Steeple Renewables Project

Appendix 8.2: Surface Water Drainage Strategy

Environmental Statement – Volume 2

March 2026

Document Reference: EN010163/APP/6.3.8

Revision: 5

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)a

APPENDIX 8.2: SURFACE WATER DRAINAGE STRATEGY

Document Properties		
Prepared By	The Steeple Renewables Project Consultant Team	
Version History		
Version	Date	Version Status
Application Version	April 2025	Rev 1
Application Version	January 2026	Rev 2
Application Version	January 2026	Rev 3
Application Version	March 2026	Rev 4
Application Version	March 2026	Rev 5

STEEPLE SOLAR FARM LIMITED

STEEPLE RENEWABLES PROJECT

Surface Water Drainage Strategy

890792-R1(05)
March 2026

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RSK GENERAL NOTES

Project No.: 890792-R1(05)-Surface Water Drainage Strategy

Site: Steeple Renewables Project

Title: Surface Water Drainage Strategy

Client: Steeple Solar Farm Limited

Date: 16.03.2026

Office: Coventry

Status: Final

Author	[redacted]	**Technical reviewer**	[redacted]
Signature		Signature	
Date:	16.03.2026	Date:	16.03.2026
Project manager	[redacted]	**Approved by**	[redacted]
Signature		Signature	
Date:	16.03.2026	Date:	16.03.2026

Issue No	Version/Details	Date issued	Author	Reviewed by	Approved by
R1(01)	Final	30.04.25	AS	APT/AC	APT
R1(02)	Final	08.01.26	AS	APT/AC	APT
R1(03)	Final	15.01.26	AS	APT/AC	APT
R1(04)	Final	04.03.26	AS	APT/AC	APT
R1(05)	Final	16.03.26	AS	APT/AC	APT

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EXECUTIVE SUMMARY

ES.1 This document outlines the Surface Water Drainage Strategy for the proposed development, adhering to the principles set forth in the Overarching National Policy Statement for Energy EN-1 and EN-3. The strategy addresses the quantitative effects of the development on surface water flooding risks both on-site and within the catchment area. It also explores potential Sustainable Drainage Systems (SuDS) features to be integrated into the Proposed Development.

ES.2 The surface water drainage strategy considers increases in rainfall intensity due to climate change. The recommended allowances for rainfall intensity specific to the Lower Trent and Erewash Management Catchment have been used.

ES.3 The Lead Local Flood Authority (LLFA) and the Internal Drainage Board (IDB) have confirmed that the proposed 1% Annual Exceedance Probability (AEP) event with a 25% climate change allowance is appropriate for designing storage features

ES.4 Measures to manage runoff from various parts of the proposed development, focusing on the Battery Energy Storage System (BESS), the Onsite Substation, access tracks, inverters and vegetation and soil management are identified.

ES.5 Firewater runoff has been considered as part of the BESS drainage strategy to isolate the drainage system in the event of fire.

ES.6 Opportunities have been identified and mitigation proposed to reduce flood risk in Sturton le Steeple reported by local residents.

ES.7 An assessment of the proposed surface water drainage system has been conducted using the Simple Index Approach (SIA) from CIRIA C753 The SuDS Manual evaluating the pollution hazard level of the land use and the treatment level provided by the drainage system to ensure adequate water quality mitigation.

ES.8 The maintenance and management schedules for the proposed surface water drainage system are outlined according to CIRIA SuDS Manual guidelines.

1 INTRODUCTION

1.1 Steeple Solar Farm Limited (The Applicant) engaged RSK Land and Development Engineering Ltd to develop a Surface Water Drainage Strategy in support of 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 (the 'Proposed Development').

1.2 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, the west and within the site centre.

1.3 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.

1.4 The Development will 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.

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

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

1.7 The construction phase of the Proposed Development is currently anticipated to last 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.

1.8 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.

1.9 This report discusses the surface water management measures that will be implemented across the scheme to satisfactorily manage flood risk to reduce the impact on the natural water cycle on people and property. These measures will include the use of sustainable drainage systems (SuDS) ensuring the development aligns with the principles of sustainable development as outlined in the Overarching National Policy Statement for Energy (NPS EN1).

1.10 A Flood Risk Assessment Report has been produced as a separate document [EN010163/APP/6.3.8] and is referenced where applicable in this report.

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

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.

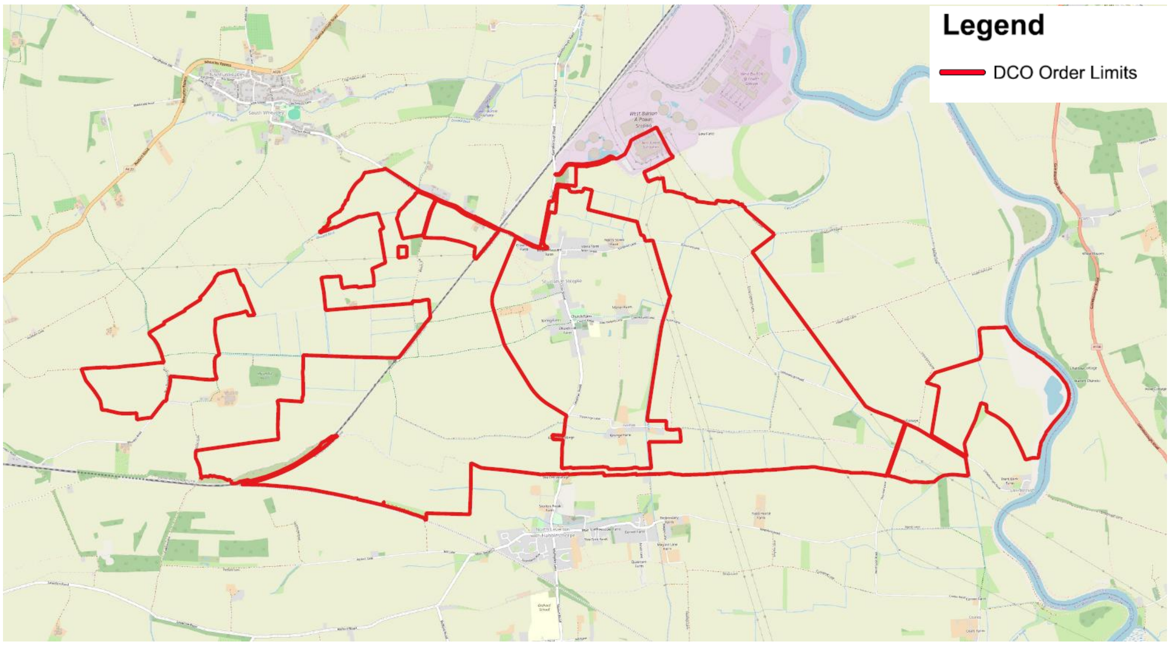

Figure.1: Site location plan

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**.

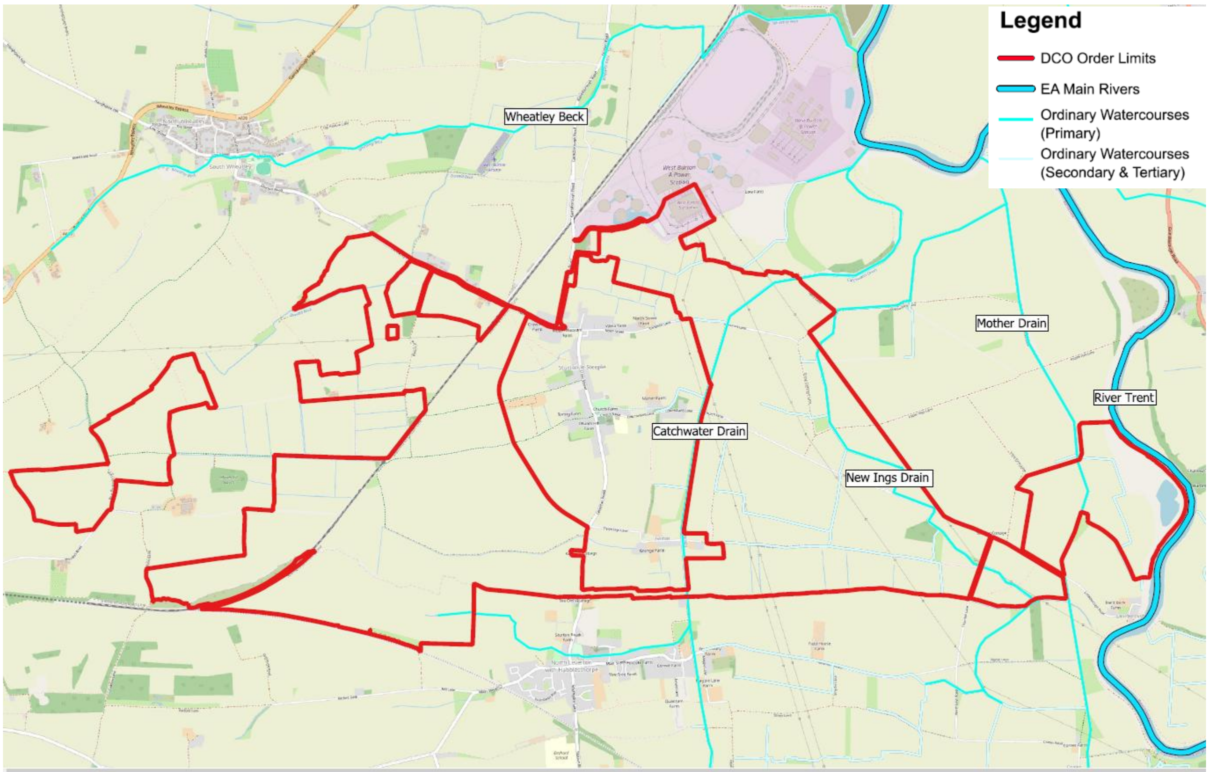

Figure 3.1: On-Site watercourses

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

3.1.5 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.

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

3.1.7 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 4.8m 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

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
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
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

BGS Borehole Ref	Location in relation to Site	Geology Recorded	Groundwater Recorded
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

3.1.8 All available boreholes within the Site have been included in **Table 3.1** 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.

3.1.9 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.

3.1.10 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 3.1**, 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.

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 drainage requirements are as follows.

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

4.1.2 This NPS 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).

4.1.3 Paragraph 5.18.15 outlines that a drainage strategy must detail the existing surface water drainage arrangements and provide approximate rates and volumes of run-off, including proposals for restricting discharge rates. It should outline sustainable drainage systems (SuDS) for managing and discharging surface water, considering climate change impacts, and justify any exclusion of SuDS.

The strategy must demonstrate adherence to the hierarchy of drainage options, explain the selection and appropriateness of SuDS and discharge methods, and describe their integration with other development aspects. Additionally, it should highlight the multifunctional benefits of SuDS, identify flood reduction opportunities, and ensure that run-off from the development does not impact other areas. Finally, the strategy must include plans for maintenance and adoption to ensure long-term operational standards.

NPS for Renewable Energy Infrastructure (EN-3)[2]

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.

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

[2] 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*".

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*".

4.2 Local planning policy

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

Policy ST50: Flood Risk and Drainage

4.2.2 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

4.2.3 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 SURFACE WATER DRAINAGE ASSESSMENT

5.1 Introduction

5.1.1 The following sections describe the outline Surface Water Drainage Strategy for the proposed development with due regard to the Overarching NPS for Energy (EN-1) paragraph 5.18.15.

5.1.2 It discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere in the catchment, as well as the type of potential SuDS features that could be incorporated as part of the Proposed Development.

5.1.3 According to Paragraph 5.7.19 of NPS EN-1 and Paragraph 080 of the NPPG: Flood Risk and Coastal Change, the preferred method for surface water drainage is to utilise soakaway systems or infiltration, followed by discharging to an appropriate watercourse. If this is not feasible, the final option is to discharge to an existing public sewer. However, consideration should be given to rainwater harvesting within the development.

5.1.4 The Applicant is considering the implementation of rainwater harvesting systems to be utilised during both the construction and post-construction phases. This initiative aims to provide a sustainable source of non-potable water, ensuring environmental responsibility and resource efficiency throughout the project's lifecycle.

5.1.5 This strategy has been agreed with the Nottinghamshire Lead Local Flood Authority and the Trent Valley Internal Drainage Board.

5.1.6 It has been agreed with the LLFA and the IDB that formalised drainage is only required for the BESS and Onsite Substation, as these areas have substantial hardstanding. For all other parts of the development which are considered to have a minimal impact on runoff, such as the solar panels, access tracks and inverters, localised drainage features should be provided to infiltrate into the ground as per the existing scenario.

5.1.7 It has been agreed that the BESS and the Onsite Substation proposed drainage will positively drain to the local watercourse to avoid local groundwater contamination. The BESS presents a potential fire risk, which could lead to the spread of contaminants from the chemicals in the battery units.

5.1.8 Correspondence with the IDB and LLFA can be found in **Appendix E**.

5.2 Climate Change

5.2.1 When designing drainage strategies, it is important to consider the potential increase in rainfall intensity due to climate change. The recommended allowances for rainfall intensity in the Lower Trent and Erewash Management Catchment are included in Table 5.1.

5.2.2 The Proposed Development will be operational for a 40 year period from 2029 to 2069. Based on the EA guidance for climate change allowances, the central allowance for the 2070's epoch should be used. LLFA and IDB confirmed that the proposed 1%AEP 25% climate change event is appropriate for the design of storage features.

Table 5.1: Climate change allowances for rainfall in the Lower Trent and Erewash Management Catchment

Epoch	Central Allowance	Upper End Allowance
3.3% AEP (1 in 30)		
2050s	20%	35%
2070s	25%	35%
1% AEP (1 in 100)		
2050s	20%	40%
2070s	25%	40%

5.3 Surface Water Drainage Strategy

5.3.1 Detailed measures to manage runoff from the various parts of the development in the proposed development are provided below:

BESS Compound

5.3.2 The development will also include a Battery Energy Storage System (BESS). The BESS consists of batteries housed in sealed shipping containers supported on legs on pads.

5.3.3 The BESS is located on the northern part of the eastern portion of land with an area up to 17,000m^2.

5.3.4 Due to the fire risk associated with these units and the potential for contaminated firewater, infiltration was not considered a suitable disposal option in these areas, as water should be collected and contained within a storage area that can be isolated if necessary.

5.3.5 As previously discussed, it has been agreed with the IDB and the LLFA that the BESS will require a surface water drainage system to manage the runoff in this area. This system will positively drain into the Catchwater Drain at a restricted discharge rate.

5.3.6 The Overarching National Policy Statement for Energy (EN-1) paragraph 5.8.15 requires that the proposals for the restricting of discharge rates are in accordance with the non-statutory technical standards for sustainable drainage systems.

5.3.7 This guidance states that the runoff rate of development must not exceed the greenfield runoff rate for a given return period. Additionally, the standards require that the drainage system be designed to prevent flooding during a 3.33% AEP event, and to manage exceedance flows during a 1% AEP event to minimise risk to people and property.

5.3.8 To comply with the above, the equivalent greenfield runoff rates for the BESS Area have been calculated using HR Wallingford's UK SuDS Greenfield Runoff Rate Estimation Tool, based on the proposed contributing impermeable area (17,000m^2) with the rates given in **Table 5.2** below.

Table 5.2: BESS Greenfield Runoff Discharge Rates (from HR Wallingford Greenfield Runoff Rate Tool)

Return Period (Years)	Greenfield Runoff Rate (l/s/ha)	BESS Area Discharge Rate (l/s)
Qbar	4.00	6.80
1	3.33	5.66
30	8.02	13.63
100	10.30	17.51

5.3.9 Although the rates presented above were calculated using the IH124 method, the recommended IDB greenfield runoff rate of 1.7 l/s/ha was used to determine the limiting discharge rate for the BESS. This resulted in a significantly lower figure compared to the calculated rates shown in **Table 5.2**, with a calculated maximum discharge rate of 2.8 l/s for the BESS compound.

5.3.10 Under normal circumstances, the runoff intercepted within the proposed granular fill is conveyed to the detention basin via a perforated pipe where the runoff is attenuated and discharged in a controlled rate of 2.8l/s into the IDB Catchwater Drain Watercourse, as shown in the drainage strategy plan attached to **Appendix F**.

5.3.11 The BESS gravel storage provision will be lined to prevent potential leaching of contaminants into the ground in the event of a fire. It is intended that the firewater runoff will flow into the lined detention basin to temporarily store contaminated or potentially contaminated water. This will provide a controlled, isolated area where water quality can be assessed, avoiding any uncontrolled spill into watercourses or the wider environment.

5.3.12 In the event of fire within the BESS Site, the fire suppression system will activate automatically and initiate the closure of the site's drainage system. This isolation is achieved through the use of a shutdown valve (toggle block valve) installed at the lined detention basin downstream manhole. Once automatically activated, this valve prevents any outflow from the basin, ensuring that all firewater generated during the fire suppression is contained within the designated detention basin. The shut down valve will prevent uncontrolled discharge of contaminated water into the environment, therefore mitigating immediate pollution risks.

5.3.13 Once the fire has been extinguished and the area declared safe, the detained firewater must be recovered promptly. Firewater is likely to contain contaminants originating from damaged batteries. Firewater within the basin will be tested for contaminants. If the testing results indicate contamination above the permissible thresholds, the water will be pumped from the basin into a vacuum tanker vehicle and transported to a disposal facility. Permissible thresholds will be established post-consent in consultation with the EA. Whilst pumping is taking place, appropriate secondary containment and spill prevention measures will be in place. Water with chemical concentrations below the permissible thresholds will either be discharged on-site (under a discharge permit, where applicable) or will be tankered from the site. The Applicant will engage with the EA should a discharge permit be required.

5.3.14 Any standing firewater within the gravel areas will be pumped out using a vacuum tanker and stored in a secure container for analysis. If any contaminants are detected, remediation will involve either washing the lined gravel insitu or removing and replacing the gravel entirely. Following a fire event, the sediment beneath the gravel will also be tested for contaminants and if appropriate will be removed from the site for disposal via an appropriately licenced carrier. Appropriate excavation methods will be used to avoid damage to the impermeable lining. Integrity testing will be undertaken prior to restarting operations.

5.3.15 Based on this a preliminary design, a detention basin with depth of 1.8m and providing a storage capacity of 1688m^3, with 400mm freeboard allowed for all storms events up to the 1%AEP plus climate change has been proposed.

5.3.16 A surcharged outfall analysis was also conducted as part of the drainage design to evaluate system performance under an extreme and highly unlikely condition where the outfall ditch is assumed to be completely full. This check ensures that, even in the event of such an exceptional scenario, the upstream drainage network will not experience unacceptable flooding or structural failure. The calculations are included in **Appendix G**.

5.3.17 Exceedance flow paths for the BESS have been properly managed to ensure controlled conveyance of surface water during extreme rainfall events. In the unlikely event of a failure of the primary drainage system, these flow paths will be directed and concentrated within the proposed detention basin, thereby preventing uncontrolled discharge and minimising the risk of flooding or erosion on adjacent areas. The exceedance flow path plan is in **Appendix L**.

5.3.18 To simulate a fire scenario where no runoff is released from the detention basin, a 24-hour storm duration has been used, assuming this is the maximum time for a tanker to arrive at the site and pump out potentially contaminated water.

5.3.19 The likelihood of a fire occurring simultaneously with a 1% AEP storm is very low, so a 10% AEP event was chosen to determine the storage requirements during a fire scenario.

5.3.20 The resulting detention volume at the basin for the 10% AEP storm event is 905m³, as shown in the preliminary surface water calculations in **Appendix G**. Adding 228m³ of firefighting water, based on a standard firefighting rate of 1900 litres per minute for 2 hours, results in a total of 1131m³, which is well below the basin's storage capacity.

5.3.21 As per the above the proposed lined detention basin is to be used as a firewater containment system. A pollution containment device such as ToggleBlok valve will be fitted into a chamber downstream of the basin and closed in the event of a fire to ensure the firewater runoff cannot discharge to a surface water environment.

5.3.22 The valve will operate automatically to ensure that the drainage system is isolated in the event of a fire, but will also have a manual backup option in case automation fails. After the fire event, the runoff will then be tested and if appropriate tankered off-site as described above.

5.3.23 A headwall structure outfall will be formed outside the cross-section of the Catchwater Drain Watercourse as agreed with the IDB.

Onsite Substation

5.3.24 The Onsite Substation is located to the north of the BESS and is situated in close proximity the old West Burton Power Station.

5.3.25 Similarly with the BESS, the equivalent greenfield runoff rates for the Onsite Substation have been determined using HR Wallingford's UK SuDS Greenfield Runoff Rate Estimation Tool, based on the proposed contributing impermeable area (7,000m^2), with the rates given in **Table 5.3** below.

Table 5.3: Onsite Substation Greenfield Runoff Discharge Rates (from HR Wallingford Greenfield Runoff Rate Tool)

Return Period (Years)	Greenfield Runoff Rate (l/s/ha)	Substation Area Discharge Rate (l/s)
Qbar	4.00	2.80
1	3.33	2.33
30	8.02	5.61
100	10.30	7.21

5.3.26 Although the rates presented above were calculated using the IH124 method, the recommended IDB greenfield runoff rate of 1.7 l/s/ha was used to determine the limiting discharge rate for the Onsite Substation. This resulted in a rate of 1.2 l/s which is comparatively lower to the calculated rates shown in **Table 5.3**.

5.3.27 Despite the surface water flows from the Onsite Substation being proposed for discharge into an LLFA-managed ordinary watercourse, this watercourse drains downstream into an IDB watercourse. Consequently, the recommended rate of 1.7 l/s/ha was applied to the Onsite Substation.

5.3.28 It has been agreed with the LLFA and the IDB that the maximum discharge rate from the Onsite Substation would be increased to 2 l/s as a practical minimum discharge rate to prevent blockages.

5.3.29 The drainage strategy for the on-site Onsite Substation in **Appendix F** includes a filter drain running along the centre of the site, directing flows into an attenuation basin in the south-eastern corner. This filter drain will collect runoff from the hardstanding electrical equipment area.

5.3.30 The attenuation basin discharges at a controlled rate of 2l/s to a local LLFA-managed watercourse via a headwall, which will be installed outside the cross section of the receiving body.

5.3.31 A surcharged outfall analysis was also conducted as part of the drainage design to evaluate system performance under an extreme and highly unlikely condition where the outfall ditch is assumed to be completely full. This check ensures that, even in the event of such an exceptional scenario, the upstream drainage network will not experience unacceptable flooding or structural failure.

5.3.32 Exceedance flow paths for the onsite substation within the solar farm have been properly managed to ensure controlled conveyance of surface water during extreme rainfall events. In the unlikely event of a failure of the primary drainage system, these flow paths will be directed and concentrated within the proposed detention basin, thereby preventing uncontrolled discharge and minimising the risk of flooding or erosion on adjacent areas. The exceedance flow path plan is in **Appendix L**.

5.3.33 The attenuation basin shown in the plan with a maximum water volume of 720m^3 has been designed to provide the required storage volume to retain the 1% AEP plus 25% climate change event as demonstrated in the calculations attached in **Appendix H**.

5.3.34 The Onsite Substation area has fewer potential sources of fire compared to the Proposed BESS, which are easier to extinguish and contain less harmful contaminants. Therefore, firefighting runoff allowances and separate hold of firewater are not considered necessary for the Onsite Substation, as the likelihood and nature of a fire is not considered as significant.

Internal Access Tracks

5.3.35 As part of the Proposals new Internal Access Tracks will be provided across all operational areas of the Site. Typically, the tracks will comprise a layer of clean aggregate (40/75mm), topped with crushed aggregate (0/40mm). The access tracks will maintain a permeable nature and not increase the surface water runoff from the development.

5.3.36 Where required a gravel fill trench will be installed adjacent to tracks where there may be a potential for concentration of excess flows from wider areas of the local Catchment. These trenches will act as attenuation and treatment prior to infiltration.

Solar Panels

5.3.37 In these areas, the runoff will soak into the ground as it does currently. The solar panels have gaps between them to allow for thermal expansion, which is important for managing heat. These gaps allow the runoff to spread out, prevent it from concentrating in one place.

5.3.38 Runoff from the panels will be absorbed and slowed down by the vegetation underneath, allowing it to soak into the soil, similar to natural conditions. The panels will have a positive effect on runoff, as they will prevent the soil from becoming compacted and allow water to soak in throughout the year.

5.3.39 Overall, runoff will be reduced because the vegetation will be present all year, and the soil will not be left bare or compacted by farming activities.

5.3.40 A filter gravel trench will be provided along some of the solar panel parcels in slopes exceed 5% to act as an energy dissipator. This combined with the grassland planting will help reduce erosion and enhance interception and evapotranspiration.

5.3.41 Swale and shallow ditches will be incorporated strategically in the lower edge of fields within the solar area where a risk of concentration of flows may lie.

5.3.42 The various solar power balancing plant, such as the transformers and inverters and the associated crane bases, may be installed on concrete pad foundations. Where needed, these concrete pads will be encircled by gravel filled filter trench, designed to capture the runoff from the pads and to compensate for the loss of natural infiltration caused by the pads. The gravel would discharge water via natural soakage rather than a fitted outfall and closely replicate the existing situation the Depth-Duration Frequency model in the Flood Estimation Handbook (FEH) was used to determine the volume of runoff generated in the concrete pads for consequently sizing the gravel encircling trench. The FEH predicted rainfall depth for the present day is:

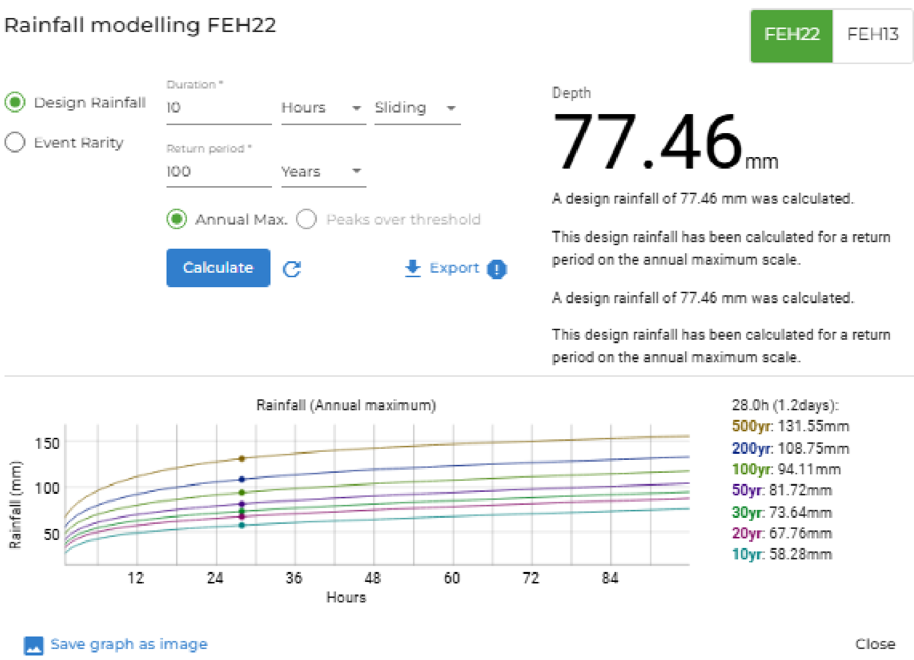

Figure 5.1 – Depth-Duration Frequency 1%AEP 10 hour duration storm

The gravel trench will extend at least 1000mm wide beyond each concrete pad edge and will be wrapped in a permeable geotextile membrane to prevent sediment and fines from entering while allowing percolation.

The resultant dimensions, runoff and trench dimension is shown in the following table:

Table 5.4: Gravel Trench Dimension

Inverter Pad Area (m^2/m)	Rainfall inc allowance 25% CC (mm)	Runoff (m^3)	Gravel Trench Base (m^2)	Gravel Trench Effective Depth (m)	Gravel Trench Storage (m^3/m)
1	96.825	0.097	1	1	0.3

As demonstrated above the storage capacity of the gravel trench would exceed the volume of runoff in a design event, providing some additional capacity for an exceedance event.

5.3.43 A plan showing the localised drainage mitigation the discussed areas is shown in **Appendix I**.

Vegetation and Soil Management

5.3.44 Sustainable management of the post development situation in terms of vegetation planting and soil type can be used as a means of managing surface water runoff from the solar panels. As such, to ensure that there is no increase in surface water runoff, managed sustainable vegetation (with a good soil structure e.g., chisel ploughed soils) will be allowed to grow beneath the solar panels, which will avoid kinetic compaction and ensure that any potential instances of rivulet formation are minimised, and surface water runoff flows over the ground in a natural way. Vegetation planting and soil management should be site wide to encompass all solar panel rows.

5.3.45 Vegetated strips of wildflowers and / or grass, left uncut, could be placed along with buffer strips around the perimeter of the fields, to capture any runoff leaving the site could be included.

6 ADDITIONAL MEASURES FOR REDUCTION IN FLOOD RISK

6.1 Introduction

6.1.1 The Applicant has explored whether there are further opportunities for the development to positively reduce flood risk in the local area. Flooding issues have been reported in the village of Sturton le Steeple. Discussions with local residents indicate that this flooding occurs after heavy rainfall, when runoff from the fields west of the village flows via drainage ditches and overland towards the village, accumulating at the junction of Cross Street and Leverton Road in the village centre.

6.2 Mitigation

6.2.1 To help address 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 locations and sizes have been carefully designed to intercept overland flows generated up-gradient of the site, with water held in the basins before being released at a controlled rate to the existing drainage ditches after the peak of the rainfall event.

6.2.2 The basins shown in the plan attached to **Appendix J** were sized to withstand storms up to the 1% AEP plus 25% climate change. The rate of discharge to the local watercourses will be restricted to the calculated greenfield runoff rate (Qbar) equivalent to the assessed contributing area, as per **Table 6.1** below:

Table 6.1: Greenfield Runoff Rates

	Northern Basin	Southern Basin
Contributing Area (ha)	5.0	4.1
Qbar (4l/s/ha)	20.0	16.4
Storage Volume (m^3)	2536	1811

6.2.3 The restricted rates will be achieved by installing orifice plates in the manholes located downstream of the basins.

6.2.4 The two basins combined would provide an attenuation capacity of approximately 4300m^3 to alleviate the flooding issue reported by the local residents.

6.2.5 As it is a grassland area infiltration and evapotranspiration are likely to occur, a volumetric runoff coefficient (Cv) of 0.5 was applied to the contributing area in the surface water drainage calculations contained in **Appendix K.**

7 WATER QUALITY

7.1 Pollution Hazard Indices

7.1.1 To evaluate the risk to receiving watercourses, an assessment has been conducted of the proposed surface water drainage system in accordance with the Simple Index Approach (SIA), as detailed in CIRIA C753 The SuDS Manual. This method determines the pollution hazard level of the proposed land use and then assesses the level of treatment the proposed drainage system would offer to ensure it provides sufficient water quality mitigation.

7.1.1 The solar panel areas and the associated access tracks do not pose a risk of pollution to the watercourse, therefore are excluded from this assessment.

7.1.2 To comply with the Simple Index Approach, the following condition must be satisfied for each of the three pollutants (Total Suspended Solids, Metals, and Hydrocarbons) considered in this method:

Total SuDS mitigation index ≥ pollution hazard index
(for each contaminant type) (for each contaminant type)

And where the mitigation index of an individual component is insufficient, two components (or more) in series will be required, where:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5\,(\text{mitigation index}_2)$$

7.1.2 Firefighting water and its potential contaminants have not been considered in this section. In the event of an incident, any fire water applied to the BESS area would be contained within the lined detention basin and, if found to be polluted, would be removed from the BESS Area using controlled methods (e.g. tanker).

7.1.3 According to the SuDS Manual, the impermeable areas in the BESS area and the On-Site Substation are best classified as 'commercial yard and delivery areas as shown in the table below:

Table 7.1: Extract of SuDS Manual Table 26.2: Pollution hazard indices for different land use classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	**Medium**	**0.7**	**0.6**	**0.7**
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

7.2 Hazard Mitigation Indices

7.2.1 Any runoff within the BESS development will be intercepted by the granular fill and directed to a perforated pipe, which drains to a detention basin located south of the compound. In the unlikely event of a pollution incident within the BESS, measures can be taken to prevent surface water from leaving the basin to protect the downstream watercourse as discussed previously.

7.2.2 The pollution mitigation indices for a granular fill material, considered in the SuDS Manual as permeable pavement in conjunction with the detention basin exceed the appropriate hazard mitigation for the BESS as shown in the table below.

Table 7.2: Extract of SuDS Manual Table 26.3: Indicative SuDS mitigation indices for discharges to surface water

SuDS Features	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Detention Basin	0.5	0.5	0.6
Permeable Pavement (Granular stone material)	0.7	0.5	0.6
Total	0.85	0.75	0.9

7.2.3 The runoff at the Substation compound will be intercepted via a filter drain and directed to detention basin. Similarly, these two SuDS features excess the hazard mitigation for the Substation.

Table 7.3: Extract of SuDS Manual Table 26.3: Indicative SuDS mitigation indices for discharges to surface water

SuDS Features	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Detention Basin	0.5	0.5	0.6
Filter drain	0.4	0.4	0.4
Total	0.7	0.7	0.8

7.2.4 In conclusion, the treatment features listed above will satisfy the water quality requirements for the Site.

8 MAINTENANCE SCHEDULES

8.1 Introduction

8.1.1 This section outlines the maintenance and management schedules for the proposed surface water drainage system. The schedules have been formulated in accordance with the guidelines contained within the CIRIA SuDS Manual (C753).

8.1.2 There are three categories of maintenance activities (including inspections and monitoring) referred to in this report:

- **Regular maintenance**: Tasks that need to be undertaken on a weekly or monthly basis, or as required.
- **Occasional maintenance**: Tasks that need to be undertaken periodically, typically at intervals of 3 months or more.
- **Remedial maintenance**: Tasks that are not required on a regular basis but are done when necessary.

8.1.3 This section provides an overview of the operation and maintenance for the range of drainage features included within the surface water drainage strategy, focusing on typical/standard details only.

8.1.4 Maintenance schedules for the proposed SuDS components are provided in the following tables. These schedules are not exhaustive and should be reassessed at regular intervals to determine if any additional maintenance requirements are needed to preserve the performance and condition of the drainage system. Notwithstanding the routine inspections and maintenance requirements, after severe storm events all features shall be inspected to clear debris and repair damaged structures or features. Records of the maintenance carried out shall be prepared by the Management Company.

8.2 Maintenance Schedules

Detention Basin

8.2.1 A typical schedule of maintenance activities for the detention basins to be constructed within the Site is included in **Table 8.1**.

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Table 8.1: Detention Basin

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), as or required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Six monthly
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Maintenance	Repair erosion or other damage by reseeding or re turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Granular Material at BESS Compound

8.2.2 A typical schedule of maintenance activities for the granular stone material to be installed at the BESS compound is included in **Table 8.2**.

Table 8.2: Granular Stone Compound

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Check for any visible damage or wear on the stone	Monthly (or as required)
	Clear any debris, leaves, or other materials that may have accumulated within the stones.	Monthly (during growing season) or as required
	Inspect the condition of the stones. Replace any stones that are significantly worn or damaged.	Monthly (at start then as required)
	Removed any weed or vegetation among the stones.	Monthly (at start then half yearly)
Occasional maintenance	Replace a portion of the stones to ensure the system remains effective	Annual maintenance
Remedial Maintenance	Address any urgent issues or damage as soon as they are identified. After severe weather events, inspect the stone for any damage or blockage	As required
Emergency Actions (Fire)	Pump out all standing water from gravel water using vacuum tanker. Collect firewater samples for contaminants testing If contamination confirmed: Wash gravel insitu using closed loop system. An impermeable barrier can be used locally to prevent runoff falling onto other uncontaminated areas. A portable sump can then be used to capture the washwater onto a portable container.	Following emergency (fire)

Below Ground Drainage Pipes

8.2.3 A typical schedule of maintenance activities for drainage pipes is included in **Table 8.3**

Table 8.3: Below Ground Drainage Pipes

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 Months and then Annually

Maintenance schedule	Required action	Typical frequency
	Remove debris from the catchment surface (where it may cause risks to performance) Remove sediment from inlet structures (channels, rainwater pipes and inspection chambers).	Monthly Annually or as required
Occasional Maintenance	Repair physical damage if necessary.	As required
Remedial Maintenance	Inspect all inlets, outlets and vents to ensure that they are in good condition and operating as designed. Survey inside of pipe runs for sediment build up and remove if necessary	Annually Every 5 years or as required.

Automatic Shut Down Valve

8.2.4 A typical schedule of maintenance activities for the automatic shutdown valve to be installed at the BESS downstream manhole basin manhole is shown on

Table 8.4. This should be confirmed with reference to the manufacturer's recommended guidance prior to finalisation of maintenance schedules.

Table 8.4: Automatic Shutdown Valve

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Visually inspect the manhole shut-down valve for any signs of damage, corrosion, or leaks.	Six monthly
	Check the surrounding area for any debris or obstructions that might hinder valve operation.	Six monthly
	Clean away any dirt that may have accumulated and also check if there are any signs of rust or corrosion.	Six monthly
	Inspect the valve packing and replace if necessary.	Six Monthly
	Open valve manually to check operating correctly. Take remedial action if fault detected.	Monthly
Occasional Maintenance	Replace malfunctioning parts or structures	As necessary – indicated by system inspections
Remedial Maintenance	Inspect for evidence of poor operation	Six monthly
Emergency Actions (Fire Event)	Confirm valve closure via manual inspection After firewater removal from detention basin, inspect valve for contamination or damage. Flush valve chamber with clean water to remove residues Cycle valve to ensure it it has not seized during the fire event If valve fails to operate, replace immediately.	Following emergency (fire)

Flow Control

8.2.5 A typical schedule of maintenance activities for flow control devices in included in **Table 8.5: Flow Control**

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect/Check Pipework to ensure that the flow control is in good condition and operating as designed. Inspect for evidence of poor operation	Monthly Monthly, or as required
Occasional Maintenance	High pressure water jet removal of silt build up	Every 6 months, or as required

Maintenance schedule	Required action	Typical frequency
Monitoring	Inspect all inlets, outlets and vents to ensure that they are in good condition and operating as designed. Survey inside of pipe runs for sediment build up and remove if necessary	Annually Every 5 years or as required.

Swale

8.2.6 A typical schedule of maintenance activities for a swale in included in **Error! Not a valid bookmark self-reference.**.

Table 8.6: Swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspection inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design level	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of soil surface	As required
	Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Filter Drain

8.2.7 A typical schedule of maintenance activities for a swale in included in **Table 8.7**.

Table 8.7: Filter Drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 398:2010	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly or as required
	Clear, perforated pipework of blockages	As required

8.2.8 .

Table 8.5: Flow Control

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect/Check Pipework to ensure that the flow control is in good condition and operating as designed.	Monthly

Maintenance schedule	Required action	Typical frequency
	Inspect for evidence of poor operation	Monthly, or as required
Occasional Maintenance	High pressure water jet removal of silt build up	Every 6 months, or as required
Monitoring	Inspect all inlets, outlets and vents to ensure that they are in good condition and operating as designed. Survey inside of pipe runs for sediment build up and remove if necessary	Annually Every 5 years or as required.

Swale

8.2.9 A typical schedule of maintenance activities for a swale in included in **Error! Not a valid bookmark self-reference.**.

Table 8.6: Swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspection inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design level	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of soil surface	As required
	Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required

Maintenance schedule	Required action	Typical frequency
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Filter Drain

8.2.10 A typical schedule of maintenance activities for a swale in included in **Table 8.7**.

Table 8.7: Filter Drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 398:2010	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly or as required
	Clear, perforated pipework of blockages	As required

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9 CONCLUSION

9.1 This Drainage Statement and associated Drainage Strategy demonstrates that the Proposed Development drainage complies with the requirements outlined within the FRA [EN010163/APP/6.3.8], the National Policy Statement for Energy EN-1 and EN-3 and the requirements stipulated by the Nottinghamshire LLFA and the Trent Valley IDB with the main principles listed below:

- The hierarchy approach aiming to manage surface water sustainably was followed.
- The Drainage Strategy promotes sustainable development practices, including the use of SuDS to enhance water quality and reduce flood risks.
- SuDS incorporated within the BESS and Onsite Substation were designed to cater to 1% AEP 25% climate change impacts, ensuring resilience in energy infrastructure.
- The firewater strategy runoff volume generated has been considered within the BESS proposal. Pollution containment devices have been proposed to ensure that in the event of a fire, firewater runoff is contained within the Site drainage system.
- Measures will be implemented to help alleviate the concerns of the local residents regarding flooding.
- Maintenance schedules of proposed drainage infrastructure will be implemented to ensure its effectiveness and longevity during the design life of the Development.
- The Development proposals reduce the existing flood risk and does not increase flood risk either on or offsite

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 Steeple Solar Farm Limited (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 considering 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.

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APPENDIX B
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BESS/SUBSTATION SURFACE WATER DRAINAGE STRATEGY PLAN

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APPENDIX J
OVERLAND FLOW MITIGATION PLAN

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APPENDIX M
DRAINAGE CONSTRUCTION DETAILS

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