception Test will need to be applied. Built development within the floodplain should be quantified to establish the need for compensatory flood storage. Consideration should be given to the flood risk from the Ordinary Watercourses crossing the Site. A 1 in 100 year fluvial flood event using the 2080s epoch higher central climate change allowance (39%) should be used as the design flood event, with panels and equipment raised 300mm above this level. A Credible Maximum scenario should also be considered, with proposals able to be adapted over their lifetime to this level (62%) climate change. Confirmation required of whether the Site will remain operational and staff will remain on Site during a flood event. Consideration should be given to access and egress during a flood event. The FRA should include a comparison of the published flood zones with the undefended 1 in 100 year and 1 in 1000 year model outputs. Defended scenarios with appropriate climate change allowances can then be used in further detailed assessment. The EA hold records of historical flooding in this location in 1932, 1947, 1977 and 2000. It would be sensible to consider the residual risk to the development in the event of a breach of the Trent embankments. This would not be used as a design scenario but would help to understand the resilience of the development in a breach scenario. EA noted the potential for shallow groundwater beneath the Site.
11.12.24	Email	EA confirmed acceptance of the 1 in 100 year plus 23% climate change flood event as the 'design' event and the use of the 1 in 100 year plus 29% climate change model outputs as a worse-case proxy for this design event.

Date	Form of Consultation	Key EA Comments
		EA are in acceptance of the 40 year design life, as long as a DCO requirements states that operation cannot continue beyond this. Decommissioning will extend into the 2080s epoch, therefore the 'higher central' climate change scenario for the 2080s epoch should be considered to identify any residual impacts during the decommissioning phase. EA acknowledged there are no safety critical elements to the Proposed Development, that the Development will not connect to the National Grid and that it could be shut down remotely during a flood event beyond the design scenario. Additionally, all infrastructure will be outside the design 1 in 100 year plus 29% climate change flood extent and all infrastructure raised a minimum of 300mm above the design flood level. A Credible Maximum climate change scenario is therefore not required to be assessed. Breach location 29 results in the largest flood extent within the Site. The extent and water levels from this scenario should be considered with regards to residual risk to the Proposed Development.
14.03.25	Consultation on PEIR	FRA to include assessment of increase in flood risk due to loss of floodplain storage. Additional modelling and assessment may be required for Ordinary Watercourses. Updated Risk of Flooding from Surface Water mapping to be assessed. Bridges to be designed with soffit levels above the 1 in 100 year plus climate change flood level. Detailed hydraulic modelling is recommended for the Catchwater Drain and is tributaries to assess flood risk to BESS and substation. The presence of shallow groundwater cannot be ruled out.

Additionally, the EA undertook a review of a draft version of this FRA on 10th April 2025. The key points raised are included in **Table 6.2**, together with a description of how these concerns have been addressed.

Table 6.2: Environment Agency comments on draft FRA and Applicant response

EA Comment	How Addressed	Additional Comments
Sequential Test not submitted for review	The Sequential Test will be submitted as a standalone document with the DCO application	As the Sequential Test is a planning matter, it is not considered appropriate to include within the FRA
The Flood Map for Planning was updated on 25th March	Figure 5.1 has been updated with the latest Flood Map for Planning. Figure 5.8 shows the latest 1 in 30 year defended Flood Map	N/A
The EA will seek a suitably worded DCO Requirement to ensure the development does not remain operational beyond 2069	N/A	The Applicant is in agreement with this approach
There is an apparent contradiction between the statement that the site will not be connected to the grid, and the description of development which includes grid connection infrastructure. Clarification is required	Clarification provided in Section 5.2.	The Applicant notes that there needs to be a connection to the grid in order to supply electricity. However, there is a switch (substation) separating the Proposed Development from the grid and the Development is able to be disconnected from the grid at any time without any interruption of power to end users. The Proposed Development will solely generate electricity, distribution is undertaken by the National Grid. Given the Proposed Development can be partially or wholly shut down without impact on grid supply, the credible maximum climate change scenario is not considered applicable.

EA Comment	How Addressed	Additional Comments
The FRA should include a description of the process for shutdown of the site during a flood event	N/A	This information will be detailed in a Flood Management Plan to be prepared post DCO consent and secured via DCO requirement. It is reiterated that the site can monitored and shut down remotely, and that all proposed infrastructure falls outside the design 1 in 100 year plus climate change flood extent for the River Trent.
Historical flood outlines should be considered in the context of the Development	Added to Section 5 and **Figure 5.7**	N/A
Details of all new watercourse crossings should be submitted in the FRA to show there is no increase in flood risk	No report amendments.	As discussed in Section 8.3, watercourse crossings will be designed in detail as part of the LLFA / IDB consenting process post-DCO consent. The principle of the proposed crossings has been agreed with these consultees i.e. that existing flows will be maintained, with additional design details to be provided as part of the watercourse consents post DCO consent.
The detention basins to alleviate flooding issues in Sturton le Steeple are welcomed. Limited information has been provided (Drainage Strategy report not reviewed). Hydraulic modelling required to ensure basins work effectively without increasing flood risk to others. Any storage of water above existing ground levels at or above 25,000m^3 will come	No report amendments.	Calculations supporting the design of the detention basins are included in Appendix K of the **Drainage Strategy Report, Appendix 8.2 of the ES [EN010163/APP/6.3.8]**. It is confirmed that the Reservoir Act thresholds are not met.

EA Comment	How Addressed	Additional Comments
under the requirements of the Reservoirs Act 1975.		
Within the Mannings Assessment, climate change should be applied by scaling the peak flows rather than the rainfall.	No report amendments	As acknowledged by the EA, this approach presents a conservative scenario
Calculations on channel capacity within the Mannings Assessment should be reviewed and amended and an updated assessment undertaken of the flood risk to the development.	**Appendix G** amended – Manning Assessment updated and 1D modelling undertaken for the IDB watercourses	N/A

6.4 Canal and River Trust

6.4.1 The Canal and River Trust is the Navigation Authority for the River Trent. They have requested that consideration be given to any changes in drainage to the River Trent, including the impact of any increase in discharge to the river or new outfalls on passing boat traffic.

7 MITIGATION MEASURES AND RESIDUAL RISK

7.1 Sequential approach within application boundary

7.1.1 Flood risk from all sources has been taken into account in the allocation of land uses within the Site boundary. The highest risk part of the Site from a fluvial / tidal, groundwater and reservoir flood risk perspective is the eastern part of the Site closest to the River Trent. This area is proposed for biodiversity mitigation, with the closest area of infrastructure located c.950m from the River Trent. All infrastructure is proposed outside the design 1 in 100 year plus 23% climate change extent, as conservatively represented by the 1 in 100 year plus 29% climate change extent. The most sensitive parts of the Site (BESS and substation) are situated outside Flood Zone 3 (1 in 100 year flood outline in an undefended scenario).

7.1.2 The breach fluvial flood extent is not considered by the EA to be a 'design' event but has been given consideration with regard to resilience during extreme events. The substation has been located outside the breach flood extent, but due to other constraints (for example the need to avoid clashes with existing assets) it has not been possible to locate the BESS or the solar panels outside this area. Instead, the resilience of these features during an extreme breach scenario are considered within this FRA.

7.1.3 The hydraulic modelling assessment of fluvial flood risk from the IDB Watercourses (Catchwater Drain, Mother Drain and New Ings Drain) has shown that very limited out of channel flow is expected during the design flood event for the New Ings Drain and Catchwater Drain only. Depths are shown to be minimal (with water levels 30mm to 40mm above the bank level), affecting only areas proposed for solar arrays (marginally greater overtopping depths were shown during the sensitivity testing model scenarios but still would not impact any sensitive infrastructure). Similarly for the smaller Ordinary Watercourses, the EA surface water flood risk mapping indicates that any associated flooding is limited to the areas close to the channel and to isolated areas upstream of railway / road culverts. Significant development-free easements have been allowed for alongside the Ordinary Watercourses (9m for IDB watercourse and 5m for LLFA watercourse), reducing the likelihood of infrastructure being impacted in the event of overtopping. Areas of medium and high surface water flood risk are proposed for solar arrays only, with the panels and associated equipment elevated above the associated flood levels. The inverters, main substation and BESS have been directed to

areas primarily at a low risk of surface water flooding, or where there is a 'very low' likelihood of surface water depths reaching 200mm.

7.2 Level of Sensitive Equipment

7.2.1 All infrastructure will be located outside the design fluvial 1 in 100 year plus climate change flood extent associated with the River Trent. The BESS and substation (most sensitive aspects of the Proposed Development) will be located at least 2m above the design fluvial flood level.

7.2.2 The hydraulic modelling assessment of fluvial flood risk associated with the IDB watercourses, in combination with the review of the EA's surface water flood risk mapping has shown that significant out of channel flows are unlikely for the IDB or Ordinary Watercourses during the design flood conditions. Any flooding that occurs is considered to remain localised to the watercourse channels and to limited depth, and the allowance of 5-9m easements along all watercourses means any equipment will be located away from the higher risk areas immediately adjacent to the watercourses. Areas of medium and high surface water risk are proposed for solar arrays only, with the panels and sensitive equipment raised above expected surface water flood levels. The greatest surface water depths are immediately to the west of the railway in the western part of the Site, here the solar panels will be raised at least 1200mm above ground level so as to be above the expected surface water flood level.

7.2.3 The BESS, substation equipment and inverters will be raised at least 200mm above ground level, ensuring they are above anticipated maximum surface water flood depths in this area in the extreme 'very low' likelihood (less than 0.1% AEP) scenario.

7.2.4 The raised nature of the BESS, substation, solar panels and associated equipment, and equipment associated with the inverters, all being elevated at least 200mm above ground level, provides additional protection in the event of residual flooding scenarios associated with high groundwater levels, sewer surcharging or reservoir breach.

7.2.5 During extreme flood events, for example in the unlikely event of a breach of the flood defences along the River Trent or a failure of the pumps on the Ordinary Watercourses discharging to the River Trent, any affected sections of the Development can be shut down remotely, if required. The breach flooding scenario is considered to be more extreme than the pump failure scenario. The EA has confirmed in their Scoping Response (see **Table 6.1**) that the breach flood event is not a 'design' scenario and only requires consideration as a residual risk scenario. ~~Equipment has therefore not been~~

~~raised above the breach flood level (this would not be viable given the potential worse-case depths involved).~~ Consideration has been given to raising the BESS area or providing a raised bund to protect the BESS during the residual flood risk scenario, but these options are not considered viable as they would restrict access for fire vehicles in the event of a fire, and they would have significant impacts with respect to other receptors, most notably with respect to landscape impacts. These measures are therefore not considered appropriate, and are not essential as the breach or pump failure scenarios are not 'design' flood risk scenarios. However, the Applicant has advised that in the event site shutdown due to flooding, all electrical connections beyond the rack terminations will no longer be live until the flood has subsided. Given the ingress protection rating of the modules within the BESS enclosure, and the ingress protection rating of the enclosure itself, a short circuit in the event of a flood is unlikely. The Applicant accepts that any equipment damaged during a breach flood event may need to be repaired or replaced, this is a commercial risk and there is no risk to life as the site will be unmanned during this event.

7.3 Safe Access / Egress

7.3.1 During the design 1 in 100 year plus 23% climate change event, as represented by the 1 in 100 year plus 29% climate change flood outline, the entire operational area of the Site will remain unaffected by flooding and safe access and egress will remain available.

7.3.2 During the construction phase, Flood Risk Management will be covered within the Construction Environmental Management Plan (**ES Appendix 4.1 outline Construction Environmental Management Plan (oCEMP) [APP-089].** During the operational phase, the Site will be unmanned with the exception of maintenance visits. In order to ensure the safety of personnel during more extreme events e.g. in the event of a breach of the flood defences, the operator will be registered to receive flood warnings from the EA. They will also monitor the Site remotely via CCTV. A Flood Evacuation Plan will be prepared prior to the operational phase of the Proposed Development, as part of the Operational Environmental Management Plan (**ES Appendix 4.4 outline Operational Environmental Management Plan (oOEMP) [APP-092].** If flooding is predicted, or should any flooding of the Site occur, personnel will be advised not to attend the Site. As the breach location representing the worse-case flood risk to the Site is located approximately 2km from the Site, significant warning is anticipated to be available following a breach in this location, prior to any floodwater reaching the Site.

7.3.3 During the decommissioning phase, where a higher climate change allowance is required when establishing the 'design' flood event, flooding is shown to affect the eastern part of the development to a level of 4.35m AOD. Given the lowest parts of the operational area are at c.3.5m AOD, this could result in flood depths of up to 0.85m AOD. During the decommissioning phase, flood warnings will be monitored together with CCTV, and works will be halted and the Site evacuated should any risk of flooding be identified. This residual risk will be managed via a Flood Evacuation Plan as part of the Decommissioning Plan **(ES Appendix 4.3 outline Decommissioning Plan (oDP) [APP-090]**.

8 IMPACT OF DEVELOPMENT ON FLOOD RISK

8.1 Displacement of floodwater

8.1.1 The design flood event for assessing floodplain compensation requirements is the 1 in 100 year plus 23% climate change fluvial event. No built development is proposed within the 1 in 100 year plus 29% flood event, used as a conservative proxy for the 1 in 100 year plus 23% climate change event. No land raising is proposed in the area in the east of the Site within the design flood extent (proposed for biodiversity improvements only) therefore there will be no displacement of floodwater within the design flood extent for the River Trent.

8.1.2 The fluvial flood extents of the smaller watercourse have been discussed in **Section 5**. For the design 1 in 100 year plus 23% climate change event, no significant out-of-bank flows are expected for the Catchwater Drain, Mother Drain or New Ings Drain, based on the hydraulic assessment in **Appendix G**. Water levels remain below bank levels in almost all locations, with only one location of potential overtopping on each of the Catchwater Drain and New Ings Drain, with water levels exceeding bank levels by c.40mm and c.30mm respectively. Marginally higher water levels were shown during the sensitivity testing model scenarios, but these would still not impact any sensitive infrastructure. Any limited localised out of channel flow would impact solar arrays only. No significant displacement of floodwater is expected as a result of infrastructure within the flood extents of the main IDB watercourses.

8.1.3 For the smaller Ordinary Watercourses, review of the EA's surface water flood risk mapping shows that any floodwater remains close to the watercourse channels during the medium and high risk events. A 5m easement has been allowed either side of these Ordinary Watercourses, and any infrastructure within medium / high risk surface water extents beyond these easements is restricted to solar arrays only. Any displacement associated with the panel supports is considered to be negligible due to the minimal cross-sectional area of these supports and the very low surface water flood depths anticipated for the vast majority of the Site (less than 0.1% chance of flood depths reaching 300mm in all but small isolated areas).

8.1.4 The decommissioning phase will take 12 months and falls within the first year of the 2080s epoch, therefore consideration needs to be given to the 1 in 100 year plus 39% climate change flood event. This flood event would occupy approximately 10% of the site, affecting the eastern part of the site closest to

the River Trent with maximum flood depths of c.0.85m. The development within the 1 in 100 year plus 39% climate change extent would comprise approximately 5,200 solar panels and approximately 18 inverters. The solar PV panels would be supported on C section galvanised steel posts driven into the ground which are estimated to be less than 0.5% of the panel area. Each panel has an area of 70m^2, which equates to 364,000m^2 across all solar panels within the flood extent. 0.5% of this panel area would be 1,820m^2. Assuming an average flood depth of 500mm, which is considered approximate based on the maximum depth of 0.85m, this would equate to 910m^3 of water displaced by the solar panel supports. The invertors each have an area of 7 x 3.5 = 24.5m^2, therefore 18 inverters would occupy 441m^2. Assuming an average floodwater depth of 500mm, this would equate to 220.5m^3 of water displaced by the invertors. The total floodwater displaced during 1 in 100 year plus 39% climate change event during the 12 month decommissioning phase by the steel posts and invertors is therefore 1130.5m^3. The total area of the site affected by the 1 in 100 year plus 39% climate change flood extent is 1.15km^2 (1,150,000m^2). Assuming an average flood depth of 500mm across the whole area, the total volume of flood storage within the site during the 1 in 100 year plus 39% climate change event is approximately 575,000m^3. The estimated displaced floodwater equates to approximately 0.19% of the total floodwater storage volume within the site which is not considered significant.

8.1.5 It is noted that equipment will be removed throughout the decommissioning phase, therefore it is likely that some or all of the equipment within the 1 in 100 year plus 39% climate change extent would have been removed at the time of any flooding. It is noted that the chance of a 1 in 100 year plus 39% climate change event occurring during the 12 month decommissioning period is low. It is also noted that the extents and depths of flooding discussed here are a highly conservative scenario, given that the 39% climate change allowance covers the 55 year period from 2070 to 2125, with the decommissioning period falling within the first year of this epoch (2070), as such the full impacts of climate change won't have taken effect.

8.1.6 Overall, negligible loss of floodplain storage is considered to result from the Proposed Development.

8.2 Disruption to existing flows

8.2.1 Localised flow paths have been identified from the EA's surface water flood risk mapping associated with land immediately alongside the Ordinary Watercourses and with overland flow paths within the low-lying fields in the east of the Site. As discussed above, infrastructure within the medium and

high risk surface water flooding extents is limited to the solar arrays. Given the small cross-sectional areas of supporting poles and the very shallow flow depth anticipated in the vast majority of locations, the potential for disruption to flow paths is considered to be negligible. Any minor deflection of flows around proposed infrastructure would not impact any sensitive receptors given that land immediately surrounding the infrastructure will comprise grassland. Even during extreme events only shallow surface water depths are anticipated.

8.2.2 Perimeter fencing will be designed to be permeable to flood flows, even though it will be located outside the design 1 in 100 year plus climate change fluvial flood extent.

8.2.3 Overall, disruption to overland flow paths is considered negligible and is not considered to result in an increase in flood risk off-site.

8.3 Watercourse crossings

8.3.1 Watercourse crossings will be required for access where tracks intersect with existing watercourses. Existing crossings will be re-used where possible, but some new crossings will be required and some existing crossings will need to be widened. New crossings will either comprise clear span bridges or culverts dependent on local circumstances. In some situations open span structures will not be viable due to the shallow depth of the existing ditches and the cover required. Regardless of construction, they will be designed to ensure the existing flows are accommodated, with no restriction of flows resulting from the new structures. This approach has been agreed with the LLFA and IDB (**Appendix H & I**) who are the consultees for all watercourses within the Site. Both consultees have accepted the use of culverts, subject to appropriate consents being obtained at the post-planning stage.

8.3.2 Crossings required only for construction access will be removed following completion of construction. The remainder will be retained for the lifetime of the development to allow access for maintenance / repairs. They will be removed following decommissioning.

8.4 Watercourse easements

8.4.1 As agreed with the LLFA and IDB, a 5m easement has been incorporated either side of Ordinary Watercourses falling under the LLFA's jurisdiction, and a 9m easement has been incorporated either side of the Ordinary Watercourses managed by the IDB.

8.4.2 The flood defence embankment within the eastern Site boundary is located a significant distance (more than 900m) from the proposed infrastructure.

Appropriate easements have been incorporated for the watercourses and flood defences to maintain access for future inspection and maintenance.

8.5 Drainage impacts

8.5.1 In accordance with NPS EN-1, a Drainage Strategy has been developed for the Proposed Development. This is described in the separate **Surface Water Drainage Strategy, Appendix 8.2 of the ES [EN010163/APP/6.3.8]** which should be referred to for full details. The drainage strategy complies with the National Standards for Sustainable Drainage Systems and has been prepared in consultation with the LLFA (Nottinghamshire County Council) and Trent Valley IDB.

8.5.2 Following guidance within NPS EN-1, the surface water drainage strategy accounts for the predicted impacts of climate change throughout the Development's lifetime and demonstrates that the volumes and peak flow rates of surface water leaving the Site are no greater than the rates prior to the Proposed Development. SuDS have been incorporated into the drainage strategy, and the potential for contaminated runoff (for example, in the event of a fire) has been considered for the BESS.

8.5.3 Following the drainage hierarchy, the potential for rainwater collection for re-use has been considered initially. Rainwater harvesting will be used where feasible for re-use within the Proposed Development during construction, operational and decommissioning phases. Infiltration has been promoted where viable and where concerns regarding the potential contamination of groundwater do not preclude its use. Within the BESS area, where there is potential for contaminated runoff in the event of an emergency (e.g. a fire which results in generation of contaminated fire-fighting water), the SuDS features have been lined to prevent infiltration and discharge is instead proposed to local drainage ditches with appropriate controls to ensure contaminated runoff is prevented from release to the local ditch network. Discharge rates have been agreed with the LLFA and IDB and are no greater than pre-development rates.

8.5.4 Within the BESS and substation areas, attenuation basins are proposed to retain runoff prior to release at a controlled rate. The BESS will be surrounded by suitable bunds to separate runoff from adjacent areas. Linear drainage features are also proposed along the access tracks (these will additionally be

permeably surfaced with gravel) and along the lower edge of the fields containing solar arrays.

8.5.5 The land beneath the solar arrays will be planted with mixed grasses which will help stabilise the soils and protect against the formulation of rivulets where rainfall runs off the trailing edge of the panels. No formal attenuation is required for the solar panels as runoff will continue to discharge to the ground as in the current situation, with no loss of permeable area.

8.5.6 Overall, the proposed Drainage Strategy will ensure that there is no increase in the rate or volume of runoff discharged from the Site and that runoff is appropriately managed and treated to prevent any contamination of the local groundwater or watercourses.

8.5.7 A temporary drainage strategy will be established for the construction phase of development to prevent silt mobilisation and contaminated runoff.

8.5.8 A Maintenance and Management Plan for the proposed drainage system will be prepared prior to its operation.

8.6 Additional measures for reduction in flood risk

8.6.1 Aside from measures to mitigate the potential impacts from the Proposed Development, the applicant has considered whether there are any additional opportunities for the Proposed Development to contribute to a positive reduction in flood risk within the local area. Flooding issues have been reported within the village of Sturton le Steeple. Following discussions with local residents, this flooding is understood to occur following periods of heavy rainfall when runoff from the fields to the west of the village runs off the fields via drainage ditches and overland flow towards the village, accumulating at the junction of Cross Street and Leverton Road in the centre of the village.

8.6.2 To help alleviate this flooding issue, two large detention basins have been strategically placed within the Proposed Development on land to the west (up-gradient) of Sturton le Steeple. Their location and sizes have been carefully designed to intercept overland flows generated up-gradient of the Site, with water proposed to be held within the basins prior to release at a controlled rate to the existing drainage ditches following the peak of the rainfall event. Full details of their design can be found in the **Drainage Strategy report, Appendix 8.2 of the ES [EN010163/APP/6.3.8]**.

8.6.3 The basins will be maintained as part of the maintenance strategy for the drainage system for the Proposed Development (produced subsequent to DCO consent and secured via DCO requirement), although it is reiterated that

these basins are not part of the mitigation for the Proposed Development but comprise an additional voluntary measure that aims to provide additional benefits to the wider community.

8.7 Summary

8.7.1 As discussed, there will be no disruption to existing flow paths or displacement of floodwater as a result of the Proposed Development. Runoff from the Proposed Development will be managed through the proposed drainage strategy to ensure there is no increase in the rate of runoff discharged to the local drainage network. There will therefore be no increase in flood risk as a result of the proposed infrastructure. A net reduction in flood risk will be achieved through the inclusion of detention basins which have been proposed to help alleviate the known flood risk to the village of Sturton le Steeple.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 This FRA complies with the relevant NPSs and PPG and demonstrates that flood risk from all sources has been considered in the Proposed Development. It is also consistent with the Local Planning Authority requirements with regard to flood risk and has been prepared following consultation with key stakeholders.

9.2 The Site has been shown to be defended against a 1 in 100 year plus climate change fluvial event associated with the River Trent, and the risk associated Ordinary Watercourses within the Site has been assessed as low. There is a residual risk associated with a breach of the River Trent flood defences. A limited flood risk also exists associated with surface water flow paths, groundwater and reservoir flooding during extreme events, particularly in the eastern part of the Site.

9.3 Flood risk to the Proposed Development has been managed through the sequential allocation of the more sensitive infrastructure in the lowest risk parts of the Site. Where appropriate, equipment has been raised above expected flood levels. The higher risk parts of the Site (for example those areas within potential surface water overland flow paths) are proposed for solar arrays only, with negligible risks arising both to and from this infrastructure. The Proposed Development can be shut down remotely during extreme events (e.g. a breach of the River Trent defences).

9.4 The flood risk from the Proposed Development is mitigated through a Surface Water Drainage Strategy, positioning of infrastructure outside the highest flood risk areas and careful design of watercourse crossings. Additionally, two large surface water detention basins are proposed within the western part of the Site to help reduce the existing risk to Sturton le Steeple village.

9.5 This FRA has considered multiple sources of flooding and concluded the following:

Table 9.1: Flood risk summary

Source	Level of risk	Mitigation
Fluvial	Low/Medium	• No development within design fluvial flood extent (River Trent) • Sensitive equipment raised above modelled fluvial flood levels for main IDB watercourses and

Source	Level of risk	Mitigation
		surface water flood level as a proxy for other Ordinary Watercourse flooding • Flood Evacuation Plan for management of residual risks • Culverts / bridges for watercourse crossings designed to maintain existing flows
Tidal	Low	• Defended tidal extents do not extend onto developable area • Mitigation for fluvial flooding manages residual tidal flood risk
Surface water	Very Low - Medium	• Localised areas of surface water flood risk although depths are generally very shallow even for extreme events • Sensitive equipment directed outside medium / high risk areas • Sensitive equipment raised above anticipated surface water flood level • Flood Evacuation Plan for management of residual risks • SuDS Strategy for management of runoff from Proposed Development to ensure no increase in flood risk • Detention basins proposed to reduce existing flood risk to Sturton le Steeple village
Groundwater	Low - Medium	• Groundwater between 1m – 5m depth recorded in parts of the Site • Should groundwater flooding occur, the raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk • In extreme events, the Proposed Development can be partially or wholly shut down remotely, managed via a Flood Evacuation Plan
Sewers	Very Low	• The raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk during extreme events

Source	Level of risk	Mitigation
Reservoir	Low	• The raised nature of equipment (panels, inverters, main substation and BESS) reduce the level of risk during extreme events • In extreme events, the Proposed Development can be partially or wholly shut down remotely, managed via a Flood Evacuation Plan
Other sources	Very Low	• None required

9.6 Overall, taking into account the above points, the Proposed Development of the Site should not be precluded on flood risk grounds.

APPENDIX A
RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for RES (the "client") in accordance with the terms of a contract between RSK and the "client" dated March 2024. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are

not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
TOPOGRAPHIC SURVEY

APPENDIX C
SEVERN TRENT WATER SEWER RECORDS

APPENDIX D
DEVELOPMENT LAYOUT

APPENDIX E
EA CONSULTATION RESPONSES

APPENDIX F
EA FLOOD DATA

APPENDIX G
HYDRAULIC ASSESSMENT OF ORDINARY WATERCOURSES

APPENDIX H
LLFA CONSULTATION RESPONSE

APPENDIX I
IDB CONSULTATION RESPONSE