EAST YORKSHIRE SOLAR FARM

East Yorkshire Solar Farm

EN010143

Environmental Statement

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ES1 This Framework Surface Water Drainage Strategy (hereafter referred to as the 'Framework Strategy') has been developed for East Yorkshire Solar Farm (hereafter referred to as the 'Scheme'). The Scheme will comprise the construction, operation (including maintenance) and decommissioning of a solar photovoltaic (PV) electricity generating facility with a total capacity exceeding 50 megawatts (MW) and export connection to the national grid, at National Grid's Drax Substation.

ES2 Due to its proposed generating capacity being more than 50 MW the Scheme is classified as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 (PA 2008) (Ref. 1), which requires a Development Consent Order (DCO) from the Secretary of State for Energy Security and Net Zero. This Framework Strategy has considered the relevant National Policy Statements, National Planning Policy Framework (2023) and current strategies/guidance implemented by East Riding of Yorkshire Council throughout the assessment. The scope of the Framework Strategy was agreed with the Ouse and Humber Drainage Board.

ES3 Consultation with the Ouse and Humber Drainage Board concluded that only Solar PV Area 1c (the "Study Area"), which contains the Grid Connection Substations, had a potential to impact on surface water runoff and needed to be considered in this Framework Strategy. The rest of the Scheme within the Order limits has therefore not been considered. The calculations used in this Framework Strategy have assumed a design/operational life of 100 years for the Grid Connection Substations contained in Solar PV Area 1c assuming, as a worst case, that they are to be retained after the Scheme is decommissioned. Therefore, attenuation storage estimations are based on a 1 in 100-year storm event (40%AEP). The Study Area for this assessment is therefore approximately 2.0 hectares (ha) in area with no watercourses or drains in proximity. Infiltration testing has not been carried out at this stage of the assessment and surrounding geological data suggest the ground consists of heavy clays. Therefore, storage sizes have been calculated based on an assumed infiltration rate of 0.0m/h.

ES4 To prevent runoff to surrounding land or risk to proposed infrastructure, the Framework Strategy has assumed that all stormwater surface runoff up to the 1 in 100-year (1% AEP) rainfall event will be collected and attenuated within three different sized attenuation storage areas across Solar PV Area 1c. The first channel is assumed to be 5.0 m wide x 40.0 m long x 1.0 m deep located adjacent to the operations building. The second channel is assumed to be 6.0 m wide x 30.0 m long x 1.0 m deep located adjacent to the south-eastern access track between the primary 132kV switchrooms. The final channel is assumed to be 10.0 m wide x 25.0 long x 1.5 m deep located at the north-eastern corner of Solar PV Area 1c. **Plate 2** illustrates the approximate locations of the attenuation storage areas. Flow will be discharged at a rate no higher than the greenfield runoff rate.

ES5 Storms larger than the 1 in 100-year rainfall event (1% AEP) will be allowed to leave the site in all directions and will infiltrate or ultimately flow to three possible drains being Wilitoft Drain, Fleet Dike Two and Londesborough

Drain. This represents an improvement to the current site runoff because there will be no flow from Solar PV Area 1c until the attenuation is full. Only the later stages of extreme rainfall will give rise to surface flow leaving the Solar PV Area 1c.

ES6 The Study Area is not expected to create any negative water quality impacts through runoff.

ES7 A detailed Surface Water Drainage Strategy will be provided post-consent following the detailed design of the Grid Connection Substations and informed by infiltration testing, as secured through a requirement of the Development Consent Order (DCO). The **draft DCO** is in Volume 7 **[EN010143/APP/3.1].**

1. Introduction

1.1 Overview

1.1.1 East Yorkshire Solar Farm (the 'Scheme') will comprise the construction, operation (including maintenance) and decommissioning of a solar photovoltaic (PV) electricity generating facility with a total capacity exceeding 50 megawatts (MW) and export connection to the national grid, at National Grid's Drax Substation.

1.1.2 Due to its proposed generating capacity being more than 50 MW the Scheme is classified as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 (PA 2008) (Ref. 1), which requires a Development Consent Order (DCO) from the Secretary of State for Energy Security and Net Zero.

1.1.3 This Appendix sets out the Framework Surface Water Drainage Strategy for the Scheme (hereafter referred to as the 'Framework Strategy'). As agreed with the Ouse and Humber Drainage Board (**Annex A**), the Framework Strategy presented in this Appendix only considers the land within Solar PV Area 1c which will be the location of the two Grid Connection Substations, as show in **Figure 9-4-1 (Annex C).**

1.1.4 The Order limits are shown on **Figure 1-2, ES Volume 3 [EN010143/APP/6.3]** and represent the maximum extent of land to be acquired or used for the construction, operation (including maintenance), and decommissioning of the Scheme. Some of this land will also be used for landscaping, ecological mitigation and habitat enhancement rather than solar PV infrastructure. The collective term for all land within the Order limits is the 'Site'. The Site comprises the following elements:

a. The Solar PV Site which will include the Solar PV Panels and supporting solar PV infrastructure, including the two 33 kV/132 kV Grid Connection Substations to which this Appendix relates;

b. The Grid Connection Corridor describes the area outside of the Solar PV Site within which the 132 kV cabling linking the Grid Connection Substations to the National Grid Drax Substation will be laid;

c. The Interconnecting Cable Corridor describes the area outside of the Solar PV Site and Grid Connection Corridor which will contain the 33 kV cabling linking the Solar PV Areas to the Grid Connection Substations;

d. Ecology Mitigation Area describes the area of land in the north-west of the Site which is to be managed to provide good quality habitat for overwintering and migratory bird species; and

e. Site Accesses describes additional land required to facilitate access to the Site, such as new access routes or measures to provide better visibility splays.

1.1.5 The Solar PV Site, Ecology Mitigation Area, and Interconnecting Cable Corridor are solely located within the administrative area of East Riding of Yorkshire Council and the management area of the Ouse and Humber Drainage Board. The Grid Connection Corridor and Site Accesses are located within the administrative areas of North Yorkshire Council and East

Riding of Yorkshire Council and cross into the management area of the Ouse and Derwent Internal Drainage Board.

1.1.6 The Solar PV Site is approximately centred on National Grid Reference (NGR) SE 756 330 and is located approximately 1.5 kilometres (km) north-west of the market town of Howden at the closest point. It will comprise the ground mounted solar PV panel arrays and supporting electrical infrastructure.

1.1.7 The Scheme will use a single-axis tracking system. This tilts the Solar PV Panels around a north-south orientated axis, tracking the sun's movement from east to west to give optimal power generation throughout the day. The maximum height of the Solar PV Panels will be 3.5 m above ground level (AGL), this will occur when the panels are at maximum tilt (early morning and late evening) and so for most of the day panel height will be lower. The panels will be positioned horizontally overnight. This means that there will be no single 'drip track' from the panels as occurs in fixed (non-tilting) panel arrangements. Panels will also revert to the horizontal position in the event of flood conditions, as further described in **Appendix 9-3, ES Volume 2 [EN010143/APP/6.2].**

1.1.8 The supporting infrastructure is located within the Field Stations which are interspersed across the Solar PV Site. These comprise inverters to convert the direct current (DC) electricity generated by the solar PV panels into alternating current (AC); transformers which adjust the voltage from less than 1 kV, as generated by the panels, to 33 kV; and switchgear which protect and isolate electrical equipment.

1.1.9 Two Grid Connection Substations will receive the electricity from Field Stations and step up the voltage from 33 kV to 132 kV ready to be exported to National Grid Drax Substation via the 132 kV Grid Connection Cables. The electricity generated by the Scheme will be evenly distributed between the two Grid Connection Substations.

1.1.10 The Grid Connection Substations will be located in Solar PV Area 1c as shown in **Figure 9.4.1 (Annex C)** and **Figure 2-3, ES Volume 3 [EN010143/APP/6.3],** and will include the required electrical infrastructure, the control and metering building(s), car parking and all other associated infrastructure. The maximum footprint for each of the Grid Connection Substation compounds is estimated to be approximately 60 m by 65 m based upon the maximum design parameters of similar facilities. Further details of the Grid Connection Substations ad their proposed layout are provided in **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]**.

1.1.11 The electrical infrastructure at the Grid Connection Substations will comprise cable sealing ends (where the export cables will terminate into the infrastructure), busbars/conductors, isolator/disconnectors and circuit breakers (for electrical safety), voltage transformers (for measuring supply) and the transformer will be outside (i.e., not contained within a building) and will comprise separate infrastructure and conductors.

1.1.12 This Appendix should be read in conjunction with **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]** and is supported by three Annexes:

a. **Annex A** – IDB Drainage Strategy Written Approval;

b. **Annex B** – Greenfield Run-off Calculations; and

c. **Annex C** – **Figure 9-4-1:** Location of Grid Connection Substations and Proximity of Drains Within the Ouse and Humber Catchment Area.

1.1.13 Further information on Scheme design is contained in **Chapter 2, The Scheme, ES Volume 1 [EN010143/APP/6.1].**

2. Requirements

2.1 National Policy Statements (NPS)

2.1.1 The NPS for energy were designated in July 2011 and set out matters, principles and impacts that should form the basis of the Secretary of State's (SoS) decision on DCO applications for Energy NSIPs. The Overarching NPS for Energy (NPS EN-1) (Ref. 1) sets out the general principles and impacts to be considered for all types of energy NSIP. Paragraph 5.7.9 states that "*In determining an application for development consent, the IPC [Infrastructure Planning Commission, now replaced by the Planning Inspectorate and Secretary of State] should be satisfied that where relevant:*

a. the application is supported by an appropriate FRA [Flood Risk Assessment];

b. the Sequential Test has been applied as part of site selection;

c. a sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;

d. the proposal is in line with any relevant national and local flood risk management strategy;

e. priority has been given to the use of sustainable drainage systems (SuDs) (as required in the next paragraph on National Standards); and

f. in flood risk areas the project is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development".

2.1.2 Part 2 of EN-1 covers the Government's energy and climate change strategy, including policies for mitigating climate change. It refers to Section 4.8 of EN-1 which sets out generic considerations that applicants and the Secretary of State should take into account to help ensure that renewable energy infrastructure is resilient to climate change.

2.1.3 The Government is currently reviewing and updating the Energy NPSs. It is doing this to assist the Planning Policy Framework deliver the infrastructure required for the country's transition to net zero carbon emissions. As part of the Energy NPS review process, the Government published a suite of revised Draft Energy NPSs for consultation on 30 March 2023. The consultation on the details of these NPSs closed on 23 June 2023, but the documents have not yet been finalised or adopted.

2.1.4 Revised Draft NPS EN-1 (Ref. 3) states the following information should be included in a DCO application regarding drainage:

a. Describe the existing surface water drainage arrangements for the site;

b. Set out (approximately) the existing rates and volumes of surface water run-off generated by the site. Detail the proposals for restricting discharge rates;

c. Set out proposals for managing and discharging surface water from the site using sustainable drainage systems and accounting for the predicted impacts of climate change. If sustainable drainage systems have been rejected, present clear evidence of why their inclusion would be inappropriate;

d. Demonstrate how the hierarchy of drainage options has been followed;

e. Explain and justify why the types of SuDS217 and method of discharge have been selected and why they are considered appropriate. Where cost is a reason for not including SuDS, provide information to enable comparison with the lifetime costs of a conventional public sewer connection;

f. Explain how sustainable drainage systems have been integrated with other aspects of the development such as open space or green infrastructure, so as to ensure an efficient use of the site;

g. Describe the multifunctional benefits the sustainable drainage system will provide;

h. Set out which opportunities to reduce the causes and impacts of flooding have been identified and included as part of the proposed sustainable drainage system;

i. Explain how run-off from the completed development will be prevented from causing an impact elsewhere; and

j. Explain how the sustainable drainage system been designed to facilitate maintenance and, where relevant, adoption. Set out plans for ensuring an acceptable standard of operation and maintenance throughout the lifetime of the development.

2.1.5 Paragraph 3.10.76 of the Revised Draft NPS EN-3 states where access tracks need to be provided, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS), such as swales and infiltration trenches, should be used to control any runoff where recommended.

2.1.6 The above statements are high level requirements that are supplemented by further detail held in other planning guides, as described below.

2.2 National Planning Policy Framework

2.2.1 The National Planning Policy Framework (NPPF) (2023) requires that new developments should not increase flood risk both on the Site and in the area surrounding it. This means that surface water runoff should not exceed the peak volumes already generated on the Site and that betterment should be

provided, where possible. Developments should provide wider sustainability benefits to the community that outweigh the flood risk.

2.2.2 The National Planning Practice Guidance (Ref. 4) reiterates that all forms of flood risk (including groundwater flooding, reservoir flooding and surface water flooding) need to be treated consistently with river (fluvial) and tidal flooding in mapping probability and accessing vulnerability, so the Sequential Test is applied across all areas of flood risk. For ground water, the sequential approach should be used and the disposal method should be discharge of surface water into the ground (infiltration) unless it can be demonstrated why this is not possible. If infiltration is not possible, discharge to a surface water body is the second preference.

2.3 Local Planning Policy

2.3.1 This section only considers local planning policy in relation to the East Riding of Yorkshire, as this is the local authority area in which the Scheme's Grid Connection Substations are located.

2.3.2 East Riding Local Plan (2016) (Ref. 6) Policy ENV6 (Managing environmental hazards) lays out high level guidance for new development within East Riding of Yorkshire Council's administrative area. The policy states:

Flood risk will be proactively managed by:

1. *Ensuring that new developments:*
    - i. *limit surface water run-off to existing run-off rates on greenfield sites, and on previously developed land reduce existing run-off rates by a minimum of 30%, or to greenfield run-off rate;*
    - ii. *do not increase flood risk within or beyond the site;*
    - iii. *incorporate Sustainable Drainage Systems (SuDS) into major development proposals and proposals at risk of flooding, unless demonstrated to be inappropriate;*
    - iv. *do not culvert or otherwise build over watercourses, unless supported by the Risk Management Authority;*
    - v. *have a safe access/egress route from/to Flood Zone 1 or establish that it will be safe to seek refuge at a place of safety within a development;*
    - vi. *incorporate high levels of flood resistant and resilient design if located in a flood risk area;*
    - vii. *are adequately set-back from all watercourses including culverted stretches; and*
    - viii. *adhere to other relevant SFRA [Strategic Flood Risk Assessment] recommendations.*
2. *Supporting proposals for sustainable flood risk management, including the creation of new and/or improved flood defences, water storage areas and other schemes, provided they would not cause unacceptable adverse environmental, social, or economic impacts.*

3. *Supporting the removal of existing culverting and returning these sections to open watercourse.*
4. *Designating areas of Flood Zone 3b (Functional Floodplain) and safeguarding land for current and future flood risk management, on the Policies Map.*

2.3.3 These policy requirements are in line with those of local councils across the country and have been used to shape other council documentation.

Flood Risk Sequential and Exception Test Supplementary Planning Document (SPD) (Ref. 8)

2.3.4 East Riding's Flood Risk Sequential and Exception Test SPD provides guidance and the requirements for undertaking the Sequential and Exceptions tests to assess flood risk.

East Riding's Local Flood Risk Management Strategy 2015–2027 (Ref. 8)

2.3.5 The Council's local flood risk management strategy provides the Council's policy position with respect to flood risk and is therefore in tune with the Local Plan. It lays out several objectives to defend against flood risk and measures to implement towards them. Objective 9 of the strategy states:

"Ensure flood risk to and from new development is minimised, and where possible achieves an overall reduction in flood risk."

2.3.6 The measures under this objective are generally to provide guidance for developers on how to manage flood risk and incorporating sustainable drainage design.

Sustainable Drainage Systems (SuDS) & Surface Water Drainage Requirements for New Development Design and Maintenance Combined Planning Note and Standing Advice September 2016 (Ref. 9)

2.3.7 This document is provided in response to the Local Flood Risk Management Strategy. It states that; "*The Non-statutory Standards for Sustainable Drainage Systems (Defra 2015)* (Ref. 10) *document provides the current benchmark for designing SuDS*". Key elements of these standards are listed below:

a. For greenfield developments, the peak runoff rate from the development to any highway drain, sewer, or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield runoff rate for the same event.

b. For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

c. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.

d. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100-year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g., pumping station or electricity substation) within the development.

e. The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance [flood flow] routes that minimise the risks to people and property.

2.3.8 The document also notes the following documents as suitable specifications for the design of drainage infrastructure:

a. Department for Transport (DfT) Design Manual for Roads and Bridges: Volume 4 or any variation/alternative specification required by the Council's Highway Development Management Team. (Ref. 11)

b. Water Research Centre (WRC) Sewers for Adoption 7th Edition (Ref. 12)

c. The SuDS Manual (C753) CIRIA (Ref. 13)

2.4 Design Phase Specific Requirements

2.1.1 The design life of this Scheme is 40 years, with decommissioning to commence 40 years after final commissioning (currently anticipated to be 2027 to 2067).

2.1.2 The future of the Grid Connection Substations in Solar PV Area 1c and their associated control and metering buildings, etc., and the Grid Connection Cables, cannot be confirmed at this time and will depend upon demand closer to the decommissioning date. It is common practice for such infrastructure to be retained and used for another purpose after the development they were originally installed to support is decommissioned.

2.4.1 The assessments presented in this Framework Strategy therefore assume a design/operational life of 40 years for the solar farm and 100 years for the Grid Connection Substations, assuming (as a worst case) that they are to be reused after decommissioning of the Scheme.

2.4.2 The calculations in this report have assumed a standard of protection within Solar PV Area 1c of up to the 1 in 100-year storm event (1%AEP) plus an allowance for climate change.

2.4.3 This Framework Strategy considers surface water only and has not accounted for foul water disposal as this will be managed separately by septic tanks at the permanent welfare facilities at Johnson’s Farm Operations and Maintenance Hub (Solar PV Area 1e) and at the Grid Connection Substations (Solar PV Area 1c). There is no outflow from the septic tanks and foul/waste water will be stored for collection/emptying by specialist licenced contractors.

3. Proposed Drainage Strategy

3.1 Strategy Overview

3.1.1 Early consultation with the Ouse and Humber Drainage Board discussed the key elements within the development and how they should be considered with respect to land drainage. Minutes of the meeting are included in Annex A. The following agreements were made:

a. The panels will be single axis tracker panels and will therefore not focus surface water in specific areas (no single drip track). The ground will be raked in line with contours to encourage the retention and infiltration of rainfall until vegetation is established. Maintenance visits will check for signs of developing flow paths and mitigate where necessary. For these reasons, **the panels do not need to be considered further in this strategy**.

b. Field stations will consist of up to four shipping containers, founded on ground screw piles or strip footings, sitting above ground with gravel or aggregate underneath. This will allow runoff to spread under the units, mitigating any impact from the structures. The units will also be located away from the edge of fields, allowing the surrounding land to further aid in mitigating any runoff. Therefore, **the field stations do not need to be considered further in this strategy**.

c. The operations and maintenance hub at Johnson's Farm will be an administration area that will refurbish the existing buildings for use, or rebuild on the existing building footprint[1], refer to **Chapter 2: The Scheme, ES Volume 1 [EN010143/APP/6.1]** for further details. No change in the current behaviour of the site is expected. This is generally flat and surrounded by fields that will hold solar panels (to the west) or be retained as land for habitat enhancement (to the east), as illustrated in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. Foul drainage will be managed by a septic tank system. For these reasons, **Johnson's Farm does not need to be considered further in this strategy.**

d. The two Grid Connection Substations will be contained in a single field (Solar PV Area 1c) and will consist of areas of hardstanding, access roads, a small parking area, auxiliary equipment and switchrooms and operations building. Surface water runoff from this field will have to be managed with flows reduced to the greenfield rate. Therefore, **Solar PV Area 1c and the Grid Connection Substations require further consideration.**

[1] Note since the agreement with the Ouse and Humber Drainage Board was made it has been confirmed that the derelict farmhouse will be demolished and a new structure erected on its footprint. The derelict brick barns will also be demolished and may be rebuilt.

3.2 Desktop Study

The Study Area

3.2.1 This Framework Strategy focuses solely on Solar PV area 1c where both Grid Connection Substations will be located. Solar PV area 1c is located adjacent to Tottering Lane, north-west of Spaldington and south-east of Willitoft as illustrated on **Figure 9-4-1 (Annex C)**. The Study Area is a contained field (approximately 2.0 hectares (ha) in area) with no water courses or drains in proximity. The topography of the Study Area is extremely flat with no obvious direction for surface water runoff.

3.2.2 **Figure 9-4-1 in Annex C** to this Framework Strategy displays the location of Solar PV Area 1c (the Study Area) and surrounding drains within the Ouse and Humber catchment area according to the Yorkshire and Humber Asset Map.

Greenfield Runoff Rate and Infiltration

3.2.3 The greenfield runoff rate for the Scheme has been estimated using the IH124 method in the HR Wallingford Greenfield runoff rate estimation tool online (Ref. 14). See **Annex B** for the results which show the calculated greenfield runoff rates for the Study Area at 50 ha followed by a table extrapolating this information to the 2 ha area of Solar PV Area 1c.

3.2.4 To prevent runoff to surrounding land or risk to the proposed infrastructure, this Framework Strategy assumes that all stormwater surface runoff up to the 1 in 100-year (1% AEP) rainfall event will be collected and attenuated. The analysis will consider the 1 in 100-year (+ climate change) flood event for the proposed impermeable areas of Solar PV Area 1c.

3.2.5 No infiltration testing has been conducted (although this will be provided post-consent/pre-construction) and therefore assumptions have been made based upon known characteristics of the Study Area. There are no local drainage ditches from the field and infiltration is assumed to be 0.00m/hr total across all surface area. This is based on surrounding boreholes and geological data which suggests the ground consists of heavy clay. Therefore, to prevent standing water within Solar PV area 1c and surface water being pushed to the surrounding land, the entire storm volume will be retained in storage. This will lower the discharge rates to below the greenfield rate.

3.2.6 This Framework Strategy therefore assesses a worst-case situation. Should the pre-construction infiltration testing show that infiltration is possible, the storage volumes will be adjusted accordingly within the detailed Surface Water Drainage Strategy to be prepared prior to construction, as secured through the DCO.

Required Attenuation Volume

3.2.7 The proposed infrastructure will be at ground level. Therefore, standing water on the surface of the flat field has the potential to impact the proposed infrastructure. It also has the potential to flow to neighbouring fields at an increased rate. With no specific route to discharge from the field, the best way to manage this risk is to hold surface water from the Scheme below

ground level elsewhere in the field. Therefore, the drainage system needs to contain the entire storm volume.

3.2.8 As part of the Framework Strategy, provisional storage volume requirements for Solar PV Area 1c have been calculated. These calculations have been carried out using the Quick Storage Estimate tool on Innovyze's InfoDrainage software. The impermeable area has been calculated using the approximate dimensions of the substations, auxiliary equipment, operations building and switchrooms footprints provided by the Applicant's design team.

3.2.9 Storage volumes have been estimated using a 1 in 100-year return period to suit the 40-year design life of the Scheme. It has been assumed that the design life of the concrete elements in Solar PV Area 1c will be 100 years as they could potentially be retained after decommissioning (see paragraph 2.1.1).

3.2.10 An upper end allowance of a 40% increase in rainfall has been derived from the Government Climate Change Allowances website (Ref. 15) for the Hull and East Riding Management Catchment. The storage volumes are based on rainfall data from the 2013 Flood Estimate Handbook (FEH) (Ref. 16) and consider both Summer and Winter Storm Profiles.

3.2.11 The input values shown in **Plate 1** were used to calculate the required attenuation volume.

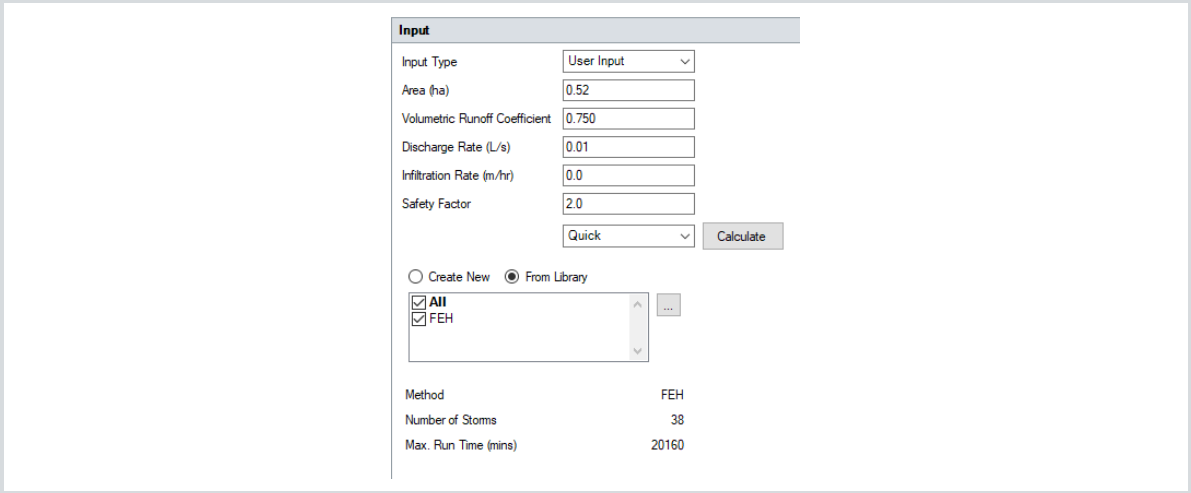

Plate 1. Infodrainage Input Data

Table 1. Estimated minimum and maximum storage attenuation volumes.

Site	Total area (ha)	Estimated Impermeable area (ha)	Greenfield runoff rate (l/s)	Minimum required volume (m^3)	Maximum required volume (m^3)
Solar PV Area 1c	2	0.52	16.76	746	750

Location of Attenuation Storage

3.2.12 Three different sized attenuation storage areas are proposed across Solar PV Area 1c. The first channel is assumed to be 5.0 m wide x 40.0 m long x 1.0 m deep located adjacent to the operations building. The second channel is assumed to be 6.0 m wide x 30.0 m long x 1.0 m deep located adjacent to the south-eastern access track between the primary 132kV switchrooms. The final channel is assumed to be 10.0 m wide x 25.0 long x 1.5 m deep located at the north-eastern corner of Solar PV Area 1c.

3.2.13 See **Plate 2** for the approximate location of attenuation storage areas in Solar PV Area 1c. Note that these locations may change if the design of the Grid Connection Substations develops post consent. For example, the Applicant may be able to construct smaller substations than the maximum parameters that have been assessed as part of the DCO Application. Such changes will be captured in the detailed Surface Water Drainage Strategy to be prepared prior to construction, as secured through the DCO.

3.2.14 The infrastructure to collect water and carry it to the storage areas will also be developed as the layout design of the Grid Connection Substations progresses at the detailed design stage (post-consent).

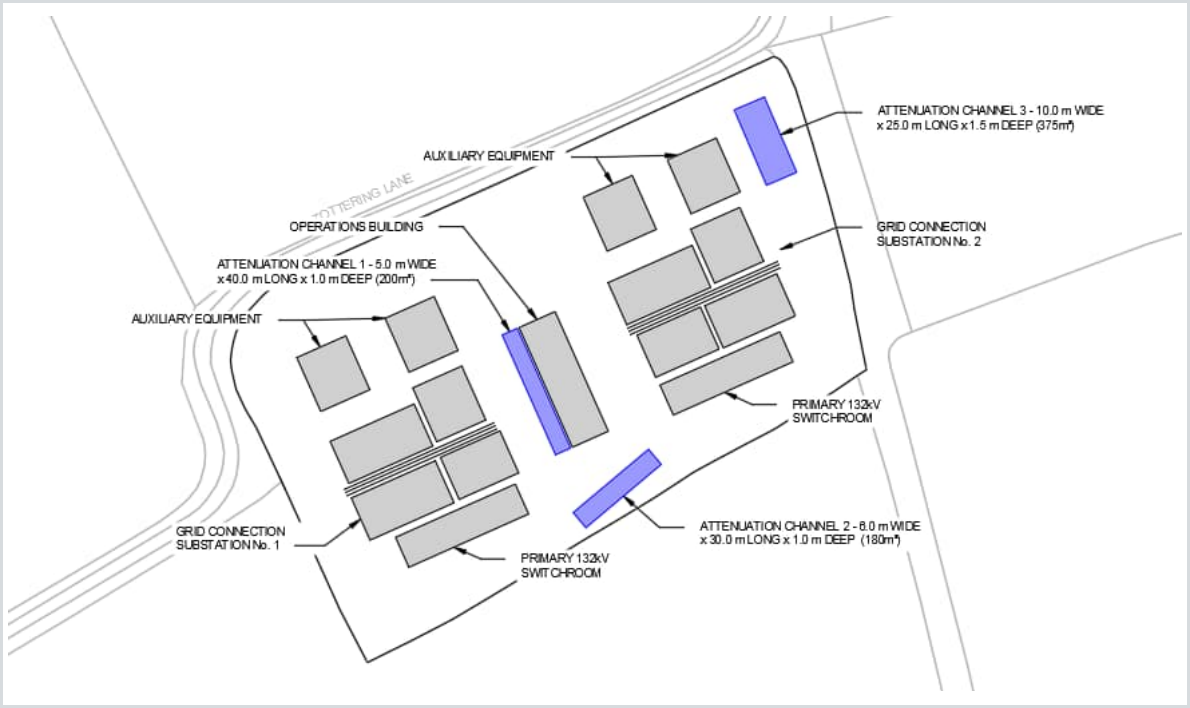

Plate 2. Location of Attenuation Storage

Exceedance Flows

3.2.15 The system is designed to contain the 100-year (+ climate change) design event. For larger storms, the surface flow will be allowed to leave the field in all directions and will infiltrate or ultimately flow to three possible drains: Wilitoft Drain, Fleet Dike Two and Londesborough Drain. This still represents an improvement of the current site runoff because there will be no flow from the site until the attenuation is full. Therefore, only the later stages of extreme rainfall (larger than the 100-year event) will give rise to surface flow leaving the Study Area.

Water Quality

3.2.16 The Grid Connection Substation compound (Solar PV Area 1c) will consist of areas of hard standing, a number of buildings, and a small carpark. The transformers will be bunded with flows being treated as foul water. All foul water will go to septic tank and be removed for treatment.

3.2.17 Using the Simple Index Approach described in the SuDS Manual (C753) CIRIA (Ref. 13), the potential for water quality impacts has been assessed. Using Table 26.2, the pollution hazard indices for the site can be considered similar to residential roofs (very low hazard), with the carpark similar to a residential car park or low traffic road (low hazard). The indices assigned to these are provided below.

Table 2. Pollution Hazard Indices

	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Residential Car Park / Low Traffic Road	Low	0.5	0.4	0.4

3.2.18 The attenuation ponds will be vegetated and allow infiltration into a depth of material more than 300 mm in depth. Table 26.4 of The SuDS Manual provides the following indices for the level of treatment provided by such a structure.

Table 3. Water Quality Treatment Indices

	Total Suspended Solids	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential of at least 300 mm in depth	0.6	0.5	0.6

3.2.19 It can be seen that the treatment indices are greater than the maximum hazard indices and therefore no negative water quality impact is expected from the Study Area.

4. Summary

4.1.1 The assessments presented in this Framework Strategy have assumed a design/operational life of 100 years for the Grid Connection Substations assuming, as a worst case, that they are to be reused after decommissioning of the Scheme. Discussion with the Ouse and Humber Drainage Board

concluded that only Solar PV Area 1c – which is where the Grid Connection Substations are located – needs to be considered within this Framework Strategy.

4.1.2 The Framework Strategy establishes the framework for how surface water runoff in Solar PV Area 1c will be managed through attenuation storage methods. Using the Storage Estimation tool on Innovyze's Infodrainage software, a maximum required storage volume of 750m³ is required. This will be achieved with three proposed attenuation storage areas of different sizes located to accommodate the proposed layout of Solar PV Area 1c. The assumed dimensions and locations are as follows:

a. Attenuation Channel 1 – 5.0 m wide x 40.0 m long x 1.0m deep, located adjacent to the operations building.

b. Attenuation Channel 2 – 6.0 m wide x 30.0 m long x 1.0 m deep, located adjacent to the south eastern access track between the 132kV switchrooms.

c. Attenuation Channel 3 – 10.0 m wide x 25.0 long x 1.5 m deep, located in the north eastern corner of Solar PV Area 1c.

4.1.3 Infiltration testing has not taken place within Solar PV Area 1c and therefore an infiltration rate of 0.0m/h has been assumed, as a worst case, when calculating the storage sizes. A detailed Surface Water Drainage Strategy will be provided post-consent following the detailed design of the Grid Connection Substations and informed by infiltration testing, as secured through the DCO (see draft DCO **[EN010143/APP/3.1]**).

5. References

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Ref. 4 Department for Levelling Up, Housing and Communities and Local Government (2023). *National Planning Policy Framework.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf [Accessed 19 September 2023].

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Ref. 12 Water Research Centre WRC (2012). *Sewers for Adoption: A design and construction guide for developers. 7th Edition.* Not available online.

Ref. 13 CIRIA (2016). *CIRIA C753: The SuDS Manual (2nd Ed.)* Not available online. [Accessed 19 September]

Ref. 14 HR Wallingford (2023) *Greenfield runoff rate estimation.* Online tool. [Accessed 19 September 2023]

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Ref. 17 DECC (2011) National Planning Statement (NPS) for Renewable Energy EN-3 (2011). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_da ta/file/47856/1940-nps-renewable-energy-en3.pdf. [Accessed 10 November 2023]

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Annex A – Ouse and Humber Drainage Board: Drainage Strategy Written Approval

Yorke, Sam

From: [redacted]@yorkshirehumberdrainage.gov.uk>
Sent:
To: [redacted]
Subject: RE: Boom Power EYSF - IDB m

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Sam,

Thank you for your time this morning. I can confirm that I am happy with the meeting minutes.

If you require anything further during the design process please feel free to get in touch.

Kind regards,

[redacted]

[redacted]
Senior Development Control Officer

Yorkshire & Humber Drainage Boards

Black Drain Drainage Board
Cowick & Snaith Internal Drainage Board
Danvm Drainage Commissioners
Dempster Internal Drainage Board
Ouse & Humber Drainage Board
Rawcliffe Internal Drainage Board
Reedness & Swinefleet Internal Drainage Board
Vale of Pickering Internal Drainage Board

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From: [redacted]
Sent: Thursday, August 17, 2023 11:17 AM
To: [redacted]
Cc: [redacted]
Subject: Boom Power EYSF - IDB meeting minutes 17/08/2023

Hi [redacted]

Thanks again for attending the meeting this morning and providing useful feedback to our queries, it is greatly appreciated.

Please can you provide your written approval of the following minutes taken during the meeting so that we may action them going forward. Feel free to add further comments if you wish to expand on any of the notes.

Date, Time & Location: 17/08/2023 @ 09:30am on Microsoft Teams

Attendees
[redacted]

Agenda and Responses

1. Impact of Solar Panels on catchpoint permeability
    a. Panels are tracking, there is no single drip track - must be included in reporting.
    b. [redacted] is happy with this - "May solve most of our concerns".

2. Gravel access roads do not require a drainage strategy
    a. Gravel roads are permeable, constructed with aggregate over geotextile.
    b. [redacted] is happy with this, no further drainage requirements needed.

3. Field stations do not require a drainage strategy
    a. 1-4 shipping containers (20') per area, raised from the ground with a plinth or screw piles with gravel underneath.
    b. All field stations will be located inland away from hedges or roadsides.
    c. [redacted] happy to ignore these.

4. Suitability of proposed strategy for field 1c
    a. [redacted] needs to see infiltration testing (before construction) to confirm storage sizing. "Don't want to worsen flood risk to surrounding areas".
    b. Happy with proposed solution of constructing a water storage area within field.

5. Suitability of proposed strategy for Johnsons farm
    a. Need to show no risk to the properties themselves
    b. May be a planning input with the LPA for the general design to demonstrate operationally it won't cause flooding.
    c. Surrounding fields owned by Boom Power.
    d. No change to footprint means no additional drainage required.

Kind regards,

[redacted] Water, Leeds

M [redacted]

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Annex B – Greenfield Run-off Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sam Yorke
Site name:	Field 1c
Site location:	Spaldington

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.80344° N
Longitude:	0.85768° W
Reference:	2819413981
Date:	Jul 28 2023 11:36

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 50

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	600	600
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

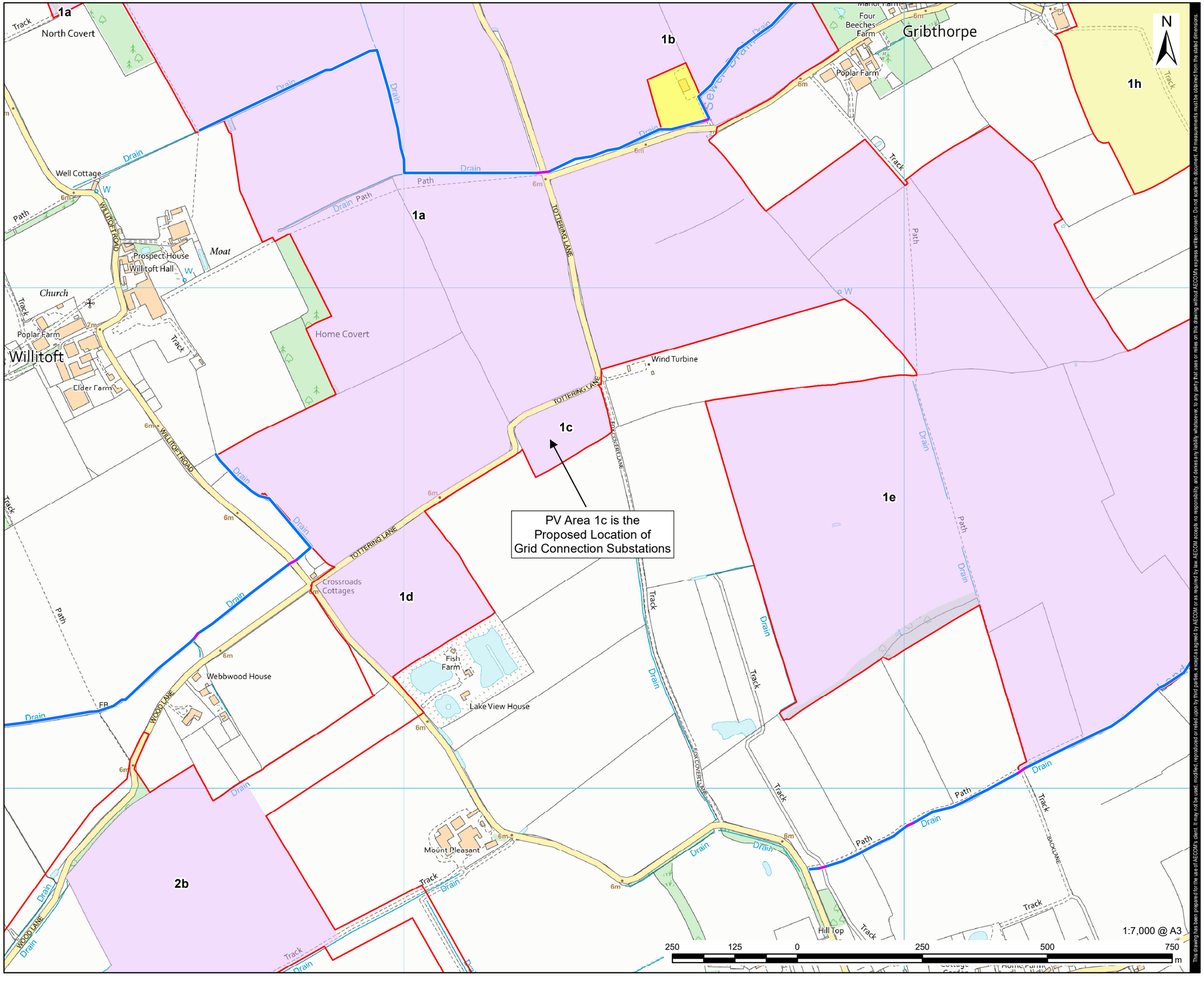
	Default	Edited

Q_{BAR} (l/s):	201.56	201.56
1 in 1 year (l/s):	173.34	173.34
1 in 30 years (l/s):	352.72	352.72
1 in 100 year (l/s):	419.24	419.24
1 in 200 years (l/s):	477.69	477.69

Greenfield Runoff Rates

	50 Hectares	1 Hectares	Site (2Hectares)	Site (0.36hectares)
Qbar (l/s)	201.56	4.0312	8.0624	1.451232
1 in 1 year (l/s)	173.34	3.4668	6.9336	1.248048
1 in 30 years (l/s)	352.72	7.0544	14.1088	2.539584
1 in 100 years (l/s)	419.24	8.3848	16.7696	3.018528
1 in 200 years (l/s)	477.69	9.5538	19.1076	3.439368

Annex C – Figure 9-4-1



AECOM

PROJECT

East Yorkshire Solar Farm

CLIENT

East Yorkshire Solar Farm Limited

CONSULTANT

AECOM Limited
Midpoint,
Alencon Link
Basingstoke, RG21 7PP
www.aecom.com

LEGEND

- Order limits
- Land not included in the Order limits
- Ecology Mitigation (xx = Ecology Mitigation Area)
- Solar PV Site (xx = Solar PV Area)
- Drain
- Culvert

NOTES

ISSUE PURPOSE

Environmental Statement

PROJECT NUMBER

60683115

FIGURE TITLE

Location of Grid Connection Substations and Proximity of Drains Within the Ouse and Humber Catchment Area

FIGURE NUMBER

Appendix 9-4-1