



High Grove Solar

Preliminary Environmental Information Report

Appendix 14.2 Preliminary Drainage Strategy

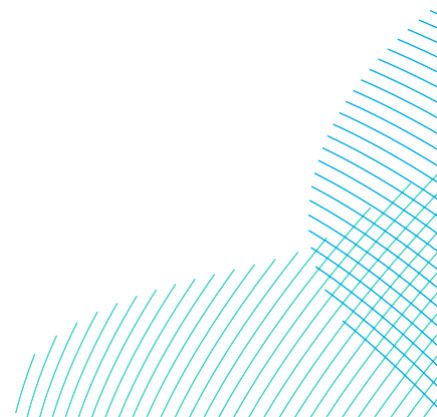
April 2025

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1 Introduction

- 1.1.1.1 This document provides a Preliminary Drainage Strategy for High Grove Solar (the Proposed Development). RWE Renewables UK Solar and Storage Limited (the Applicant) has prepared this document as part of the statutory consultation process in relation to an application for a Development Consent Order (DCO) for the construction, operation and decommissioning of the Proposed Development.
- 1.1.1.2 This preliminary drainage strategy outlines how surface water will be managed during the operational phase of the Proposed Development and provides an overview maintenance plan for the drainage mitigation proposed. It also considers temporary foul and surface water drainage requirements during the construction phase.
- 1.1.1.3 The Proposed Development is a renewable energy scheme, comprising five distinct Panel Areas covering an area of approximately 1,700 hectares (ha), including solar photovoltaic (PV) panels, on-site Battery Energy Storage Systems (BESS), underground cabling and associated infrastructure including substations and environmental mitigation and enhancement areas. The Proposed Development will also include underground Cable Corridors, which are still being refined, connecting the Panel Areas to one another and to the point of connection. The Proposed Development will have the capacity to generate over 50 Megawatts (MW) of alternating current (AC) electricity. The Proposed Development is located between Narborough and Dereham in the county of Norfolk in the East of England.
- 1.1.1.4 A full description of the Proposed Development and a detailed description of the design and environmental mitigation is provided in PEIR Chapter 2 The Proposed Development.

2 Planning policy context

2.1.1 National planning requirements

- 2.1.1.1 Based on National Policy Statement (NPS) EN 1 (5.8.12) [1] and as set out in the National Planning Policy Framework (NPPF) [2] and the accompanying Planning Practice Guidance (PPG), any new development should include measures to manage post-development surface water run-off rates.
- 2.1.1.2 As the majority of land within the draft Order Limits is currently greenfield land, effective management of surface water from the Proposed Development is required to maintain the existing hydrological regime.

2.1.2 Local planning requirements

- 2.1.2.1 The draft Order Limits are entirely within Breckland Council's administrative boundary. The Breckland District Council Local Plan 2023 [3] outlines the strategic framework and guidelines for development in the district over the next 20 years.

Policy ENV 09 Flood Risk & Surface Water Drainage outlines key drainage policies. These are outlined below.

2.1.2.2 All new developments must:

- Minimise flood risk through design and sustainable drainage principles
- Implement surface water drainage measures to avoid increasing flood risk elsewhere, with specific attention to water-sensitive habitats

2.1.2.3 Developers must demonstrate that their sites:

- Do not increase greenfield runoff rates or flood vulnerability
- Positively impact surface water flood risk in adjacent areas, where possible
- Address infiltration impacts on Ground Protection Zones and Critical Drainage Areas

2.1.2.4 Norfolk County Council is the Lead Local Flood Authority (LLFA) in this area. The Norfolk Local Flood Risk Management Strategy (LFRMS) 2015 [4] outlines how local flood risks will be managed in the county by the LLFA.

2.1.2.5 Norfolk County Council sets out key advice and guidance for developments in Norfolk in the LLFA Statutory Consultee Guidance Document (current version dated June 2024) [5], which includes:

- All developments must provide adequate drainage for surface water and schemes should attenuate runoff to pre-development Greenfield runoff rates and volumes for all rainfall events up to and including the 1% annual probability (1:100 year) plus 40% climate change.

2.1.2.6 In relation to Sustainable Drainage Systems (SuDS), the LFRMS [4] states that the use of SuDS is mandated for major developments except where demonstrated to be inappropriate. Any proposed SuDS should have clear arrangements in place for ongoing maintenance over the lifetime of the development.

2.1.2.7 The western most boundary of the draft Order Limits for the Proposed Development encroach into the East of Ouse, Polver and Nar Internal Drainage Board (IDB) including a small area to the north west of the Western Panel Area. Any proposed works that may interface with IDB assets are subject to consent under Section 23 of the Land Drainage Act 1991. Norfolk Rivers IDB have confirmed the draft Order Limits are not located within their drainage district.

3 Scoping consultation

3.1.1.1 At the time of writing, Breckland Council have not provided a response to the previously issued Environmental Impact Assessment (EIA) Scoping Report, submitted to the Planning Inspectorate 6 September 2024.

- 3.1.1.2 A number of key stakeholders have provided responses through the Scoping Opinion issue by the Planning Inspectorate 17 October 2024. A summary of key points relating to drainage are as follows:

Norfolk County Council

- A sustainable surface water management system is required for the access tracks and a water quality assessment is required for proposed SuDS (using the simple index approach from the CIRIA SuDS Manual (C753) [6] or similar).
- A detailed drainage design should be provided for the operational phase and construction phases. Drainage proposals should include how surface water drainage from the development will be managed on-site and how any phasing of the development will affect the overall drainage strategy and details of who will adopt and maintain all the surface water drainage features for the lifetime of the development. Details should be provided for the surface water drainage arrangements for the construction compounds including location and duration.
- Onsite infiltration tests should be carried out in accordance with BRE365 to investigate if infiltration is viable across the site and at the depth and location of any proposed infiltration drainage feature.

Environment Agency

- Due to the presence of a chalk bedrock (principal aquifer) beneath the entirety of the draft Order Limits and the presence of abstraction licences and Source Protection Zones, this is a high sensitivity site.
- Impacts of firewater drainage and other contaminated runoff from construction activities, the BESS, substations must be considered. A sealed drainage system must be in place to contain and manage any fire-fighting effluent or contaminated surface waters from the BESS.
- Due to the presence of chalk streams, it should be ensured that during all phases of development, but particularly during construction, a strong approach is taken to mitigate against the loss of sediment and to reduce runoff.

Anglian Water

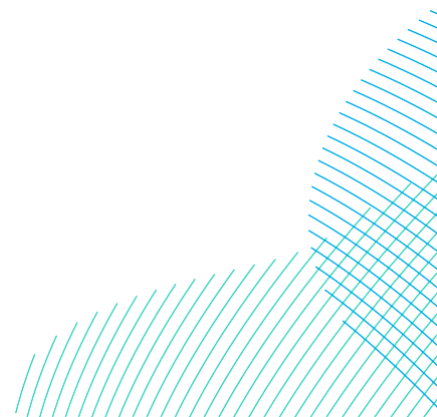
- Suitable easements, separation distances and safe working practices will need to be agreed with Anglian Water (AW) and suitable buffers will inform the design, construction and operation of the Proposed Development.
- Consideration must be given to whether the management of surface and foul water require any public sewer connection(s) or services.
- AW would wish to be engaged on the preparation of a drainage strategy.

Planning Inspectorate

- The Environmental Statement should include an assessment of any likely significant effects on agricultural drainage.

- In relation to chalk streams, consideration should be given to impacts on groundwater recharge arising from possible increased interception.

3.1.1.3 To advance the drainage strategy, the next steps will include engagement with key stakeholders to gather feedback and address outstanding concerns not covered in this draft. As design details are refined, further development of the strategy will continue to ensure alignment with regulatory requirements and stakeholder expectations.



4 Summary of proposed drainage strategy

4.1.1 Surface water outfall

4.1.1.1 Surface water runoff not collected for use must be discharged to one or more of the following, in the order of priority shown:

- 1) Discharge into the ground (infiltration).
- 2) Discharge to a surface water body.
- 3) Discharge to a surface water sewer, or other surface water system.
- 4) Discharge to combined sewer.

4.1.1.2 Discharge hierarchy promotes infiltration as the first consideration for where run-off is directed, and it is considered that this should be pursued as the primary method of surface water disposal used for the Proposed Development.

4.1.1.3 A summary of surface water drainage proposals for the different elements of the Proposed Development is provided in the following sections.

4.1.2 Solar PV areas

4.1.2.1 The Proposed Development comprises five Panel Areas (groups of solar photovoltaic (PV) panels): the Western, Central, Northern, Eastern, and Southern Panel Areas.

4.1.2.2 Presently it is assumed that the site drains naturally following the topography towards the watercourse with some losses into the ground. Existing subsurface field drainage systems may also be present.

4.1.2.3 Formal soakaway systems are deemed unnecessary for the site. It is proposed that surface water will drain freely off the panels onto the surrounding vegetated ground, promoting natural land drainage around the structures. This method is considered appropriate as the solar PV modules are anticipated to be ground-mounted, and secured via steel poles, elevated above the ground, and do not cover the entire area. Surface water is proposed to be managed according to the existing conditions, with no introduction of hard infrastructure such as pipework, manholes, or storage features.

4.1.2.4 The nature of the underlying groundcover will have a demonstrable influence on the surface water run-off characteristics in the draft Order Limits. Grass or wildflower cover will be present across the draft Order Limits to ensure that Proposed Development do not increase the surface water run-off, volume, or time to peak compared to pre-development conditions.

- 4.1.2.5 A previous study [7] examining the hydrological effects of solar farms found that solar PV modules are unlikely to significantly affect run-off volumes, peak rates, or the time to peak rates, as long as the ground beneath them remains vegetated. The research accounted for factors including soil type, slope angle and rainfall intensity and concluded that ground cover has the greatest influence on run-off rates.
- 4.1.2.6 As it is proposed to mimic the existing greenfield runoff response withing the draft Order Limits by allowing surface water to drain freely from the panels, it is considered that infiltration testing is not required to confirm the drainage strategy for these areas. This approach is considered to be proportionate given the type and scale of the Proposed Development.
- 4.1.2.7 Landscaping within the Proposed Development should aim to mitigate ground compaction caused during construction. Utilising grass or wildflower cover will help to enhance interception and root growth, promoting effective rainwater infiltration and interception.
- 4.1.2.8 Considering the current site comprises arable and pasture farmland, ceasing grazing or arable activities and enhancing vegetation is expected to improve the existing greenfield conditions of withing the draft Order Limits. As long as vegetation beneath the solar PV modules is maintained, no significant increase in surface water runoff is anticipated from the installation of the solar PV modules.
- 4.1.2.9 Rutting during the operational phase can be an issue at solar farm sites, particularly during intense storms, at the base of panels. This can disrupt natural flow paths and should be avoided wherever possible through adequate planting and maintenance of the vegetation. Any areas that may be accessed by maintenance equipment or machinery should be managed to ensure rutting of the surface is avoided or repaired where necessary.
- 4.1.2.10 Additionally, the runoff quality from the Panel Areas is expected to be comparable to that from roofs, so no extra water quality treatment measures are deemed necessary beyond that provided by the grass cover beneath the panels. With the proposed shift from arable and pasture to native meadow species, the quality of surface water runoff from the solar PV modules is anticipated to be as good as or improved when compared to the current situation.
- 4.1.2.11 Groundwater Source Protection Zones (SPZs) are areas designated by the EA to protect groundwater sources used for public drinking water supply from contamination. They are defined around wells, boreholes and springs that provide potable water. Most of the draft Order Limits are located within SPZ III. The far north west of the draft Order Limits including most of the Western Panel Area is in SPZ I. The west of the draft Order Limits, including around a third of the Central Panel Areas, and an area to the east of the draft Order Limits including the northern most land parcel of the Southern Panel Area, are within SPZ II. See Figure 14.9 of the PEIR for the SPZ locations.

4.1.3 Battery Energy Storage System (BESS)

- 4.1.3.1 The Proposed Development includes co-located battery storage units located across the Panel Areas and which are referred to as “hybrid packs”. Each hybrid pack would comprise of four BESS units, one inverter unit, and four direct current (DC) converters with a total footprint of 286m². There may be some stand-alone inverter units and BESS units across the site, however, the majority will be arranged as hybrid packs.
- 4.1.3.2 It is proposed that surface water from the hardstanding areas will drain freely onto surrounding gravel aprons, promoting natural land drainage around the structures. This practice is common for solar farms, where the scale of these impermeable areas is relatively small compared to the surrounding rural landscape. Although the layout and extent of hardstanding for the BESS areas is yet to be defined, approximately 190 BESS units would be constructed. This approach to surface water management is considered appropriate. Similar to the solar PV modules, these features will receive rainfall directly from above and are not expected to generate additional pollutant loads. Maintenance operations are considered to pose minimal pollution risks. The stone apron will help capture and treat low-risk pollutants, such as oils from maintenance machinery. Currently, no other planned maintenance activities are known that present an increased risk of pollution.
- 4.1.3.3 Numerous safety measures are proposed to prevent a fire occurring within the BESS. However, in the event that a fire does occur, it is understood that the containers are to be fitted with an automated fire-suppression system, using an automatic clean agent (aerosol). In the event of a fire, this would mitigate the risk of contaminated water filling the BESS container. Water is typically only used to cool adjacent BESS in the event of a BESS fire to prevent the spread of fire to other units, and therefore only used when multiple BESS are installed in a central location on a site in close proximity to each other. The Proposed Development has BESS spread throughout the Panel Areas over a large geographic area; therefore, cooling water would not be used in the event of a fire.
- 4.1.3.4 The Applicant is continuing to develop the drainage strategy in discussion with the Environment Agency including in relation to BESS.

4.1.4 Substations and transformers

- 4.1.4.1 The development proposals include seven onsite substations (132kV) within the draft Order Limits. The area of each of the 132kV substation compounds is anticipated to be 0.4ha (50m x 80m), totalling 2.8ha for seven substations. The locations of substations and exact total areas will be confirmed and considered in the DCO application documents.
- 4.1.4.2 Some of these elements of the Proposed Development can inherently pose a high-pollution risk due to the presence and decanting of oil/fuel, and as such, special consideration must be given to the drainage of these areas. Under The Control of Pollution (Oil Storage) (England) Regulations (2001) it is an offence to cause or

knowingly permit the discharge of poisonous, noxious or polluting matter into surface and groundwaters.

- 4.1.4.3 The drainage design related to these areas must ensure adequate collection, storage and treatment is provided for runoff during both normal operation, refuelling, and a spill scenario. Treatment may be provided through the inclusion of appropriately sized oil water separators (OWS) in the drainage network.
- 4.1.4.4 The design for the on-site substations would include a bund designed to accommodate at least 110% of the oil volume present. Transformers are often exposed and under normal conditions any rainwater collected within a sump should be removed using specialised Bund Water Control Unit pumps that automatically shut off if they detect the presence of oil. These pumps are normally connected to control and monitoring systems that will raise alarms if oil is detected. Surface water from the bund can be discharged to a foul or combined sewer, or to a surface water sewer via a suitable interceptor. Where no mains drainage is available, surface water can be discharged to a soakaway subject to agreement with the LLFA. The specifics of this will be a matter for detailed design.
- 4.1.4.5 The Drainage Strategy should consider the NPPF and other technical guidance documents as the design for the Proposed Development evolves, including: the now withdrawn but still referenced EA pollution prevention guidance (PPG) 3 (Use and design of oil separators in surface water drainage systems) [8] and GPP3 18 (Managing Firewater and Major Spillages) [9] .
- 4.1.4.6 Other areas of hardstanding associated with the substations, which pose a low pollution risk, can be managed through direct infiltration via appropriately sized SuDS features including, for example, infiltration trenches. If infiltration is not feasible, the drainage hierarchy should be followed and a suitable outfall to watercourse identified. If no watercourse is available, a suitable discharge to sewer should be pursued. Any attenuation required will need to be designed to accommodate the runoff from a 1 in 100-year plus climate change event and be attenuated to greenfield discharge rates.
- 4.1.4.7 Regarding foul drainage, all foul water generated should be appropriately collected in sealed storage tanks and regularly emptied and disposed of by a licensed waste contractor in accordance with regulatory requirements.

4.1.5 Access roads

- 4.1.5.1 Access to the Proposed Development will be required during construction and operational phases for maintenance. Access to the Proposed Development is proposed via existing access points from the local highway network. Each access point will be approximately 8m wide at the point of entry/exit and new tracks within the draft Order Limits are anticipated to be up to 4.5m wide.
- 4.1.5.2 Regular vehicular movements during operation and maintenance will be kept to designated access tracks as far as practicable, to reduce the risk of soil compaction. Any internal access tracks that are required are proposed to be of permeable construction (e.g. gravel medium). Careful consideration will be given to the

construction of any tracks and the materials selected, so that water is allowed to infiltrate through the gravel and maintain greenfield runoff rates.

4.1.5.3 When more detail is available regarding track alignments in relation to the topography, further consideration should be given to the provision of a more formal drainage solution (i.e. the inclusion of swales, cross drains and basins to manage flows as close to source or at points of concentrated flow) if appropriate.

4.1.5.4 As part of the Proposed Development, there will be mitigation planting and enhancements to elements of access including Public Rights of Way and permissive paths.

4.1.6 Temporary works and construction

4.1.6.1 It is anticipated that several construction compounds would be required for the construction of the Proposed Development. This is expected to include at least one central compound on each of the Panel Areas, as well as a number of satellite compounds across the site.

4.1.6.2 In any temporary works or construction phases, careful consideration must be given to managing surface water runoff to prevent any increase in flood risk or impacting water quality on-site and in surrounding areas. A 'Durabase Mat System' or a similar non-ground penetrating mat system is planned to be used within the compounds.

4.1.6.3 Temporary drainage measures must be provided as described in the above sections to ensure that surface water is adequately controlled, with flow rates mimicking greenfield conditions.

4.1.6.4 Given the sensitivity of the draft Order Limits and the presence of chalk streams, it is important that consideration be given to runoff from construction areas to prevent overland flow entering any watercourses. Construction areas should be designed to prevent overland flow entering watercourses and the accumulation of standing water, to reduce the potential for pollutants to enter the water environment. Spill kits should be available to ensure any spills of oils, fuels, or hazardous materials are promptly contained and cleaned to prevent contamination of surface and ground waters.

4.1.6.5 Additionally, bunding, settlement lagoons, sediment traps and grass filter strips should be employed where there is a risk of silt entering watercourses. To reduce compaction and rutting of surfaces, consideration should be given to utilising low ground pressure tyres on vehicles and managing deliveries to reduce repeat journeys where possible.

4.1.6.6 Where the construction time is anticipated to be greater than one year, in accordance with LLFA, construction drainage should be designed up to and including the 1 in 100-year flood event with an allowance for climate change and freeboard.

- 4.1.6.7 It is anticipated that the construction site will be equipped with appropriate welfare facilities and all foul water generated should be appropriately collected in sealed storage tanks and regularly emptied and disposed of by a licensed waste contractor in accordance with regulatory requirements.
- 4.1.6.8 Implementation of the above measures will ensure that the environmental impact on the surrounding area is minimised during the construction phase.

4.1.7 Decommissioning

- 4.1.7.1 Further to recommendations outlined in the temporary works and construction section, consideration must be given to the safe decommissioning of all drainage features. Decommissioning activities must be carefully planned and executed to ensure compliance with environmental regulations and operational requirements applicable at the time of decommissioning.
- 4.1.7.2 Surface water systems must be decommissioned with due regard to water quality management and the prevention of uncontrolled runoff. The decommissioning process would typically involve dewatering, disconnecting, and sealing any drainage outfalls to prevent uncontrolled discharges; removing silt or debris from any drainage features including SuDS; and ensuring no residual contaminants remain that could pose a risk to surface or ground waters.
- 4.1.7.3 Infiltration systems or storage tanks should be emptied and inspected to ensure they do not pose a residual flood or pollution risk. Components may need to be removed entirely with surrounding areas reinstated or landscaped accordingly for the planned end use.
- 4.1.7.4 For foul water drainage systems, any remaining effluent within drainage features such as tanks, pumps, or septic systems should be safely removed by licensed contractors in accordance with regulatory guidelines. Manholes, inspection chambers and pipework should be inspected, suitably capped off, and removed. If any elements are to be abandoned and retained in-situ, they must be sealed to prevent ingress of debris or surface water.
- 4.1.7.5 All decommissioning activities should follow an appropriate specification developed according to industry standard documents such as the Civil Engineering Specification for the Water Industry (CEWSI) (8th Edition current at the time of writing).
- 4.1.7.6 Relevant stakeholders including Anglian Water, Breckland Council, and the Environment Agency will be engaged in relation to the detailed decommissioning proposals at that stage.

5 Maintenance plan

- 5.1.1.1 This section has been produced in accordance with guidance provided by the CIRIA SuDS Manual (C753) [6] and an example maintenance plan is included in Table 1.

The primary maintenance procedures for the Proposed Development relate to the upkeep of landscaping and gravel aprons.

- 5.1.1.2 The Maintenance Plan covers suggested maintenance activities for a variety of features and will evolve as the design progresses. The plan should be agreed with the relevant parties, including Breckland Council, landowners and any maintenance contractors, when the drainage strategy has been finalised. The anticipated operational assumption regarding maintenance for the Proposed Development is for 1-2 maintenance visits per month.

Table 1 Maintenance Plan

Feature	Maintenance Activity	Frequency	Responsible Body
Landscaping	Wildflower areas trimmed to 50mm on 3-year rotation 30% each year	Annually	The Applicant
	Grass should be cut to a height of 50 mm (with a minimum height of 35 mm and a maximum height of 100 mm)	Annually or as required	
	Safety inspections of pervious surfaces	Annually or as required	
	Inspect for problematic weeds and invasive plants and treat them as necessary	Annually	
	Inspect for strips of bare soil	Annually	
	Sediment removal using vacuum sweeping	Every 6 months	
Gravel Aprons / Infiltration Trenches	Litter and debris removal	Monthly	The Applicant
	Inspect silt / sediment accumulation rates and establish removal practices	Monthly, then half yearly	
	In areas of high pollution loads, wash or replaced overlying filter medium	Five yearly or as required	
	Mow grass edges min. 1m wide between 100-150mm height maximum	Monthly or as required	
	Hand-pull or spot treat weed growth, if necessary, ensure weed killer does not enter	As required	
Hardstanding Areas (including	Sediment and silt removal using vacuum sweeping	Every 6 months	The Applicant

Feature	Maintenance Activity	Frequency	Responsible Body
permeable construction and access tracks)	Sweeping of previous surfaces using a brush and suction cleaner	Annually	
	Litter and debris removal	Monthly	
	Safety inspections of pervious surfaces	Monthly or as required	
Infiltration basins and swales	Litter and debris removal	Monthly	The Applicant
	Inspect silt/sediment accumulation rates and establish removal practices	Monthly	
	Safety inspections of inlet and outlet	Monthly	
	Mow grass edges min. 1m wide between 75-150mm height maximum	Monthly or as required	

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