GREEN HILL SOLAR FARM

Green Hill Solar Farm

EN010170

Environmental Statement

Appendix 10.6: Flood Risk Assessment and Drainage Strategy Annex E: Green Hill C

Revision A (Tracked)

Prepared by: Arthian

Date: ~~May~~ November 2025

Document Reference: ~~APP~~EX1/GH6.3.10.6_A

APFP Regulation 5(2)(e)

Schedule of Changes

Revision	Section Reference	Description of Changes	Reason for Revision
A	[cover]	Updated to Revision A	As required for submission at Deadline 1.
	[throughout]	Updates to document references	As required for submission at Deadline 1.
	Section 3.6	Updated drainage strategy with respect to BESS surface water and firewater	In response to Relevant Representations received by the Environment Agency
	Paragraph 3.10.2	Confirmation of site maintenance with respect to BESS firewater containment	In response to Relevant Representations received by the Environment Agency

Appendix 10.6: Annex E - Flood Risk Assessment and Drainage Strategy – Green Hill C

Prepared by: Georgia Hirst

For: Green Hill Solar Farm Ltd

Site: Green Hill C

Date: ~~16/05/2025~~07/11/2025

Document Ref: 313532

~~Issue-04~~

Issue-05

Quality Assurance

Issue Record

Revision	Description	Date	Author	Reviewer	Approver
1.0	First Issue	04/09/2024	GH	LA	JR
2.0	Second Issue	24/10/2024	GH	LA	JR
3.0	Third Issue	11/04/2025	GH	LA	JR
4.0	Fourth Issue for submission of ES Chapter	~~16~~20/05/2025	GH	IR	JR
5.0	Fifth Issue following Updates made in response to Relevant Representations Lot 2: Statement of Common Ground Parties	31/10/2025	GH	IR	JR

Staff Detail

Initials	Name	Qualifications and Position	Signature
GH	Georgia Hirst	BSc (Hons), MSc, Consultant	[redacted]
LA	Lucy Antell	BSc (Hons), Senior	
IR	Isobel Randall	BSc (Hons), Senior	
JR	Josh Rigby	BSc (Hons), Manager	

Contents

Tables

Figures

Annexes

1. Site Details

The aim of this section of the report is to outline key environmental information associated with the baseline environment.

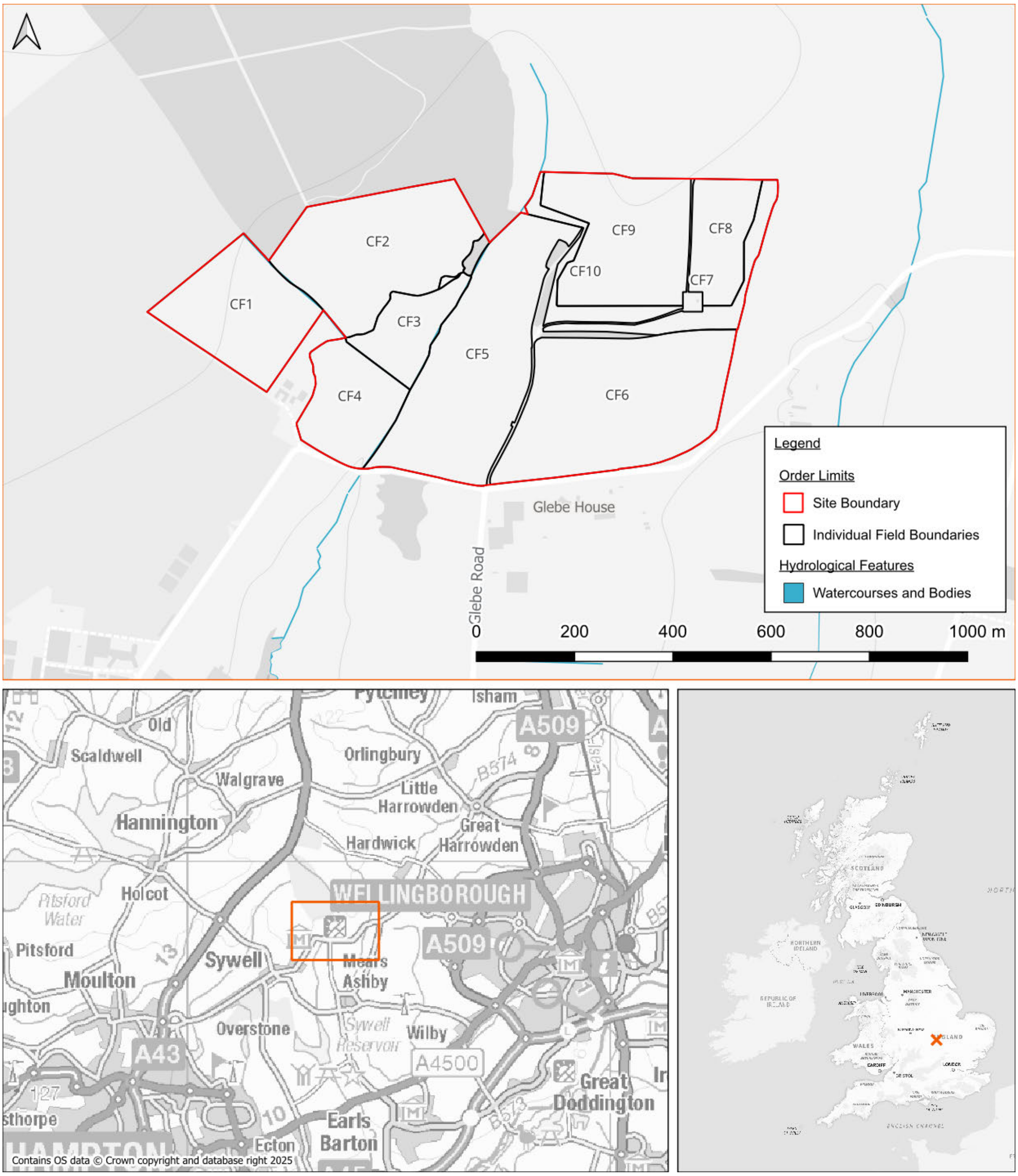


Figure 1: Site Location Plan

1.1 Site Location

1.1.1 Green Hill C is located to the north-east of Sywell, a village in North Northamptonshire, directly south of Sywell Wood. The National Grid Reference for Green Hill C is approximately 482770, 268430 in the west (CF1) to 483940, 268320 in the east (CF6).

1.2 Existing Site Conditions

1.2.1 Online mapping (including Google Maps / Google Streetview imagery accessed March 2025)[i] shows that the Site is greenfield comprising agricultural / arable fields.

1.3 Topography

1.3.1 Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR ground elevation data shows that the Site slopes from approximately 120m AOD in the north and west down to approximately 110 m AOD in the south and 111 / 112 m AOD in the east (Figure 2).

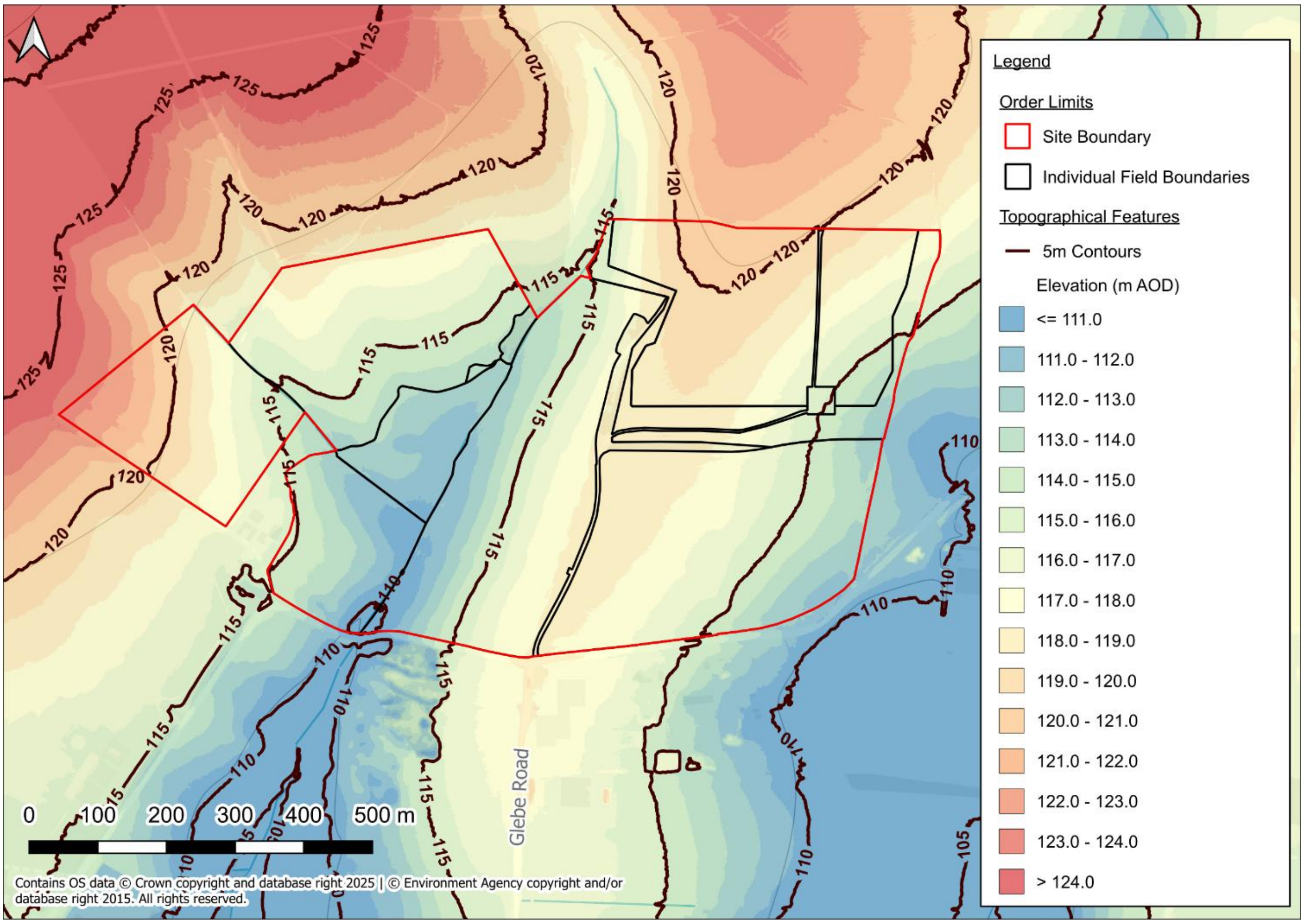


Figure 2: LiDAR Plan

1.4 Hydrology

1.4.1 No EA main rivers are located within the vicinity of Green Hill C. There is one land drain that is located through the centre of the Site, between Fields CF3 and CF5. The drain flows in a southwards direction where is later joins the River Nene.

1.5 Water Framework Directive Status

1.5.1 The Site is located within the Nene Catchment, partially within the Sywell Brook Water Body and also the Swanspool Brook Water Body[ii].

1.5.2 The Sywell Brook Water Body catchment has a Cycle 3 Ecological status of Poor in 2019 and 2022 and a Failing chemical status in 2019 (no data in 2022).

1.5.3 The Swanspool Brook Water Body has a Cycle 3 Ecological status of Moderate in 2019 and 2022 and a Failing chemical status in 2019 (no data in 2022).

1.5.4 A summary of the Water Body Classifications for the catchments are included as Annex A.

1.6 Geology

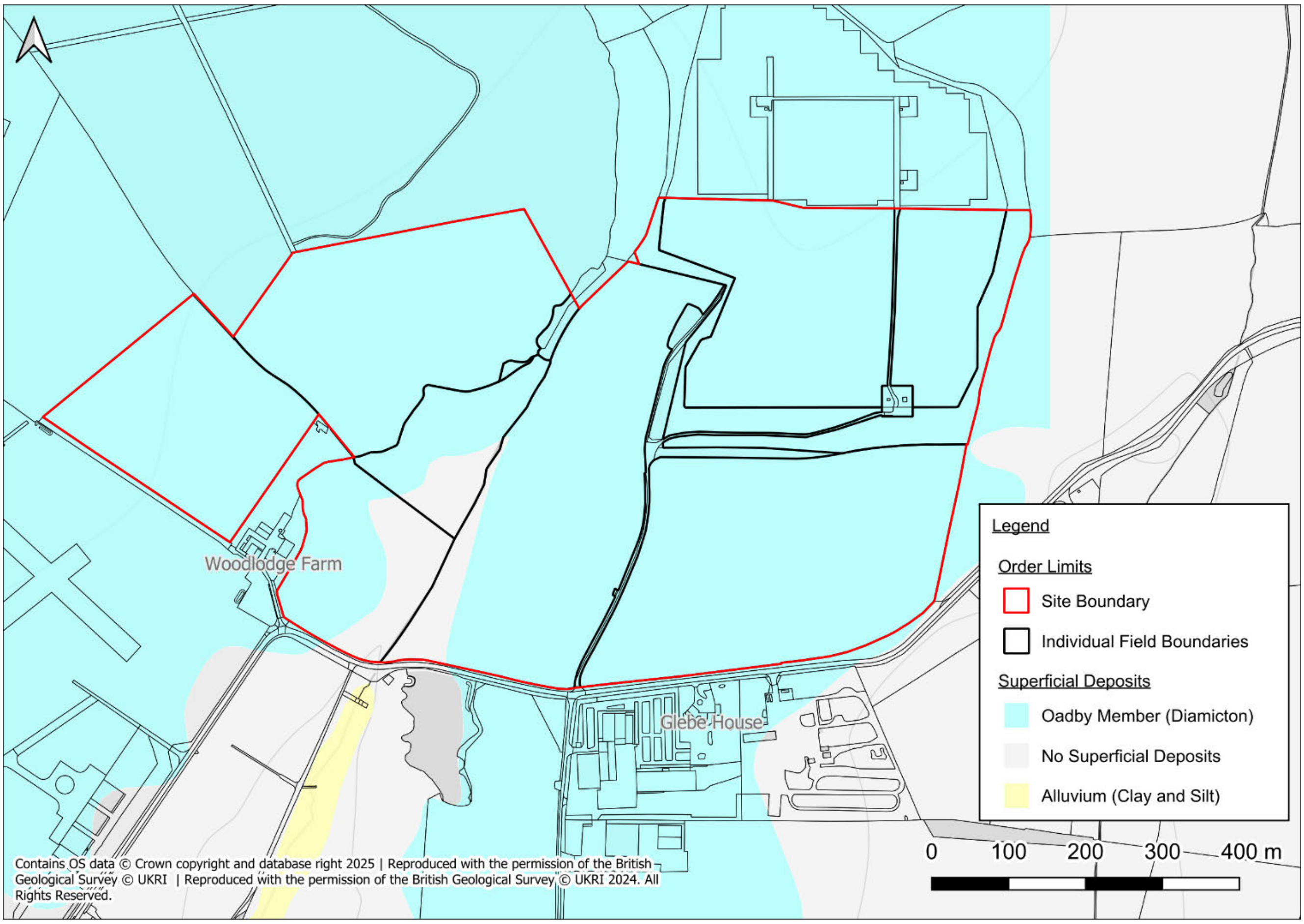


Figure 3: Superficial Deposits

1.6.1 Reference to the British Geological Survey (BGS) online mapping[iii] (1:50,000 scale) indicates that the Site is underlain predominately by Oadby Member generally comprising diamicton, with a small area identified as not being underlain by any superficial deposits.

1.6.2 The Site is identified as being underlain by the following bedrock deposits (see Figure 4 for the locations of the varying deposits):

- Stamford Member (Interbedded Sandstone and Siltstone)
- Wellingborough Limestone Member (Limestone and mudstone, interbedded)
- Northampton Sand Formation (Ooidal Ironstone)

1.6.3 The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a Site-specific basis.

1.6.4 There are no BGS boreholes located at Green Hill C or within the Site's near vicinity.

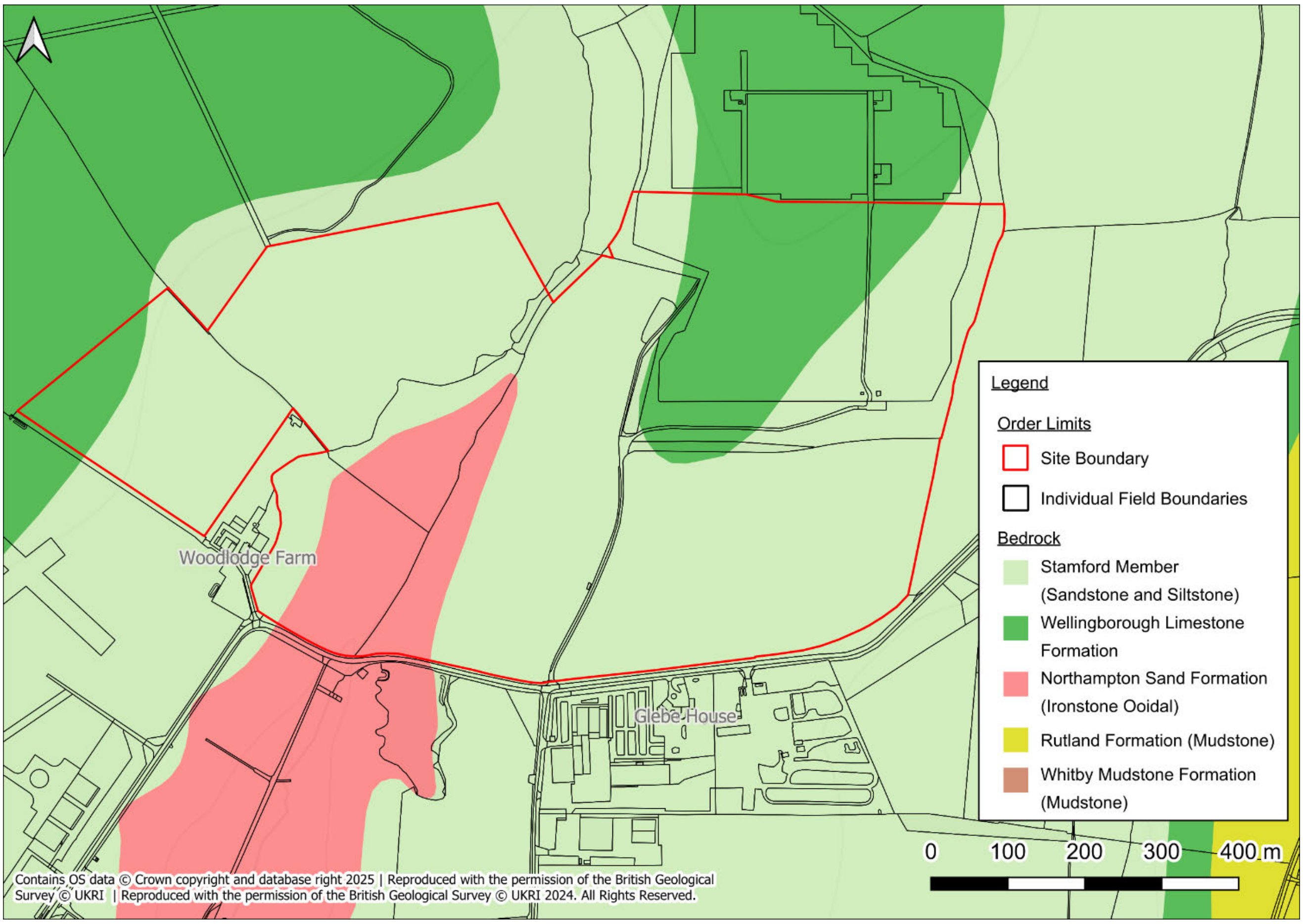


Figure 4: Bedrock Deposits

1.7 Hydrogeology

1.7.1 According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping[iv] [accessed 12/08/24], the Oadby Member is classified as a Secondary Undifferentiated Aquifer.

1.7.2 The underlying Stamford Member, Wellingborough Limestone Member and Northampton Sand Formation are detailed to be Secondary A Aquifers.

1.7.3 The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 12/08/24], indicates that the Site is not located within a Groundwater Source Protection Zone.

1.8 Proposed Site Conditions

1.8.1 Green Hill C proposes a ground mounted solar photo-voltaic plant and associated electrical infrastructure and access. An **Outline Landscape and Ecological Management Plan (OLEMP) [~~EN010170/APP~~EX1/GH7.4_A]** has been developed to support the DCO application, and details that the vast majority of the Site is proposed to be utilised for solar panels, supporting infrastructure, internal access and peripheral areas will comprise landscaped buffers in line with the embedded mitigation described throughout the ES.

1.8.2 The preferred location for a Battery Energy Storage System (BESS) at the time of writing is shown on in the separate **Appendix 10.11 Annex J - Flood Risk Assessment and Drainage Strategy ~~-~~ – BESS~~.~~ [EX1/GH6.3.10.11_A].** BESS will also be located on Green Hill C and therefore both locations have been assessed. A 400kV substation at Green Hill C will be located at Field CF9 and is detailed further in the Drainage Strategy in Section 3.0 of this report.

1.8.3 Table 1 below details the proposed areas derived from the final design plans on AutoCAD.

Table 1 : Green Hill C BESS areas

	Areas (m^2)			
		Substation	BESS	Total Hardstanding
Green Hill C	68,002.2	21,360.4	34,519.2	55,879.6

2. Assessment of Flood Risk

The aim of this section of the report is to assess and summarise the existing flood risk at Green Hill C.

2.1 Fluvial Flood Risk

2.1.1 There is one land drainage ditch which runs through the centre of the Site between Fields CF3 and CF5. The ditches are expected to flow in a south-westerly direction based on local topography. All of the land drains are classified as ordinary watercourses. These fall under the regulatory remit of the LLFA, which has permissive powers to manage flood risk but is not responsible for routine maintenance. Maintenance responsibilities lie with the riparian landowners. By contrast, Main Rivers fall under the responsibility of the EA.

2.1.2 Fluvial flooding could occur if the land drains overtopped their banks during or following an extreme rainfall event.

2.1.3 According to the EA's Flood Map for Planning[v] (updated March 2025), the entirety of the Green Hill C is situated in Flood Zone 1 (has less than a 1 in 1,000 annual probability of river or sea flooding).

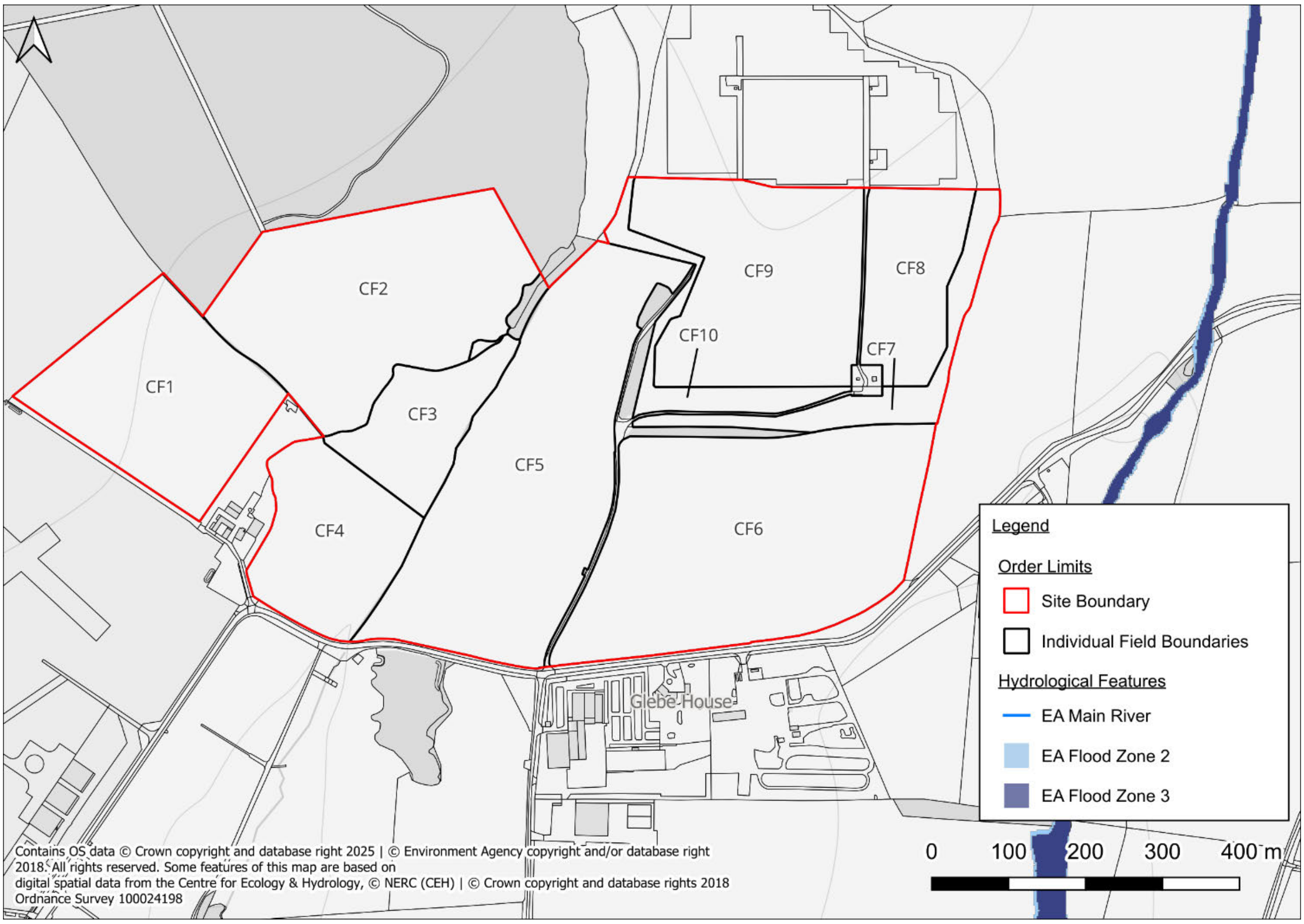


Figure 5: EA's Flood Map for Planning

2.1.4 The EA 'Historical Flood Map' indicates that Green Hill C has not historically flooded and neither has the Site's near vicinity.

2.1.5 In accordance with Environment Agency climate-change guidance for the Anglian River Basin District, the higher-central and upper-end allowances for peak river flow in the 2080s are +13 % and +36 % respectively; the drainage strategy applies the upper-end (+36 %) for fluvial events and +40 % for rainfall to represent the credible maximum scenario for a nationally significant infrastructure project.

~~2.1.5~~2.1.6 In addition, the Manning's open channel flow formula has been used to demonstrate and quantify potential fluvial flood risk to the Site during a 1% AEP +36%CC fluvial event. Cross-sections of existing watercourses and the wider floodplain have been extracted from EA LiDAR data (flown Q1 2020) and used to inform the calculations. More detail on these calculations is provided in Annex B. The flood levels estimated by the calculations suggest that the flood extent is low and that flood extents on Site would be similar to or smaller than the EA surface water flood extents, which could therefore be used as a conservative proxy for fluvial flood risk.

Consultation

~~2.1.6~~2.1.7 Given that Green Hill C is located within Flood Zone 1, the EA will not provide any Product Data, therefore Product Data was not requested from the EA. The North Northamptonshire LLFA was initially contacted in February 2024. A response was received in April 2024 and is included in Annex C. Further to this, the EA and LLFA were consulted with throughout the pre-application process, with guidance complied with where required.

~~2.1.7~~2.1.8 The Site is not located within an IDB.

Summary

~~2.1.8~~2.1.9 Green Hill C is therefore considered to be at **Low** risk of fluvial flooding, the proposed solar panels will be raised above surrounding ground levels with associated power infrastructure appropriately located out of the flood zone and waterproofed.

2.2 Surface Water Flood Risk

2.2.1 The EA's National Flood Risk Assessment Mapping (NaFRA), known as the Long Term Flood Risk Map (Surface Water)[vi] was updated in January 2025.

2.2.2 The previous EA Risk of Flooding from Surface Water (RoFSW) mapping indicates that Green Hill C is largely at very low risk of surface water flooding (less than 0.1% annual probability of flooding). The risk increases to low (between a 1% and 0.1% annual probability), medium (between a 3.3% and 1% annual probability) and high risk (greater than 3.3% annual probability) of flooding associated with the land drain that runs between the Fields CF5, CF3 and CF4.

2.2.3 The updated NaFRA mapping (Figure 6) has been assessed and indicates that there is no visible change in surface water risk across Green Hill C. As described in the fluvial section above, the surface water flooding extents largely correspond with the land drainage ditches which bisect Green Hill C, flowing in a south-westerly direction.

2.2.4 NaFRA surface water depth mapping indicates that the majority of Green Hill C has flood depths of below 0.3m, which is considered passible by vehicles and people. Flood depths above 0.3m are indicated during all risk scenarios and reflect the drainage ditch that runs between the Fields CF5, CF3 and CF4. NaFRA surface water mapping indicates that the majority of Green Hill A is subject to flood depths of below 0.3m. Surface water depths of less than 0.3m are typically passable by both vehicles and pedestrians.

2.2.5 There is no indication within relevant third party reports (listed in 'Sources of Information' on the Covering Report) to suggest that the Site has historically experienced surface water flooding.

2.2.6 Based on the above and considering the embedded mitigation as part of the design of the solar panels, the overall risk of surface water flooding at Green Hill C considered to be **Low**. The proposed solar panels will be raised above surrounding ground levels and will be appropriately located out of the flood zone and waterproofed thereby reducing the potential to be impacted in the event of surface water flooding.

2.2.7 The impact of the development on surface water risk is covered in Section 5.0 of the Covering Report to ensure that surface water risk is not exacerbated through appropriate SuDS measures.

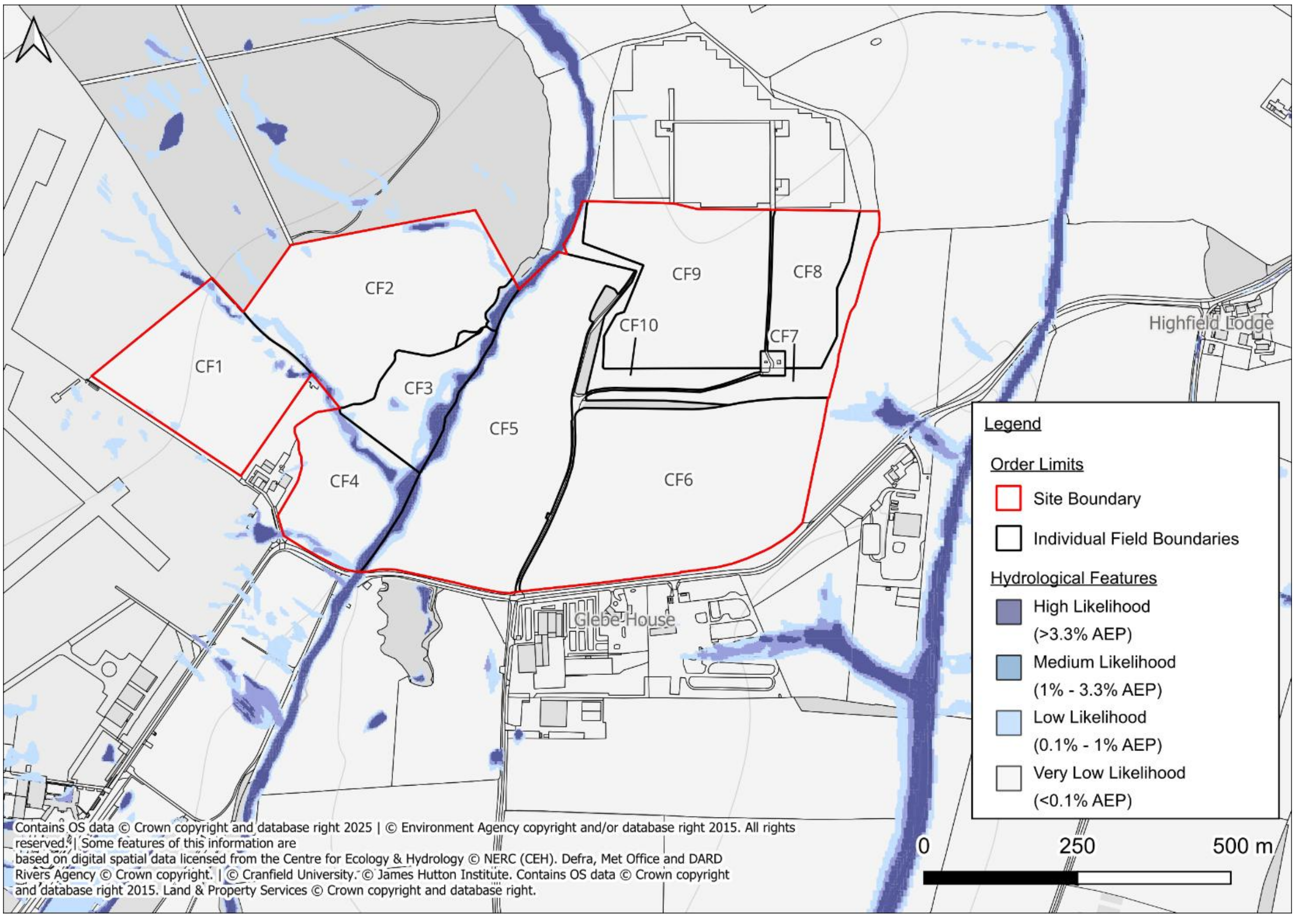


Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

2.3 Groundwater Flood Risk

2.3.1 A description of the Site's geology is included within Section 1.0.

2.3.2 There is no information within relevant third party reports (listed 'Sources of Information' on the Covering Report) to suggest that the Site has experienced historical groundwater flooding.

2.3.3 The Scheme does not include any basement structures or buildings requiring permanent occupation. Only unstaffed, above-ground supporting infrastructure is proposed, which would not be sensitive to low-level groundwater seepage.

2.3.4 It can therefore be concluded that the risk of groundwater flooding is **Low** and no specific mitigation measures are required.

2.4 Sewer Flooding

2.4.1 No Site-specific incidents of sewer flooding have been identified from relevant third-party reports. Utility records have been checked and no sewers are identified within the Site. There is a water main located across Fields CF1, CF4 and CF5, however these have been respected in the Scheme design. It can therefore be concluded that the risk of sewer flooding is **Low.**

2.5 Reservoir and Canal Flooding

2.5.1 There are no canals within the vicinity of Green Hill C, therefore there is negligible associated flood risk.

2.5.2 The EA 'Flood Risk from Reservoirs' map shows that Green Hill C is not at risk of flooding from reservoirs.

2.5.3 It can therefore be concluded that there is a **Negligible** risk of flooding from artificial sources.

2.6 Residual Flood Risks

2.6.1 A residual risk is an exceedance event, such as greater than the 1 in 1000 year (<0.1% AEP) flood event that would overtop the land drains and potentially impact the Site. As the probability of a greater than a 1 in 1000 year flood event occurring is <0.1% in any given year, the probability is low and, therefore, no further mitigation beyond what is proposed is required.

2.6.2 In the event of the defences failing or an exceedance event occurring, the residual risk to people working within the Site can be managed through the implementation of an appropriate Site management plan, which recognises the residual risks and details what action is to be taken by staff in the event of a flood to put occupants in a place of safety.

2.7 Summary of Flood Risk and Mitigation

2.7.1 It can be concluded that the risk to Green Hill C from all sources of flooding is **Negligible to Low**, however it would be prudent to include the below mitigation measures.

Flood Warnings and Evacuation

2.7.2 Flood Warnings / Flood Alerts[vii] do partly cover this area therefore Site management should sign up to the free EA Floodline service to receive flood alerts.

2.7.3 Access to the Site will be required relatively infrequently, typically by technicians for maintenance and inspection works or Site management. Such works can be scheduled as to avoid the Site during times of flood.

2.8 Embedded Mitigation

2.8.1 Embedded Mitigation is detailed in Section 3.2 of the covering report.

For Proposed BESS / Substations:

2.8.2 All electrical equipment (to include BESS containers and 400kV substation infrastructure) will be raised by a minimum of 150mm, or as high as practically possible, above surrounding ground levels.

2.8.3 Firewater (including water run-off from fire-fighting equipment) and other surface water pollution risks will be managed through the use of impermeable liners, containment systems and isolation valves that close automatically in the event of a fire. With these measures in place, all potential effects on flood risk and water quality are considered to be not significant.

2.8.4 The BESS and 400kV substation infrastructure can be adequately waterproofed to withstand the effect of flooding. Batteries should be located within areas of the Site which are located in Flood Zone 1. Where this isn't been possible, equipment will be raised 0.6m above the 0.1% AEP flood level or as high as practicable.

2.9 Impact on Off-Site Flood Risk

2.9.1 The solar panels will be mounted on frames and raised 0.4 m above the surrounding ground level allowing flood water to flow freely underneath. Therefore, there will be no loss of floodplain volume as a result of the proposed development and no increase in flood risk elsewhere.

2.9.2 The supporting infrastructure is insignificant in size and will not increase flood risk elsewhere.

2.9.3 The surface water management has been considered in Section 3.0 below.

3. Drainage Strategy

3.1 Introduction

~~3.1.1~~ Green Hill C currently comprises undeveloped land which is not formally drained and is therefore considered to be 100% permeable.

~~3.1.2~~3.1.1 Figure 7 details where the proposed development is for a BESS and 400kV substation, located in Field CF9. Should batteries not be installed where currently proposed, Solar PV Panels will be proposed. Green Hill C has been assessed based on the assumption that the BESS will be installed; therefore, this acts as a worst-case scenario assessment based on the areas of increased hardstanding.

~~3.1.3~~3.1.2 Areas within Green Hill C that are comprised of Solar PV Panels will be freely draining and not impact flood risk, therefore drainage calculations will only be undertaken on the BESS and 400kV substation areas of hardstanding (location provided in Figure 7).

~~3.1.4~~3.1.3 North and West Northamptonshire councils stated that 'all new development in the Upper Nene catchment must be designed for a flood with a 0.5% probability (1 in 200 chance) occurring in any year, including an appropriate allowance for climate change. This includes design of mitigation for main river flooding and any surface water attenuation.' Therefore, for the purposes of this assessment, attenuation will be designed to accommodate up to a 200 year event including a 40% allowance for climate change.

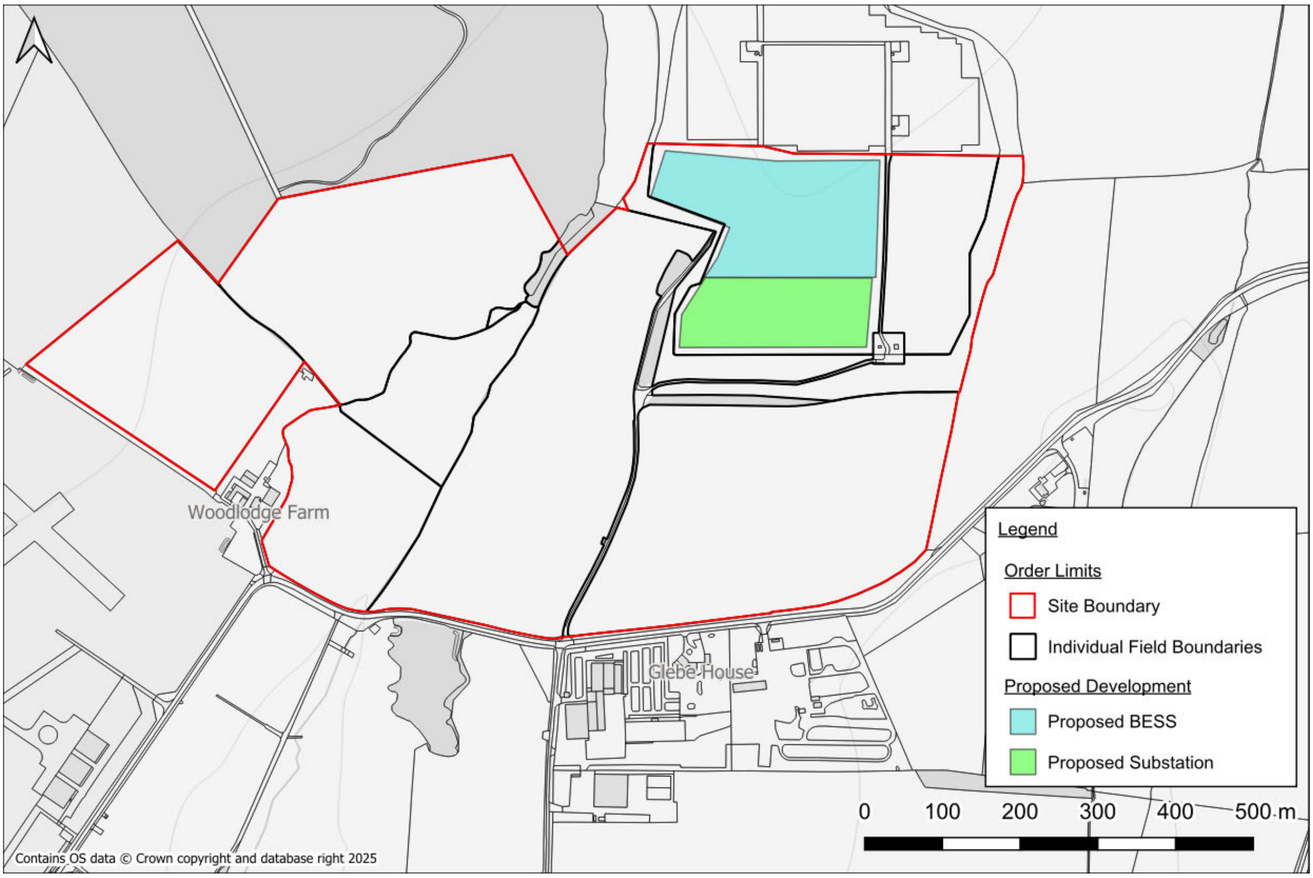


Figure 7: Proposed Development

~~3.1.5~~3.1.4 The increase in hardstanding area will result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the Site will be controlled.

3.2 Drainage Hierarchy

3.2.1 The recommended surface water drainage hierarchy (Paragraph 5.8.15 of the NPS EN-1[viii] and Paragraph 056 (Ref ID: 7-056-20220825) of the PPG: Flood Risk and Coastal Change[ix]) is to utilise soakaway systems or infiltration as the preferred option, followed by discharging to an appropriate watercourse, followed by discharging to a public surface water sewer, and then a highway drain or other drainage system. If this is not feasible, the final option is to discharge to an existing combined sewer.

3.2.2 The following options assume normal operation, during a potential pollution event (such as a fire), the system will be isolated and managed. Firewater management is discussed further below.

Surface Water Discharge to Soakaway

3.2.3 The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above the Site is underlain by Oadby Member generally comprising diamicton, with a small area identified as not being underlain by any superficial deposits.

3.2.4 It can be concluded that soakaways may not be suitable for the discharge of surface water runoff.

3.2.5 BRE 365 soakaway testing is therefore not proposed at this stage, as infiltration is not proposed in the current drainage strategy. This assessment adopts a combination of passive infiltration over undeveloped greenfield land and lined attenuation systems with controlled discharge where formal drainage is required. As infiltration is not relied upon in the current strategy, BRE 365 testing is not considered necessary or proportionate to support the DCO application. Should infiltration become feasible during detailed design, soakaway testing would be undertaken at that stage in line with BRE 365 and relevant guidance.

Surface Water Discharge to Watercourse

3.2.6 Where soakaways are not suitable, a connection to a watercourse is the next consideration.

3.2.7 The nearest watercourse is a land drain that is located through the centre of the Site, between Fields CF3 and CF5 which flows in a southwards direction.

3.2.8 Discharge to the land drain at a limited discharge rate of 13.94l/s, appears to be feasible via gravity. Discharge rates are discussed in detail below in Section 3.3.

Surface Water Discharge to Sewer

3.2.9 As described above, connections to the neighbouring ~~land drain~~ are feasible and therefore~~,~~ a connection to the public surface water sewer is not the preferred option. Should it be determined that direct discharge to the land drain is not preferable, discharge to the public drainage system could be considered. No connection to Anglian Water foul or surface-water infrastructure is currently proposed or considered necessary. Should any localised connection be required at detailed-design stage for the 400 kV substation or optional BESS, consultation with Anglian Water will be undertaken to agree connection points, discharge parameters and any necessary consents pursuant to the protective provisions for Anglian Water in Part 5 of Schedule 15 to the DCO.

3.3 Surface Water Discharge

3.3.1 The existing greenfield runoff rates generated per hectare for the Green Hill C BESS development have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method, provided in Table 2 below. Greenfield runoff calculations are based on a 55,879.6m^2 proposed hardstanding area.

Table 2: Runoff Rates

Return Period (Years)	Runoff Rate (l/s)
1 in 2	13.94
1 in 10	23.97
1 in 30	30.43
1 in 100	38.21
1 in 1000	62.16

3.3.2 A flow rate of 13.94l/s is proposed for the Green Hill C BESS Site.

3.4 Attenuation Storage

3.4.1 In order to achieve a discharge rate of 13.94l/s, attenuation storage will be required. Storage estimates have been provided using Causeway Flow and are included in Annex D. Table 3 below provides the input parameters for the calculations and the estimated storage volumes required for the proposed hardstanding area at Green Hill C.

Table 3: Attenuation Storage Volume Parameters

	Attenuation Storage Volume Parameters
Proposed Discharge Rate	13.94l/s
Total Proposed Impermeable Area	55,879m^2
Design Head	1m
Flow Control Device	HydroBrake/Orifice Plate
Estimated Storage Volume (1 in 200 year + 40% CC)	4,847m^3

3.4.2 The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

3.5 Sustainable Drainage Systems

3.5.1 Attenuation storage should be provided in the form of Sustainable Drainage Systems (SuDS) where practical. The following SuDS options have been considered:

Soakaways

3.5.2 As described above, the use of soakaways is not considered to be feasible.

Swales, Detention Basins and Ponds

3.5.3 Sufficient space is available on Site to incorporate above-ground attenuation features such as swales, detention basins, or ponds. These features would serve a dual function by managing surface water runoff and providing containment capacity in the event of a fire, helping to isolate potentially contaminated firewater from the wider environment. To support this function, features can be lined where necessary to prevent infiltration into underlying soils and mobilisation of contaminants.

3.5.4 Attenuation features should be located towards the western, lower-lying parts of the BESS/Substation area to facilitate gravity drainage and positioned outside of the 0.1% AEP flood extents. The selection and specification of these features will be confirmed at detailed design stage, with due regard to firewater containment requirements and pollution control measures as outlined in Section 3.9 of this report.

Filter Drains/Strips

3.5.5 Filter drains are stone- or gravel-filled trenches that provide temporary subsurface storage to support the filtration, conveyance, and attenuation of surface water runoff. They are typically designed to receive lateral inflows from adjacent impermeable areas, ideally pre-treated via a filter strip to reduce sediment and pollutant loads. By encouraging flow through the granular medium, filter drains help manage peak runoff rates and provide attenuation by temporarily storing water within the voids of the fill material, particularly when paired with a controlled outlet.

3.5.6 Filter drains are most effectively used alongside access tracks, roads, and hardstanding areas where space for above-ground SuDS features may be limited. They can also be used to intercept runoff at the edge of impermeable areas and form part of a wider treatment train to manage water quality and flow rates prior to discharge or onward conveyance.

Bioretention Systems

3.5.7 Bioretention systems, including rain gardens, are shallow landscaped features designed to capture, slow, and treat surface water runoff. They reduce runoff rates and volumes through a combination of infiltration, evapotranspiration, and attenuation, while also providing excellent water quality treatment. In addition to their functional role, bioretention systems offer visual amenity, biodiversity benefits, and can be integrated into the overall landscape strategy.

3.5.8 These systems are highly flexible and can be configured in various shapes, sizes, and planting arrangements to suit different development layouts. Within the BESS area of the Site, bioretention systems may be used to manage runoff from hardstanding and access routes. Where firewater or contamination risks are present, these features can be lined to prevent infiltration into underlying soils. Bioretention systems should be considered at the detailed design stage as part of the surface water management approach for the BESS zone.

Rainwater Harvesting

3.5.9 The attenuation benefits associated with rainwater harvesting are considered to be limited, as such benefits are only realised when storage tanks have available capacity. Given the nature of the Site, ongoing water demand is expected to be minimal, meaning that storage tanks are likely to remain full for extended periods. As a result, the overall benefit of rainwater harvesting for runoff management is constrained, and its contribution to the Site-wide attenuation strategy is expected to be negligible.

Green Roofs

3.5.10 Green roofs are not proposed as part of the current development plans, and are not considered appropriate for the BESS or 400kV substation infrastructure due to structural and operational constraints.

Porous/Permeable Surfacing

3.5.11 Permeable gravel surfacing will be considered, where appropriate, within the Green Hill C BESS development and Substation area. Surface water attenuation will be achieved using lined sub-base storage beneath the gravel layer, with attenuation volumes for each BESS location detailed in Table 5. Runoff from container units and adjacent hardstanding will be directed into this gravel surfacing, which will act as a temporary storage layer.

3.5.12 To prevent infiltration and provide containment in the event of a fire, the sub-base will be underlain with an impermeable liner. This approach supports the Site-wide firewater containment strategy, preventing the mobilisation of contaminants into underlying soils. Gravel surfacing will be limited to the battery compound and 400kV substation areas only, excluding access roads, and will cover a total area of approximately 48,938.15 m^2. Attenuation potential has been calculated based on a sub-base depth of 0.35 m and a conservative void ratio of 30%.

Table 4: Permeable Surfacing (Gravel Beds) Attenuation Potential

	Permeable Surfacing Attenuation Parameters
Total Proposed Impermeable Area	55,879.6m^2
Proposed Gravel Surfacing Area	48,938.15m^2
Estimated Required Storage Volume (1 in 200 year + 40% CC)	4,846.86m^3
Lined Gravel Surfacing Attenuation Potential	5,138.5m^3

3.5.13 The provision of storage within the sub-grade material would only be feasible in areas with a proposed gradient of <1 in 20 as detailed within CIRIA RP992/28 (Design Assessment Checklists for Permeable/Porous Pavementx). Site gradients should be confirmed at the detailed design stage. The amount of storage provided within permeable paving is subject to sub-grade depth and gradient. Given the nature of the Site the proposed gravel subgrade should be lined to prevent potential pollution incidents from mobilising to the ground.

Underground Attenuation Tanks

3.5.14 Storage could be provided within underground attenuation tanks or within oversized pipes. This will be considered further within the detailed design stage.

3.6 Preferred Drainage Scheme

3.6.1 Surface water runoff from the Green Hill C BESS ~~Site~~site will be discharged ~~at a restricted rate of 13.94 l/s~~ to the land drain located west of the BESS at a restricted rate of 13.94 l/s. This discharge rate reflects the existing 1 in 2 year greenfield runoff rate, ensuring compliance with greenfield~~-~~-runoff principles.

3.6.2 Runoff generated during storm events up to the 1 in 200 year ~~plus~~+ 40 % climate~~-~~-change allowance will be fully attenuated within the BESS boundary. The total attenuation requirement is 4,846.86~~-~~ m^3, which can be met in full through ~~the use of lined gravel surfacing~~ a sealed, impermeable containment system beneath the proposed battery~~ units~~-unit and ~~400kV~~400 kV substation ~~area (~~areas, excluding access roads~~)~~.. Based on the proposed 48,938.15~~-~~ m^2 gravelled area, this system can provide up to 5,138.5~~-~~ m^3 of storage, ~~thereby offering~~providing a small buffer in capacity. ~~These~~The lined sub-base ~~systems will~~ also ~~serve a dual function by preventing~~prevents infiltration and ~~containing~~contains potentially contaminated ~~firewater~~fire-water runoff in accordance with the ~~firewater~~fire-water management strategy. ~~A conceptual~~ This represents a feasible outline solution shown on the drainage ~~sketch illustrating this arrangement is~~drawings. At detailed design, alternative impermeable systems such as lined slabs or individual foundation pads may be adopted, provided they achieve equivalent standards of impermeability, containment and controlled discharge.

~~3.6.2~~3.6.3 The drainage within the BESS compound will be impermeable and fully sealed to prevent infiltration to ground, forming a secondary-containment system for the compound area. Containment may be achieved using a robust geotextile composite, impermeable pond liner, or another construction that provides the same level of impermeability and structural performance. The system will incorporate isolation valves that automatically close in ~~Annex E~~the event of a fire or spill, allowing the contained runoff or fire-water to be held, tested and either treated and released or tankered off-site under controlled conditions.

~~3.6.3~~3.6.4 The proposed surface~~-~~-water drainage scheme ensures no increase in runoff rates or volumes over the lifetime of the development. ~~Additionally, attenuation~~Attenuation calculations have been based on a conservative assumption that the BESS and ~~400kV~~400 kV substation areas will comprise 100 % impermeable surfacing, which is unlikely in practice. This~~ approach~~ provides additional robustness and flexibility within the design~~.~~ and is consistent with the **Outline Battery Storage Safety Management Plan [EX1/GH7.7_A]**.

3.6.5 The detailed surface-water drainage design will be prepared in accordance with this strategy and submitted to the relevant Local Planning Authority for approval under the applicable DCO Requirement. Before any formal submission to discharge the Requirement, the Authority will consult the respective Lead Local Flood Authority (LLFA) to confirm that the detailed design is consistent with the agreed principles of this Flood Risk Assessment and Drainage Strategy, including discharge rates, outfall locations and attenuation or containment measures. This process ensures that the LLFA is engaged at the detailed-design stage and that any comments are addressed prior to approval being granted.

3.7 Event Exceedance

3.7.1 Storage will be provided for the 1 in 200 year plus 40% CC event. Storm events in excess of the 1 in 200 year plus 40% CC event should be permitted to produce temporary shallow depth flooding within access roads.

3.7.2 The proposed location for the 400kV substation at Green Hill C BESS, is not identified to be at risk from fluvial flooding. The units will be raised by a minimum of 150mm above surrounding ground levels to prevent exceedance flooding from impacting the Site and to ensure significant resilience to flooding.

3.8 Surface Water Treatment

3.8.1 In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015)[xi], other roofs have a 'low' pollution hazard level, with commercial yards classified as having a 'medium' pollution hazard level. Table 5 below shows the pollution hazard indices for each land use.

Table 5: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (typically commercial/industrial roofs)	Low	0.5*	0.2**	0.4
Commercial Yard and Delivery Areas, Non-residential Car Parking and all roads except Low Traffic Roads	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2
*Indices values range from 0-1.
**up to 0.8 where there is potential for metals to leach from the roof.

3.8.2 Where practical, runoff from roofs and roads will be directed to the existing drainage or the gravel where it can infiltrate into the ground. Table 6 below demonstrates that the porous surfacing provides sufficient treatment.

Table 6: SuDS Mitigation Indices

	Mitigation Indices		
Type of SuDS	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Permeable Surfacing	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' -Table 26.3

3.8.3 It can be concluded that the inclusion of lined gravel surfacing will provide sufficient water quality treatment during normal operation, particularly for runoff from roofs and access routes. Where attenuation is provided in a below-ground system (tank storage), treatment will be achieved via a suitably sized separator, in accordance with CIRIA SuDS Manual guidance.

3.8.4 During exceedance events, when rainfall exceeds the design capacity of the drainage system, any overflow will be significantly diluted due to the much higher stormwater volumes. As a result, the concentration of pollutants in any runoff is expected to be considerably lower than under normal operating conditions. The likelihood of water quality impacts from such exceedance flows is therefore minimal. Furthermore, the limited extent of impermeable surfacing at the site, combined with the use of gravel surfacing and vegetated margins, provides inherent mitigation that reduces both the volume and potential pollutant load of exceedance flows.

3.9 Firewater Consideration

3.9.1 Given the nature of the development there is a risk of fire, and contamination may be mobilised by fire suppression water. The principal route for any firewater loss from the Site is via the proposed surface water drainage system into the ground. In order to isolate the Site's drainage, the proposed gravel subbase should be lined and the proposed outfalls from the drainage system should be controlled by automatically actuated valves. In the event of a fire, the valve will be designed to activate to close off the battery storage area's drainage system triggered by the fire alarm systems. Flows will then back up in the system. The system will be designed to accommodate the 1 in 200 plus 40% climate change storm event, therefore a sufficient amount of storage is provided to contain a reasonable worst case 1 in 10 year storm event.

3.9.2 According to National Fire Chiefs Council Grid Scale Battery Energy Storage System planning guidance for FR Guidance, a tank measuring 228m3 will be required to supply a fire hydrant located adjacent to the BESS developments. Guidance also states that fire and rescue services may wish to increase this requirement, given the size of the development there is available space onsite to provide additional storagexii.

3.9.3 Following a fire event, the wastewater will be tested to ascertain the level of contamination. A decision will then be made as to the appropriate methodology to dispose of the attenuated water. This may involve on-Site treatment and release or tankering.

3.10 Maintenance

3.10.1 Maintenance of communal drainage features such as permeable paving or an attenuation tank will be the responsibility of the Site owner. Maintenance of shared surface water drainage systems can be arranged through appointment of a Site management company.

3.10.2 Inspection and maintenance of the containment system, isolation valves and associated impermeable drainage features will be incorporated within the operational management plan to ensure long-term integrity and continued performance of the system. Following any fire or spill event, the containment area will be inspected for damage and, where necessary, repaired or reinstated before the drainage system is returned to service, ensuring that full containment capacity is maintained.

~~3.10.2~~3.10.3 Maintenance schedules for an attenuation tank and permeable surfacing are included in Annex F. Maintenance of the separator will be as per the manufacturer's guidance.

4. Conclusions and Recommendations

4.1 Conclusions

4.1.1 The proposed development for Green Hill C is a ground mounted solar farm and associated infrastructure including a BESS, a 400kV substation and access roads.

Flood Risk

4.1.2 The Site is located within Flood Zone 1 on the Environment Agency (EA) 'Flood Map for Planning (Rivers and Sea)' – an area considered to have the lowest probability of fluvial and tidal flooding.

4.1.3 The risk of flooding from all sources has been assessed and the flood risk to the Site is considered to be **Negligible to Low** and therefore does not require Site-specific mitigation measures.

4.1.4 The solar panels will be mounted on raised frames and therefore raised above surrounding ground level allowing flood water to flow freely underneath. Therefore, there will be no loss of floodplain volume as a result of the proposed development.

BESS / 400kV substation Drainage Strategy

4.1.5 If Green Hill C were to be used for the BESS, this will introduce impermeable drainage area in the form of equipment and access. This will result in an increase in surface water runoff. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, flow control will be used, and attenuation provided on Site in the form of lined gravel surfacing beneath the BESS and substation area to accommodate storm events up to and including the 1 in 200 year plus 40% climate change event.

4.1.6 Any surface water exceeding the infiltration capacity of the surrounding strata will naturally drain to the surrounding land drains in line with the existing scenario.

4.1.7 The heavily managed agricultural land will be replaced with wildflowers and grassland. This will help to reduce run off rates by increasing the roughness of the ground, helping to increase infiltration by reducing compaction, and improve water quality by reducing erosion and mobilisation of pollutants. As a result, runoff rates may be reduced following development when compared to the existing greenfield scenario.

4.1.8 The proposed drainage scheme therefore meets the four pillars of SuDS (water quality, water quantity, amenity and biodiversity).

4.2 Recommendations

4.2.1 Embedded Mitigation is detailed in Section 3.2 of the covering report.

For BESS / 400kV substation developments:

4.2.2 All electrical equipment (to include BESS containers and 400kV substation) will be raised by a minimum of 150mm, or as high as practically possible, above surrounding ground levels.

4.2.3 An automatic actuating valve has been proposed as a precaution, in the unlikely event of a chemical leak and /or fire, the valve would be triggered to lock ensuring that no contaminants are discharged to watercourses.

4.2.4 The BESS / 400kV substation infrastructure can be adequately waterproofed to withstand the effect of flooding. Batteries should be located within areas of the Site which are located in Flood Zone 1 where this isn't been possible, equipment will be raised 0.6m above the 0.1% AEP flood level or as high as practicable.

Annex A – Water Body Classification Summaries

The Sywell Brook Water Body catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Macrophytes and Phytobenthos Combined	Poor	Poor	Poor	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	High	High	High	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	High	High	High	Good	2015	
Phosphate	High	High	High	Good	2015	
Temperature	High	High	High	Good	2015	
pH	High	High	High	Good	2015	
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	2015	
Supporting Elements (surface Water)	N/A	N/A	N/A	N/A	2015	
Mitigation Measures Assessment	N/A	N/A	N/A	N/A	2015	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	Good	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Fail	Fail	N/A	Good	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	

The Swanspool Brook Water Body Catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Macrophytes and Phytobenthos Combined	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Acid Neutralising Capacity	High	High	N/A	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	Moderate	Moderate	N/A	Good	2015	
Phosphate	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Temperature	Good	Good	N/A	Good	2015	
pH	High	High	N/A	Good	2015	
Hydromorphological Supporting Elements	Supports good	Supports good	Supports good	Supports good	2015	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	Good	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Fail	Fail	N/A	Good	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Macrophytes and Phytobenthos Combined	Moderate	Moderate	Moderate	Good	2027- Low confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Acid Neutralising Capacity	High	High	N/A	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	Moderate	Moderate	N/A	Good	2015	
Phosphate	Moderate	Moderate	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Temperature	Good	Good	N/A	Good	2015	
pH	High	High	N/A	Good	2015	
Hydromorphological Supporting Elements	Supports good	Supports good	Supports good	Supports good	2015	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time; Technically infeasible: No known technical solution is available
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	Good	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Fail	Fail	N/A	Good	2039	Technically infeasible: No known technical solution is available
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	

Annex B – Manning's Open Channel Flow Mapping

313532 Green Hill Solar Farm

Manning's Open Channel Flow Calculation - Option Area C

Methodology

Cross-sections of the channel and floodplain were extracted from Environment Agency (EA) LiDAR DTM data (flown Q1 2020) at the locations shown in Figure 1. These cross-sections can be considered representative of the channel and general floodplain adjacent to the site and at the location of the proposed development. Due to the nature of LiDAR, volume and conveyance of the main channels will likely be underestimated, providing a conservative assessment of fluvial flood risk.

The cross-sections were imported into Flood Modeller and the "tabulate cross section properties" tool was utilised to establish the level-flow relationship for the channel and wider floodplain. This tool utilises the Manning's open channel flow equation. Manning's 'n' roughness was set to 0.03s/m$^{1/3}$ for the channel and 0.04s/m$^{1/3}$ for the floodplain based on aerial imagery. The bed slope was set for each cross-section based on underlying LiDAR. Catchment descriptors for the catchments upstream of the outlet locations shown in Figure 1 were imported into ReFH2 and used to provide an estimate of flows within the channel during the 1% AEP +36%CC event. These flows were scaled by area as required.

Within this excel workbook, the xlookup function has been used along with the Flood Modeller level-flow relationship for the cross-sections to determine the equivalent water level for the calculated flow, rounding up where a direct match is not found. To provide additional confidence in the assessment, a second xlookup has been used to determine the estimated flood level should an additional 50% flow be applied.

Cross-sections have been located at suitable locations throughout the proposed development. Whilst it is acknowledged that the Manning's open channel flow equation used to determine the level-flow relationship does not constitute detailed hydraulic modelling, the calculation can still be considered suitable to demonstrate the scale of the changes in water level that can be expected when considering a +36% uplift in flows (Nene Catchment, 2080's higher allowance).

Cross-Section Locations

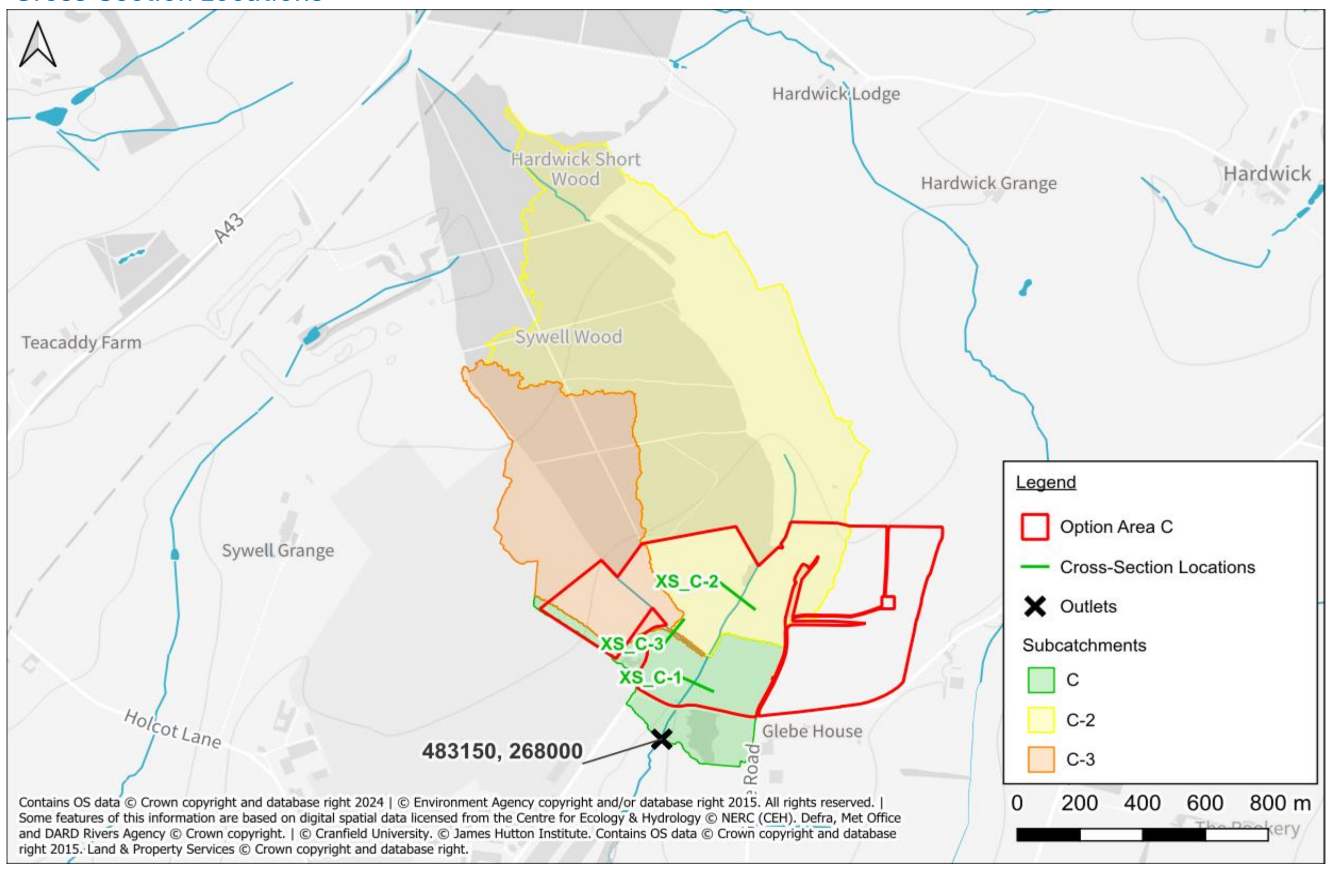


Figure 1: Cross-section locations

Calculated Flows and Levels

Cross-Section	ReFH2 Peak Flow - 1% AEP +36%CC (m^3/s)	Equivalent Flood Level (m AOD)	Sensitivity Flow - ReFH2 +50% (m^3/s)	Equivalent Flood Level (m AOD)
C-1	2.26	110.39	3.39	110.44 (+57mm)
C-2	1.51	112.40	2.26	112.47 (+68mm)
C-3	0.51	111.80	0.76	111.91 (+110mm)

Tabulated Cross-Section Properties | C-1

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
C-1	0.000	109.653	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0065
C-1	0.002	109.699	0.046	0.161	0.339	0.012	0.023	0.506	0.517	0.0065
C-1	0.012	109.745	0.092	0.256	0.380	0.047	0.147	1.013	1.033	0.0065
C-1	0.035	109.791	0.138	0.335	0.407	0.105	0.435	1.519	1.550	0.0065
C-1	0.092	109.850	0.197	0.455	0.438	0.203	1.145	1.851	1.902	0.0065
C-1	0.177	109.908	0.255	0.551	0.458	0.321	2.193	2.183	2.254	0.0065
C-1	0.291	109.966	0.313	0.634	0.474	0.459	3.603	2.515	2.606	0.0065
C-1	0.436	110.025	0.372	0.709	0.487	0.616	5.405	2.847	2.958	0.0065
C-1	0.615	110.084	0.431	0.775	0.497	0.794	7.622	3.210	3.340	0.0065
C-1	0.832	110.143	0.490	0.837	0.507	0.994	10.312	3.572	3.722	0.0065
C-1	1.090	110.202	0.549	0.897	0.515	1.216	13.509	3.935	4.103	0.0065
C-1	1.191	110.223	0.570	0.917	0.518	1.300	14.761	4.072	4.246	0.0065
C-1	1.290	110.242	0.589	0.925	0.605	1.394	15.978	5.857	6.038	0.0065
C-1	1.401	110.261	0.608	0.925	0.626	1.514	17.353	6.798	6.985	0.0065
C-1	1.722	110.306	0.653	0.923	0.641	1.866	21.335	8.822	9.025	0.0065
C-1	1.854	110.322	0.669	0.919	0.655	2.017	22.972	10.034	10.243	0.0065
C-1	1.889	110.326	0.673	0.918	0.658	2.057	23.409	10.349	10.559	0.0065
C-1	2.091	110.346	0.693	0.920	0.650	2.272	25.908	11.114	11.332	0.0065
C-1	2.588	110.388	0.735	0.933	0.639	2.773	32.067	12.734	12.967	0.0065
C-1	2.749	110.400	0.747	0.939	0.637	2.929	34.063	13.229	13.466	0.0065
C-1	3.264	110.435	0.782	0.954	0.637	3.423	40.432	14.991	15.240	0.0065
C-1	3.312	110.438	0.785	0.955	0.662	3.470	41.032	16.355	16.604	0.0065
C-1	3.428	110.445	0.792	0.956	0.670	3.587	42.473	17.301	17.554	0.0065
C-1	3.444	110.446	0.793	0.955	0.671	3.605	42.664	17.468	17.720	0.0065
C-1	3.680	110.460	0.807	0.952	0.686	3.865	45.589	19.649	19.907	0.0065
C-1	3.788	110.466	0.813	0.950	0.702	3.988	46.925	21.391	21.651	0.0065
C-1	3.806	110.467	0.814	0.949	0.702	4.009	47.157	21.520	21.780	0.0065
C-1	4.773	110.512	0.859	0.950	0.657	5.023	59.138	23.527	23.802	0.0065
C-1	5.154	110.527	0.874	0.957	0.657	5.386	63.856	24.873	25.154	0.0065
C-1	5.180	110.528	0.875	0.957	0.657	5.411	64.171	24.978	25.259	0.0065
C-1	5.998	110.556	0.903	0.977	0.655	6.140	74.316	27.093	27.383	0.0065
C-1	6.283	110.565	0.912	0.984	0.655	6.387	77.840	27.787	28.080	0.0065
C-1	6.947	110.583	0.930	1.008	0.655	6.894	86.066	28.593	28.889	0.0065
C-1	9.000	110.631	0.978	1.085	0.657	8.297	111.504	29.882	30.185	0.0065
C-1	9.362	110.639	0.986	1.097	0.658	8.538	115.992	30.166	30.469	0.0065
C-1	9.408	110.640	0.987	1.098	0.659	8.568	116.560	30.257	30.561	0.0065
C-1	10.694	110.666	1.013	1.139	0.682	9.391	132.496	33.072	33.379	0.0065
C-1	11.348	110.678	1.025	1.159	0.691	9.795	140.597	34.207	34.514	0.0065
C-1	11.404	110.679	1.026	1.160	0.692	9.829	141.285	34.282	34.589	0.0065
C-1	11.910	110.688	1.035	1.174	0.704	10.145	147.555	35.818	36.126	0.0065
C-1	12.255	110.694	1.041	1.182	0.715	10.364	151.826	37.211	37.520	0.0065

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
C-1	14.354	110.728	1.075	1.233	0.712	11.644	177.839	38.130	38.442	0.0065
C-1	16.802	110.764	1.111	1.291	0.713	13.012	208.168	38.897	39.212	0.0065
C-1	19.459	110.799	1.146	1.351	0.716	14.406	241.081	39.664	39.982	0.0065
C-1	20.680	110.815	1.162	1.374	0.724	15.051	256.210	40.971	41.290	0.0065
C-1	20.841	110.817	1.164	1.377	0.724	15.133	258.202	41.036	41.355	0.0065
C-1	24.910	110.866	1.213	1.449	0.731	17.189	308.610	42.867	43.189	0.0065
C-1	25.348	110.871	1.218	1.456	0.742	17.407	314.040	44.282	44.605	0.0065
C-1	26.069	110.880	1.227	1.464	0.740	17.807	322.971	44.657	44.980	0.0065
C-1	28.968	110.912	1.259	1.504	0.744	19.260	358.892	46.182	46.507	0.0065
C-1	30.371	110.927	1.274	1.522	0.746	19.960	376.274	47.130	47.454	0.0065
C-1	31.570	110.940	1.287	1.534	0.749	20.579	391.121	48.068	48.393	0.0065
C-1	33.608	110.961	1.308	1.556	0.750	21.600	416.370	49.238	49.563	0.0065
C-1	34.247	110.971	1.318	1.550	0.748	22.100	424.292	50.577	50.903	0.0065
C-1	36.156	110.988	1.335	1.574	0.751	22.965	447.948	51.220	51.547	0.0065
C-1	42.229	111.039	1.386	1.648	0.757	25.625	523.178	53.082	53.411	0.0065
C-1	43.106	111.046	1.393	1.658	0.758	25.997	534.046	53.306	53.636	0.0065
C-1	49.011	111.093	1.440	1.717	0.762	28.548	607.211	55.228	55.561	0.0065
C-1	50.342	111.103	1.450	1.730	0.763	29.101	623.699	55.606	55.939	0.0065
C-1	56.488	111.147	1.494	1.789	0.767	31.580	699.834	57.033	57.369	0.0065
C-1	63.537	111.193	1.540	1.856	0.773	34.230	787.177	58.211	58.550	0.0065
C-1	64.011	111.196	1.543	1.860	0.781	34.407	793.049	59.451	59.791	0.0065
C-1	68.818	111.228	1.575	1.894	0.780	36.325	852.600	60.479	60.821	0.0065
C-1	72.774	111.253	1.600	1.923	0.783	37.851	901.606	61.543	61.886	0.0065
C-1	76.206	111.274	1.621	1.946	0.785	39.153	944.130	62.413	62.757	0.0065
C-1	83.929	111.317	1.664	2.005	0.790	41.865	1039.808	63.731	64.078	0.0065
C-1	91.412	111.357	1.704	2.057	0.795	44.441	1132.525	65.071	65.420	0.0065
C-1	93.978	111.372	1.719	2.069	0.796	45.423	1164.305	65.892	66.243	0.0065
C-1	96.860	111.389	1.736	2.081	0.797	46.553	1200.017	67.019	67.370	0.0065
C-1	100.390	111.407	1.754	2.102	0.800	47.766	1243.748	67.832	68.184	0.0065
C-1	103.749	111.425	1.772	2.117	0.803	49.000	1285.363	69.183	69.536	0.0065
C-1	110.332	111.457	1.804	2.153	0.808	51.238	1366.923	70.724	71.078	0.0065
C-1	113.394	111.471	1.818	2.171	0.809	52.231	1404.859	71.180	71.535	0.0065
C-1	122.799	111.515	1.862	2.216	0.812	55.404	1521.385	73.037	73.394	0.0065
C-1	123.607	111.519	1.866	2.219	0.813	55.697	1531.390	73.330	73.688	0.0065
C-1	127.405	111.537	1.884	2.234	0.816	57.028	1578.450	74.569	74.927	0.0065
C-1	137.271	111.579	1.926	2.280	0.819	60.195	1700.682	76.223	76.583	0.0065
C-1	139.936	111.590	1.937	2.293	0.820	61.035	1733.693	76.646	77.007	0.0065
C-1	150.509	111.633	1.980	2.338	0.824	64.371	1864.680	78.512	78.874	0.0065
C-1	152.757	111.642	1.989	2.347	0.825	65.080	1892.534	78.932	79.295	0.0065
C-1	159.887	111.671	2.018	2.373	0.828	67.391	1980.868	80.462	80.826	0.0065
C-1	164.102	111.689	2.036	2.383	0.830	68.852	2033.096	81.883	82.248	0.0065
C-1	164.581	111.691	2.038	2.385	0.830	69.016	2039.026	82.038	82.403	0.0065
C-1	177.619	111.739	2.086	2.433	0.833	73.000	2200.550	83.988	84.356	0.0065
C-1	178.809	111.743	2.090	2.438	0.834	73.336	2215.299	84.103	84.470	0.0065
C-1	181.205	111.751	2.098	2.448	0.842	74.017	2244.978	85.961	86.330	0.0065
C-1	182.446	111.760	2.107	2.439	0.838	74.794	2260.355	86.640	87.008	0.0065
C-1	197.601	111.808	2.155	2.502	0.842	78.980	2448.118	87.784	88.157	0.0065
C-1	208.370	111.841	2.188	2.544	0.851	81.914	2581.533	90.014	90.392	0.0065
C-1	209.610	111.848	2.195	2.539	0.847	82.544	2596.895	90.157	90.535	0.0065
C-1	221.340	111.882	2.229	2.584	0.850	85.667	2742.222	90.893	91.275	0.0065
C-1	233.382	111.917	2.264	2.628	0.852	88.816	2891.414	91.630	92.015	0.0065
C-1	241.149	111.941	2.288	2.649	0.855	91.032	2987.636	93.007	93.393	0.0065
C-1	243.203	111.947	2.294	2.655	0.855	91.590	3013.089	93.259	93.645	0.0065
C-1	252.676	111.977	2.324	2.676	0.857	94.413	3130.453	94.973	95.361	0.0065
C-1	256.599	111.989	2.336	2.685	0.858	95.557	3179.058	95.599	95.987	0.0065
C-1	267.784	112.020	2.367	2.718	0.860	98.539	3317.623	96.817	97.207	0.0065
C-1	287.039	112.071	2.418	2.773	0.864	103.521	3556.185	98.552	98.945	0.0065
C-1	288.147	112.074	2.421	2.776	0.864	103.817	3569.908	98.674	99.068	0.0065
C-1	296.427	112.098	2.445	2.791	0.866	106.205	3672.491	100.266	100.660	0.0065
C-1	307.241	112.126	2.473	2.818	0.867	109.027	3806.462	101.300	101.696	0.0065
C-1	322.998	112.164	2.511	2.861	0.870	112.897	4001.681	102.406	102.804	0.0065
C-1	334.529	112.193	2.540	2.887	0.873	115.888	4144.545	103.871	104.271	0.0065
C-1	344.253	112.216	2.563	2.910	0.874	118.287	4265.020	104.720	105.122	0.0065
C-1	353.353	112.238	2.585	2.930	0.876	120.601	4377.761	105.662	106.064	0.0065
C-1	366.426	112.270	2.617	2.955	0.878	124.009	4539.723	107.351	107.754	0.0065
C-1	369.341	112.277	2.624	2.960	0.878	124.762	4575.829	107.713	108.117	0.0065
C-1	380.579	112.303	2.650	2.983	0.880	127.579	4715.063	108.955	109.360	0.0065
C-1	401.576	112.349	2.696	3.028	0.883	132.631	4975.195	110.717	111.124	0.0065
C-1	404.184	112.355	2.702	3.032	0.884	133.297	5007.514	111.068	111.476	0.0065
C-1	412.143	112.374	2.721	3.043	0.885	135.419	5106.113	112.307	112.716	0.0065
C-1	428.288	112.408	2.755	3.076	0.886	139.256	5306.142	113.446	113.857	0.0065
C-1	441.942	112.439	2.786	3.095	0.887	142.797	5475.305	114.944	115.357	0.0065
C-1	453.327	112.462	2.809	3.117	0.888	145.449	5616.350	115.715	116.129	0.0065
C-1	467.470	112.492	2.839	3.139	0.889	148.944	5791.576	117.292	117.707	0.0065
C-1	469.943	112.497	2.844	3.143	0.890	149.531	5822.212	117.528	117.943	0.0065
C-1	497.029	112.549	2.896	3.192	0.893	155.693	6157.788	119.448	119.866	0.0065
C-1	504.353	112.563	2.910	3.205	0.894	157.369	6248.518	120.027	120.446	0.0065
C-1	518.804	112.592	2.939	3.225	0.895	160.871	6427.554	121.504	121.924	0.0065
C-1	525.817	112.607	2.954	3.232	0.896	162.702	6514.449	122.575	122.995	0.0065
C-1	529.968	112.616	2.963	3.235	0.896	163.807	6565.872	123.246	123.666	0.0065
C-1	545.532	112.646	2.993	3.256	0.897	167.527	6758.692	124.692	125.114	0.0065
C-1	561.809	112.672	3.019	3.290	0.899	170.775	6960.353	125.206	125.629	0.0065
C-1	575.780	112.696	3.043	3.313	0.902	173.794	7133.448	126.314	126.737	0.0065
C-1	583.117	112.710	3.057	3.321	0.903	175.570	7224.342	127.422	127.845	0.0065
C-1	614.648	112.757	3.104	3.385	0.907	181.572	7614.987	127.976	128.401	0.0065
C-1	646.903	112.804	3.151	3.448	0.911	187.600	8014.597	128.530	128.957	0.0065
C-1	648.779	112.810	3.157	3.444	0.912	188.374	8037.843	129.638	130.065	0.0065
C-1	686.501	112.864	3.211	3.513	0.917	195.397	8505.184	130.493	130.922	0.0065
C-1	697.863	112.880	3.227	3.534	0.922	197.496	8645.953	131.854	132.283	0.0065

Tabulated Cross-Section Properties | C-2

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
C-2	0.000	111.911	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0118
C-2	0.002	111.935	0.024	0.142	0.415	0.016	0.021	1.353	1.357	0.0118
C-2	0.032	111.981	0.070	0.377	0.527	0.084	0.290	1.603	1.623	0.0118
C-2	0.086	112.026	0.115	0.530	0.571	0.163	0.792	1.852	1.889	0.0118

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
C-2	0.165	112.072	0.161	0.652	0.600	0.253	1.515	2.102	2.155	0.0118
C-2	0.268	112.118	0.207	0.756	0.621	0.355	2.463	2.352	2.421	0.0118
C-2	0.397	112.163	0.252	0.848	0.639	0.468	3.645	2.602	2.687	0.0118
C-2	0.552	112.209	0.298	0.932	0.653	0.592	5.072	2.852	2.953	0.0118
C-2	0.735	112.255	0.344	1.010	0.665	0.728	6.758	3.102	3.220	0.0118
C-2	0.948	112.300	0.389	1.083	0.676	0.876	8.713	3.351	3.486	0.0118
C-2	1.192	112.346	0.435	1.152	0.686	1.034	10.952	3.601	3.752	0.0118
C-2	1.266	112.360	0.449	1.167	0.689	1.085	11.638	3.710	3.865	0.0118
C-2	1.368	112.378	0.467	1.181	0.739	1.159	12.573	4.454	4.615	0.0118
C-2	1.483	112.396	0.485	1.171	0.911	1.267	13.627	7.529	7.697	0.0118
C-2	1.511	112.400	0.489	1.163	0.959	1.299	13.888	8.660	8.829	0.0118
C-2	1.534	112.403	0.492	1.156	0.981	1.326	14.094	9.363	9.533	0.0118
C-2	1.663	112.418	0.507	1.122	0.994	1.482	15.283	11.411	11.587	0.0118
C-2	1.752	112.427	0.516	1.100	1.009	1.593	16.098	13.153	13.333	0.0118
C-2	1.871	112.437	0.526	1.084	0.967	1.726	17.197	13.473	13.656	0.0118
C-2	1.950	112.443	0.532	1.078	0.973	1.809	17.921	14.463	14.648	0.0118
C-2	1.993	112.447	0.536	1.067	0.970	1.869	18.316	15.170	15.357	0.0118
C-2	2.016	112.449	0.538	1.061	0.990	1.900	18.524	16.232	16.419	0.0118
C-2	2.039	112.451	0.540	1.054	1.007	1.934	18.739	17.298	17.486	0.0118
C-2	2.142	112.459	0.548	1.032	0.977	2.076	19.683	18.266	18.455	0.0118
C-2	2.170	112.461	0.550	1.026	1.003	2.114	19.938	19.825	20.015	0.0118
C-2	2.275	112.468	0.557	1.007	0.988	2.258	20.907	21.293	21.485	0.0118
C-2	2.465	112.479	0.568	0.985	0.960	2.503	22.655	23.314	23.509	0.0118
C-2	2.582	112.485	0.574	0.976	0.941	2.646	23.730	24.098	24.295	0.0118
C-2	3.006	112.504	0.593	0.960	0.903	3.133	27.629	27.221	27.424	0.0118
C-2	3.681	112.528	0.617	0.962	0.868	3.827	33.831	30.572	30.783	0.0118
C-2	3.776	112.531	0.620	0.964	0.865	3.919	34.703	30.990	31.201	0.0118
C-2	3.812	112.532	0.621	0.965	0.865	3.950	35.037	31.105	31.316	0.0118
C-2	3.869	112.534	0.623	0.964	0.877	4.014	35.554	32.581	32.793	0.0118
C-2	3.869	112.534	0.623	0.964	0.877	4.014	35.554	32.581	32.793	0.0118
C-2	4.033	112.539	0.628	0.964	0.891	4.183	37.066	35.052	35.264	0.0118
C-2	4.105	112.541	0.630	0.965	0.893	4.254	37.729	35.760	35.973	0.0118
C-2	4.456	112.550	0.639	0.971	0.899	4.588	40.953	38.582	38.797	0.0118
C-2	4.456	112.550	0.639	0.971	0.899	4.588	40.953	38.582	38.797	0.0118
C-2	4.493	112.551	0.640	0.971	0.896	4.627	41.295	38.651	38.866	0.0118
C-2	5.292	112.568	0.657	0.998	0.884	5.302	48.630	40.851	41.068	0.0118
C-2	6.434	112.589	0.678	1.042	0.872	6.177	59.130	42.465	42.686	0.0118
C-2	7.711	112.609	0.698	1.096	0.868	7.034	70.863	43.240	43.462	0.0118
C-2	8.733	112.624	0.713	1.136	0.867	7.688	80.258	43.953	44.175	0.0118
C-2	11.564	112.661	0.750	1.238	0.872	9.343	106.271	45.506	45.730	0.0118
C-2	12.858	112.678	0.767	1.269	0.874	10.130	118.166	47.083	47.307	0.0118
C-2	14.698	112.698	0.787	1.327	0.880	11.079	135.074	47.836	48.062	0.0118
C-2	17.895	112.731	0.820	1.410	0.892	12.690	164.458	49.790	50.017	0.0118
C-2	17.895	112.731	0.820	1.410	0.903	12.690	164.458	51.072	51.299	0.0118
C-2	18.761	112.741	0.830	1.421	0.896	13.203	172.417	51.472	51.700	0.0118
C-2	21.910	112.768	0.857	1.497	0.905	14.632	201.352	52.455	52.684	0.0118
C-2	25.289	112.796	0.885	1.572	0.915	16.088	232.409	53.438	53.669	0.0118
C-2	28.546	112.821	0.910	1.637	0.923	17.436	262.346	54.382	54.614	0.0118
C-2	33.085	112.855	0.944	1.713	0.933	19.316	304.060	56.237	56.470	0.0118
C-2	33.710	112.860	0.949	1.720	0.934	19.599	309.802	56.738	56.972	0.0118
C-2	35.104	112.871	0.960	1.735	0.937	20.229	322.617	57.872	58.106	0.0118
C-2	35.492	112.874	0.963	1.739	0.940	20.404	326.177	58.439	58.673	0.0118
C-2	37.081	112.887	0.976	1.751	0.951	21.182	340.781	61.298	61.534	0.0118
C-2	38.095	112.896	0.985	1.753	0.943	21.735	350.104	61.669	61.906	0.0118
C-2	44.065	112.930	1.019	1.846	0.953	23.877	404.967	62.503	62.744	0.0118
C-2	50.431	112.965	1.054	1.936	0.964	26.048	463.467	63.337	63.582	0.0118
C-2	58.136	113.004	1.093	2.037	0.976	28.535	534.282	64.197	64.446	0.0118
C-2	66.331	113.043	1.132	2.136	0.987	31.055	609.592	65.056	65.310	0.0118
C-2	72.283	113.070	1.159	2.200	0.994	32.855	664.290	65.851	66.108	0.0118
C-2	78.479	113.098	1.187	2.263	1.002	34.677	721.234	66.646	66.906	0.0118
C-2	78.948	113.100	1.189	2.268	1.002	34.810	725.547	66.690	66.950	0.0118
C-2	87.992	113.138	1.227	2.355	1.012	37.363	808.666	67.683	67.947	0.0118
C-2	97.486	113.176	1.265	2.440	1.021	39.954	895.911	68.677	68.943	0.0118
C-2	104.063	113.202	1.291	2.492	1.027	41.751	956.354	69.570	69.839	0.0118
C-2	110.857	113.228	1.317	2.544	1.033	43.572	1018.792	70.464	70.734	0.0118
C-2	111.940	113.232	1.321	2.553	1.034	43.854	1028.750	70.582	70.852	0.0118
C-2	111.760	113.236	1.325	2.532	1.032	44.139	1027.098	71.943	72.213	0.0118
C-2	112.506	113.243	1.332	2.520	1.031	44.647	1033.948	73.363	73.633	0.0118
C-2	122.783	113.282	1.371	2.582	1.038	47.549	1128.398	75.412	75.684	0.0118
C-2	125.845	113.293	1.382	2.601	1.040	48.381	1156.535	75.923	76.196	0.0118
C-2	135.970	113.330	1.419	2.654	1.046	51.231	1249.587	78.127	78.401	0.0118
C-2	136.504	113.332	1.421	2.656	1.047	51.388	1254.497	78.271	78.545	0.0118
C-2	144.902	113.363	1.452	2.691	1.051	53.850	1331.677	80.579	80.854	0.0118
C-2	146.364	113.368	1.457	2.698	1.052	54.253	1345.114	80.888	81.163	0.0118
C-2	160.586	113.412	1.501	2.776	1.060	57.853	1475.817	82.703	82.980	0.0118
C-2	170.327	113.440	1.529	2.830	1.065	60.181	1565.335	83.585	83.864	0.0118
C-2	174.943	113.453	1.542	2.855	1.070	61.272	1607.757	84.357	84.638	0.0118
C-2	184.051	113.481	1.570	2.891	1.078	63.669	1691.458	86.878	87.162	0.0118
C-2	187.304	113.490	1.579	2.906	1.081	64.454	1721.360	87.482	87.767	0.0118
C-2	199.418	113.524	1.613	2.956	1.090	67.473	1832.684	90.096	90.385	0.0118
C-2	204.171	113.537	1.626	2.974	1.093	68.650	1876.368	91.019	91.309	0.0118
C-2	204.898	113.539	1.628	2.977	1.094	68.832	1883.046	91.168	91.459	0.0118
C-2	204.201	113.542	1.631	2.955	1.092	69.108	1876.644	92.596	92.887	0.0118
C-2	218.449	113.585	1.674	2.987	1.082	73.123	2007.585	94.147	94.441	0.0118
C-2	230.413	113.615	1.704	3.033	1.087	75.970	2117.542	95.709	96.006	0.0118
C-2	248.544	113.657	1.746	3.106	1.094	80.025	2284.163	97.384	97.683	0.0118
C-2	250.373	113.661	1.750	3.113	1.095	80.416	2300.973	97.501	97.801	0.0118
C-2	264.350	113.691	1.780	3.171	1.100	83.353	2429.421	98.338	98.640	0.0118
C-2	278.683	113.721	1.810	3.229	1.105	86.316	2561.150	99.175	99.480	0.0118
C-2	294.685	113.753	1.842	3.293	1.110	89.500	2708.213	99.868	100.176	0.0118
C-2	307.472	113.778	1.867	3.341	1.124	92.025	2825.724	102.142	102.454	0.0118
C-2	312.660	113.788	1.877	3.360	1.133	93.055	2873.402	103.822	104.134	0.0118
C-2	326.358	113.814	1.903	3.407	1.143	95.779	2999.288	105.647	105.964	0.0118
C-2	331.050	113.824	1.913	3.419	1.146	96.840	3042.414	106.704	107.022	0.0118
C-2	334.003	113.830	1.919	3.426	1.147	97.482	3069.546	107.183	107.501	0.0118
C-2	338.953	113.840	1.929	3.439	1.153	98.561	3115.038	108.744	109.062	0.0118
C-2	339.947	113.842	1.931	3.441	1.155	98.779	3124.170	109.061	109.379	0.0118
C-2	340.941	113.844	1.933	3.444	1.155	98.998	3133.306	109.246	109.564	0.0118
C-2	344.439	113.851	1.940	3.452	1.165	99.769	3165.453	111.380	111.698	0.0118

Node	Flow (m³/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m²)	Conveyance (m³/s)	Width (m)	W Perim. (m)	Slope
C-2	351.530	113.865	1.954	3.469	1.174	101.346	3230.620	113.900	114.220	0.0118
C-2	355.589	113.872	1.961	3.481	1.179	102.148	3267.927	114.908	115.228	0.0118
C-2	356.170	113.873	1.962	3.483	1.180	102.263	3273.270	115.154	115.474	0.0118
C-2	364.944	113.888	1.977	3.509	1.190	104.006	3353.901	117.350	117.671	0.0118
C-2	390.241	113.930	2.019	3.581	1.194	108.968	3586.386	118.911	119.235	0.0118
C-2	402.621	113.950	2.039	3.616	1.197	111.353	3700.161	119.697	120.021	0.0118
C-2	423.270	113.983	2.072	3.670	1.201	115.327	3889.931	121.108	121.434	0.0118
C-2	434.697	114.001	2.090	3.699	1.207	117.522	3994.942	122.725	123.051	0.0118
C-2	446.380	114.019	2.108	3.728	1.209	119.737	4102.316	123.450	123.778	0.0118
C-2	473.345	114.060	2.149	3.792	1.213	124.835	4350.128	125.231	125.560	0.0118
C-2	485.457	114.078	2.167	3.820	1.215	127.097	4461.434	126.075	126.405	0.0118
C-2	506.956	114.111	2.200	3.861	1.218	131.291	4659.014	128.113	128.444	0.0118
C-2	508.268	114.113	2.202	3.864	1.218	131.547	4671.076	128.285	128.616	0.0118
C-2	525.306	114.137	2.226	3.901	1.223	134.646	4827.656	129.884	130.216	0.0118
C-2	562.091	114.187	2.276	3.981	1.228	141.187	5165.714	131.801	132.136	0.0118
C-2	570.334	114.198	2.287	3.998	1.229	142.639	5241.474	132.233	132.569	0.0118
C-2	584.474	114.217	2.306	4.026	1.234	145.168	5371.422	133.863	134.200	0.0118
C-2	598.131	114.235	2.324	4.053	1.238	147.589	5496.931	135.154	135.491	0.0118
C-2	602.722	114.241	2.330	4.061	1.246	148.405	5539.124	136.973	137.310	0.0118
C-2	614.873	114.257	2.346	4.083	1.246	150.602	5650.797	137.551	137.889	0.0118
C-2	657.553	114.307	2.396	4.175	1.250	157.501	6043.032	138.441	138.780	0.0118
C-2	664.092	114.315	2.404	4.187	1.255	158.614	6103.129	139.723	140.062	0.0118
C-2	674.233	114.327	2.416	4.206	1.259	160.299	6196.328	141.005	141.344	0.0118
C-2	700.899	114.357	2.446	4.260	1.262	164.538	6441.387	141.646	141.986	0.0118
C-2	728.070	114.387	2.476	4.313	1.264	168.797	6691.096	142.287	142.628	0.0118
C-2	733.980	114.394	2.483	4.323	1.269	169.797	6745.414	143.569	143.910	0.0118
C-2	767.042	114.429	2.518	4.385	1.271	174.905	7049.255	144.210	144.551	0.0118
C-2	800.812	114.465	2.554	4.448	1.274	180.036	7359.611	144.850	145.193	0.0118

Tabulated Cross-Section Properties | C-3

(Calculated by Flood Modeller)

Node	Flow (m³/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m²)	Conveyance (m³/s)	Width (m)	W Perim. (m)	Slope
C-3	0.000	111.306	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0076
C-3	0.001	111.348	0.042	0.158	0.350	0.005	0.008	0.223	0.239	0.0076
C-3	0.005	111.390	0.084	0.251	0.392	0.019	0.054	0.447	0.477	0.0076
C-3	0.014	111.431	0.125	0.329	0.420	0.042	0.159	0.670	0.716	0.0076
C-3	0.030	111.473	0.167	0.399	0.440	0.075	0.341	0.893	0.955	0.0076
C-3	0.054	111.515	0.209	0.463	0.457	0.117	0.619	1.117	1.194	0.0076
C-3	0.088	111.557	0.251	0.523	0.471	0.168	1.007	1.340	1.432	0.0076
C-3	0.132	111.599	0.293	0.579	0.483	0.229	1.518	1.563	1.671	0.0076
C-3	0.189	111.640	0.334	0.633	0.494	0.299	2.168	1.786	1.910	0.0076
C-3	0.259	111.682	0.376	0.685	0.504	0.378	2.968	2.010	2.148	0.0076
C-3	0.343	111.724	0.418	0.735	0.513	0.467	3.930	2.233	2.387	0.0076
C-3	0.428	111.760	0.454	0.778	0.520	0.550	4.906	2.418	2.586	0.0076
C-3	0.525	111.796	0.490	0.819	0.527	0.641	6.016	2.603	2.784	0.0076
C-3	0.634	111.832	0.526	0.859	0.533	0.738	7.268	2.788	2.983	0.0076
C-3	0.756	111.868	0.562	0.899	0.539	0.841	8.669	2.972	3.181	0.0076
C-3	0.884	111.906	0.600	0.920	0.543	0.960	10.127	3.287	3.506	0.0076
C-3	1.031	111.944	0.638	0.944	0.548	1.091	11.812	3.602	3.831	0.0076
C-3	1.198	111.982	0.676	0.971	0.552	1.234	13.735	3.917	4.156	0.0076
C-3	1.232	111.989	0.683	0.972	0.645	1.267	14.120	5.479	5.720	0.0076
C-3	1.421	112.022	0.716	0.954	0.705	1.489	16.287	7.984	8.234	0.0076
C-3	1.439	112.025	0.719	0.950	0.729	1.514	16.494	8.755	9.006	0.0076
C-3	1.458	112.028	0.722	0.946	0.750	1.542	16.714	9.509	9.761	0.0076
C-3	1.458	112.028	0.722	0.946	0.750	1.542	16.714	9.509	9.761	0.0076
C-3	1.469	112.030	0.724	0.940	0.840	1.563	16.840	12.249	12.501	0.0076
C-3	1.674	112.053	0.747	0.896	0.791	1.869	19.184	14.303	14.562	0.0076
C-3	1.837	112.068	0.762	0.876	0.776	2.097	21.053	16.153	16.417	0.0076
C-3	1.837	112.068	0.762	0.876	0.776	2.097	21.053	16.153	16.417	0.0076
C-3	1.915	112.075	0.769	0.864	0.780	2.216	21.956	17.701	17.966	0.0076
C-3	2.287	112.100	0.794	0.851	0.740	2.686	26.213	19.933	20.205	0.0076
C-3	2.355	112.104	0.798	0.851	0.735	2.766	26.991	20.245	20.519	0.0076
C-3	2.488	112.111	0.805	0.855	0.732	2.911	28.519	20.930	21.205	0.0076
C-3	2.504	112.112	0.806	0.854	0.733	2.932	28.704	21.181	21.456	0.0076
C-3	2.605	112.118	0.812	0.850	0.744	3.064	29.861	22.993	23.270	0.0076
C-3	2.766	112.126	0.820	0.850	0.748	3.255	31.705	24.735	25.014	0.0076
C-3	2.872	112.131	0.825	0.849	0.770	3.385	32.926	27.324	27.605	0.0076
C-3	2.862	112.132	0.826	0.839	0.760	3.413	32.809	27.489	27.769	0.0076
C-3	3.338	112.150	0.844	0.849	0.749	3.930	38.258	29.990	30.276	0.0076
C-3	3.481	112.155	0.849	0.853	0.745	4.081	39.905	30.578	30.865	0.0076
C-3	4.018	112.172	0.866	0.872	0.727	4.608	46.060	31.399	31.691	0.0076
C-3	4.495	112.185	0.879	0.895	0.723	5.021	51.526	32.147	32.441	0.0076
C-3	4.999	112.198	0.892	0.917	0.731	5.451	57.301	33.949	34.244	0.0076
C-3	5.680	112.214	0.908	0.946	0.730	6.002	65.108	35.007	35.304	0.0076
C-3	7.210	112.247	0.941	1.001	0.732	7.204	82.645	37.787	38.088	0.0076
C-3	7.461	112.252	0.946	1.009	0.733	7.394	85.519	38.246	38.547	0.0076
C-3	7.558	112.254	0.948	1.012	0.733	7.470	86.630	38.478	38.780	0.0076
C-3	8.198	112.267	0.961	1.027	0.739	7.984	93.970	40.523	40.826	0.0076
C-3	8.560	112.274	0.968	1.035	0.747	8.274	98.124	42.336	42.640	0.0076
C-3	8.787	112.278	0.972	1.041	0.752	8.445	100.724	43.248	43.551	0.0076
C-3	9.204	112.285	0.979	1.052	0.756	8.752	105.499	44.386	44.690	0.0076
C-3	9.796	112.295	0.989	1.065	0.752	9.199	112.285	44.963	45.268	0.0076
C-3	10.714	112.309	1.003	1.089	0.759	9.842	122.807	46.974	47.279	0.0076
C-3	11.513	112.321	1.015	1.105	0.770	10.422	131.969	49.611	49.917	0.0076
C-3	11.513	112.321	1.015	1.105	0.770	10.422	131.969	49.611	49.917	0.0076
C-3	12.088	112.330	1.024	1.112	0.764	10.872	138.563	50.383	50.689	0.0076
C-3	13.003	112.343	1.037	1.127	0.766	11.539	149.044	52.304	52.611	0.0076
C-3	13.305	112.347	1.041	1.132	0.765	11.749	152.506	52.599	52.906	0.0076
C-3	16.596	112.386	1.080	1.199	0.762	13.844	190.228	54.841	55.148	0.0076
C-3	17.417	112.395	1.089	1.215	0.762	14.340	199.642	55.343	55.651	0.0076
C-3	20.506	112.427	1.121	1.270	0.764	16.142	235.047	57.295	57.605	0.0076
C-3	21.448	112.438	1.132	1.278	0.763	16.780	245.851	58.707	59.016	0.0076
C-3	21.623	112.440	1.134	1.280	0.763	16.898	247.853	58.973	59.283	0.0076
C-3	25.519	112.475	1.169	1.343	0.769	18.998	292.508	61.062	61.373	0.0076
C-3	25.482	112.476	1.170	1.337	0.772	19.060	292.084	62.369	62.679	0.0076
C-3	27.301	112.491	1.185	1.365	0.774	20.001	312.943	63.055	63.366	0.0076
C-3	30.301	112.514	1.208	1.410	0.777	21.494	347.324	64.068	64.380	0.0076

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
C-3	33.458	112.538	1.232	1.454	0.781	23.012	383.513	65.081	65.395	0.0076
C-3	33.524	112.540	1.234	1.449	0.783	23.143	384.270	66.407	66.721	0.0076
C-3	34.594	112.548	1.242	1.461	0.785	23.677	396.538	67.074	67.388	0.0076
C-3	36.255	112.560	1.254	1.481	0.788	24.488	415.576	68.029	68.343	0.0076
C-3	36.396	112.561	1.255	1.482	0.789	24.556	417.184	68.217	68.531	0.0076
C-3	38.460	112.575	1.269	1.507	0.799	25.527	440.852	70.470	70.786	0.0076
C-3	42.147	112.599	1.293	1.546	0.811	27.255	483.115	73.564	73.881	0.0076
C-3	44.241	112.615	1.309	1.556	0.803	28.438	507.112	74.233	74.551	0.0076
C-3	44.578	112.617	1.311	1.559	0.803	28.586	510.975	74.305	74.623	0.0076
C-3	50.795	112.652	1.346	1.626	0.807	31.246	582.235	75.542	75.862	0.0076
C-3	57.407	112.688	1.382	1.691	0.812	33.950	658.032	76.779	77.101	0.0076
C-3	57.970	112.691	1.385	1.696	0.812	34.180	664.475	76.935	77.257	0.0076
C-3	63.508	112.722	1.416	1.735	0.815	36.602	727.957	79.288	79.611	0.0076
C-3	64.084	112.725	1.419	1.740	0.816	36.840	734.563	79.477	79.800	0.0076
C-3	68.343	112.746	1.440	1.774	0.818	38.518	783.381	80.352	80.676	0.0076
C-3	72.740	112.767	1.461	1.809	0.821	40.215	833.784	81.227	81.552	0.0076
C-3	81.455	112.805	1.499	1.880	0.827	43.320	933.675	82.220	82.549	0.0076
C-3	82.635	112.810	1.504	1.889	0.834	43.735	947.198	83.667	83.996	0.0076
C-3	85.502	112.822	1.516	1.911	0.839	44.745	980.068	84.681	85.012	0.0076
C-3	88.552	112.835	1.529	1.931	0.845	45.854	1015.032	86.025	86.357	0.0076
C-3	95.074	112.862	1.556	1.972	0.852	48.208	1089.788	88.274	88.611	0.0076
C-3	95.943	112.866	1.560	1.976	0.853	48.562	1099.744	88.845	89.182	0.0076
C-3	98.106	112.876	1.570	1.984	0.856	49.458	1124.541	90.322	90.660	0.0076
C-3	104.910	112.907	1.601	2.007	0.846	52.269	1202.533	91.095	91.436	0.0076
C-3	113.580	112.938	1.632	2.061	0.850	55.106	1301.911	91.868	92.212	0.0076
C-3	120.195	112.961	1.655	2.100	0.852	57.225	1377.734	92.466	92.812	0.0076
C-3	126.989	112.984	1.678	2.139	0.855	59.359	1455.613	93.064	93.412	0.0076

Annex C – North Northamptonshire Council LLFA Response

From: Harkin, Liam [redacted]
Sent: Monday, June 17, 2024 3:29 PM
To: Joshua Rigby [redacted] Antell [redacted]
Cc: Nicola Thompson [redacted] Surface water [redacted]
Subject: RE: Green Hill Solar Farm - contact/response

[redacted]

Hi Joshua,

Please see in red answers to your queries.

- Instances of historic flooding at or near this location; We are pulling this data together and will forward on to you shortly.
- Details of flood defences in the area; Flood defence information is available from the EA here - https://flood-map-for-planning.service.gov.uk/
- Information regarding maintenance of land drains and management of flood risk in the area; Much of this information can be found in our local standards and guidance document (attached) and at https://www.floodtoolkit.com/
- Any restrictions in developing near a IDB owned watercourse; and - You must apply for Land Drainage Consent if you want to: Do work on, over, under or near an ordinary watercourse (within 9 metres of the landward toe of the bank), or make changes to any structure that helps control water.
- Do you have specific requirements for discharge rates to land drains and could you please provide these? – Details of discharge rate requirements can be found in the attached standards and guidance document.

We're happy to arrange a call to discuss your proposals in greater detail. We have availability Wednesday or Thursday this week, I then go on leave and have availability from the 3rd of July onwards.

Kind regards,

Liam Harkin
Environment Team Leader

E: [redacted]

Kier Transportation Limited | Registered in England No. 5606089
Registered office: 2nd Floor, Optimum House, Clippers Quay, Salford, M50 3XP

Annex D – Causeway Flow Storage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)		Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)		Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	10.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Storage	5.588	5.00	100.000	0.000	0.000	2.000

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	40	0	0
100	40	0	0
200	40	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	97.500	Product Number	CTL-SHE-0164-1300-1000-1300
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	13.0	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7680.4	0.0	1.000	7680.4	0.0	1.001	0.0	0.0

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 77.32%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	945	98.447	0.447	173.9	3292.4020	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	12.7	870.7

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 77.32%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	945	98.568	0.568	213.8	4182.9050	0.0000	OK

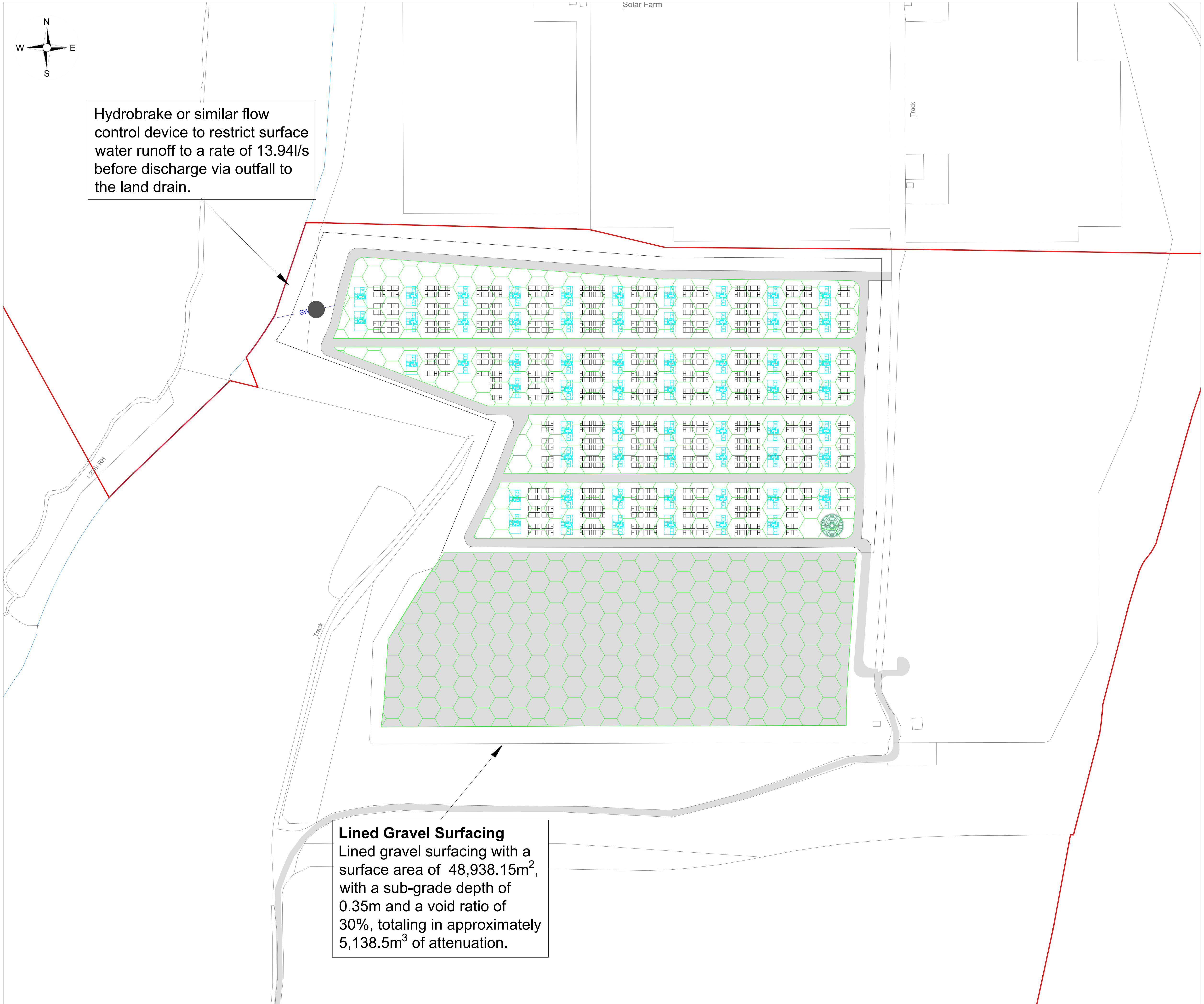
Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	13.4	897.5

Results for 200 year +40% CC Critical Storm Duration. Lowest mass balance: 77.32%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	945	98.659	0.659	243.4	4846.8550	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	13.9	917.3

Annex E – Conceptual Drainage Sketch



Legend:

- Site Location
- Proposed Surface Water Sewer
- Proposed Lined Gravel Surfacing
- Proposed Hydrobrake (or similar flow control device)

Final Revision:	Date:	Description:	By:	Chk:
-	-	-	-	-
-	-	-	-	-

All Dimensions to be checked on site and not scaled from this drawing.
This drawing is not for construction
This drawing is for planning only
All services to be checked on site and not scaled from this drawing

Arthian Ltd
13 Henderson Road,
Inverness,
IV1 1SN
info@arthian.com
+44 (0) 141 227 2300
https://www.arthian.com

Conceptual

Client: **Green Hill Solar Ltd.**

Site: **Green Hill Solar C**

Drawing Title: **Conceptual Drainage Sketch**

Date:	Scale:	Paper Size:
09 April 2025	Not to scale	A3 (297 x 420mm)

Drawn By:	Checked By:	Status:	Final Revision:
LA	JR	Final	2

CAD Ref:	Drawing No:
A3 Landscape	313532

Annex F – Maintenance Schedules

Pervious Pavements Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on Site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 20.15

Attenuation Storage Tanks Maintenance Schedule

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, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium, as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows, and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

---

[redacted]
ii England | Catchment Data Explorer
iii [redacted]
iv MAGIC
v Get flood risk information for planning in England - Flood map for planning - GOV.UK
vi Where do you want to check? - Check your long term flood risk - GOV.UK
vii Flood alerts and warnings - GOV.UK
viii EN-1 Overarching National Policy Statement for Energy
ix Flood risk and coastal change - GOV.UK
x [redacted]

[redacted]

[redacted]