HEOLDDU SOLAR FARM

Environmental Statement

Volume 3, Appendix 10.1: Flood Consequences Assessment

September 2025

Document Status					
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1 SCOPE OF WORK

1.1 Background

1.1.1 At the request of Heolddu Solar Park Ltd, RPS Consulting Services Ltd (RPS) has prepared a site-specific Flood Consequence Assessment (FCA) and conceptual drainage strategy for the development of a solar farm near Ferryside, Carmarthenshire. The key objectives of the FCA are:

- To assess the flood risk to the Proposed Development and to demonstrate the feasibility of appropriately designing the Proposed Development such that any residual flood risk to the Proposed Development would be acceptable;
- To assess the potential impact of the Proposed Development on flood risk elsewhere and to demonstrate the feasibility of appropriately designing the Proposed Development such that the Proposed Development would not increase surface water on Site or elsewhere;
- To assess potential drainage strategies to minimise flood risk and surface water flooding due to the implementation of the Proposed Development.

1.2 Project Scope

1.2.1 The report has been prepared in accordance with the guidance detailed in Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15): Development and Flood Risk. Reference has also been made to local flood risk documents and provides an outline of the potential flood risk and hydrological constraints to the Site.

1.3 Limitations

1.3.1 The report is based on publicly available hydrological and flood risk data extracted from the National Resources Wales (NRW) website (DataMap Wales). The report, therefore, provides a desktop assessment.

2 SOURCES OF INFORMATION

2.1 Introduction

2.1.1 Information sources consulted during preparation of this report are listed in Table 1 below.

Table 1. Reports consulted during preparation of the document

Reports Consulted		
Source	**Data**	**Information consulted/provided**
Local Planning Authorities (LPA) Southwest Wales	Southwest Wales Strategic Flood Consequence Assessment (2022)	The document identifies areas where there is significant flood risk from local sources, namely ordinary watercourses, surface water runoff and groundwater.
Carmarthenshire County Council	Local Plan (2006-2021)	The document outlines local planning policies.

2.2 Legislation and Guidance

National Planning Policy

The Future Wales: The National Plan 2040

2.2.1 The Future Wales: The National Plan 2040 was prepared by the Welsh Government in 2021, and of relevance to this FCA is 'Policy 8: Flooding'

"Flood risk management that enables and supports sustainable strategic growth and regeneration in National and Regional Growth Areas will be supported. The Welsh Government will work with Flood Risk Management Authorities and developers to plan and invest in new and improved infrastructure, promoting nature-based solutions as a priority. Opportunities for multiple social, economic and environmental benefits must be maximised when investing in flood risk management infrastructure. It must be ensured that projects do not have adverse impacts on international and national statutory designated sites for nature conservation and the features for which they have been designated."

Planning Policy Wales Edition 12, 2024

2.2.2 PPW Edition 12 sets out the land use planning policies of the Welsh Government. Chapter 6 – Distinctive and Natural Places outlines the Welsh Government's objectives in terms of addressing water and flood risk.

2.2.3 Section 6.6 of PPW addresses water and flood risk. The relevant guidance is summarised below:

- The planning system should:
  - protect and improve water resources and quality by promoting and encouraging increased efficiency and demand management of water as part of new developments;
  - ensure that the infrastructure networks, including nature based solutions on which communities and businesses depend is adequate to accommodate proposed development, and takes into consideration the impacts of climate change, so as to minimise risk to human health and the environment and prevent pollution at source;

  - ensure sustainable drainage systems are an integral part of design approaches for new development; and
  - ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals.

- Water resources and quality must be taken into account from an early stage in the process of identifying land for development and redevelopment.
- Ensuring the implementation of nature based solutions through green infrastructure provision is a key preference and protecting river corridors should be maximised. The identification of managed wetland and riparian buffer zones should be a key output of assessments to improve water quality, by reducing pollution and securing a net benefit for biodiversity and improving the attributes of ecosystem resilience.
- New development should be located and implemented with sustainable provision of water services in mind, using design approaches and techniques which improve water efficiency and minimise adverse impacts on water resources, including the ecology of rivers, wetlands and groundwater and thereby contributing towards ecological resilience.
- Planning authorities should secure better management of drainage and surface water so as to tackle these issues by:
  - ensuring sustainable drainage systems are incorporated into development enabling surface water to be managed close to or at source; and
  - ensuring connection to the sewer in sewered areas and by minimising the proliferation of private sewage systems.
- New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.
- The provision of SuDS must be considered as an integral part of the design of new development and considered at the earliest possible stage when formulating proposals for new development.
- Planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers. Surface water flooding will affect choice of location and the layout and design of schemes, and these factors should be considered at an early stage in formulating development proposals.
- Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself. The priority should be to protect the undeveloped or unobstructed floodplain from development and to prevent the cumulative effects of incremental development.
- In areas of flood plain currently unobstructed, where water flows in times of flood, built development should be wholly exceptional and limited to essential transport and utilities infrastructure.
- Development should not cause additional run-off, which can be achieved by controlling surface water as near to the source as possible by the use of SuDS.
- The ability of emergency services to respond to flood events should be taken into account when considering if a development in a flood risk area is appropriate. This may involve consultation with emergency planners, local resilience forums and other professional partners such as fire rescue, police and ambulance services.

2.2.4 PPW is supplemented by a series of TANs. TAN15 provides technical guidance on development and flood risk.

Technical Advice Note (TAN) 15: Development Flooding and Coastal Erosion (2025)

2.2.5 TAN 15 provides technical guidance to supplement the policy set out within Future Wales and PPW in relation to development and flooding and coastal erosion. It provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. It also provides advice on the consequences of the risks and adapting to and living with flood risk. It does not take precedence over other TANs and should be considered alongside other planning policies. This document replaces TAN 14, published in 1998 and the previous TAN 15, published in 2004.

2.2.6 In relation to flood risk, TAN 15 indicates that the Senedd has a duty to ensure that development is sustainable and does not create problems for future generations under the Well-being of Future Generations (Wales) Act 2015. Managing flooding has an important role to ensure sustainable development by: guiding developments to locations with little or no risk from river, tidal or coastal flooding, managing consequences of flooding where developments can be justified and making provision for climate change.

2.2.7 The Flood Map for Planning is the starting point for consideration of flood risk in the planning system. The map uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. TAN15 outlines the actions that should be taken when considering development in the different flood zones. The Flood Map for Planning displays predicted future flood risk under the central climate change estimate.

2.2.8 FCA is required for any development proposal located fully or partly in Surface Water and Small Watercourses - Flood Zones 2 and 3. An assessment should also be undertaken for development on sites outside of these zones, but which has the potential to affect the course of surface water and/or excess water from ordinary watercourses. Planning authorities may provide specific local advice on this issue in Development Plans. Planning authorities should ensure any new development adjacent to Flood Zones 2 and 3 for Surface Water and Small Watercourses is appropriately set back to allow for extreme flood events. Detailed FCAs, will be required to consider a range of climate change scenarios, including upper end estimates, making reference to the Welsh Government guidance on climate change allowances for planning purposes.

2.2 TAN 15 sets out the prime objectives of FCAs as developing full appreciation of;

- The risk and consequences of flooding on the development; and
- The risk and consequences (i.e. the overall impacts) of the development on flood risk elsewhere.

2.2.1 FCAs must allow for a range of potential flooding scenarios up to and including the flood probability of 0.1% in any year. An allowance for climate change must be made in line with current Welsh Government guidance.

2.2.2 The FCA can also be used to establish whether appropriate avoidance or mitigation measures could be incorporated within the design of the development to ensure that over its lifetime, development minimises risk to life, damage to property and disruption to people living and working on the Site and does not increase flood risk elsewhere.

2.2.3 The approval of Sustainable Urban Drainage Systems (SuDS) for a new development by the SuDS Approval Body (SAB) is independent of the planning process. New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100m² require approval from the SAB before construction can commence. Adoption and management arrangements, including a funding mechanism for maintenance of SuDS infrastructure and all drainage elements,

must be agreed by the SAB as part of this approval. This will ensure that SuDS infrastructure is properly maintained and functions effectively for its design life.

2.3 Local Planning Policy

Carmarthenshire Local Development Plan

2.3.1 The adopted Carmarthenshire County Council (CCC) Local Development Plan (LDP) was adopted in 2014 and aims to guide development until 2021. An updated LDP (2018-2033) is currently under examination and so the existing LDP remains in place. Polices from the 2006-2018 LDP relevant to this assessment are:

Policy EP1: Water Quality and Resources

'Proposals for development will be permitted where they do not lead to a deterioration of either the water environment and/or the quality of controlled waters. Proposals will, where appropriate, be expected to contribute towards improvements to water quality.

Watercourses will be safeguarded through biodiversity/ecological buffer zones/corridors to protect aspects such as riparian habitats and species; water quality and provide for flood plain capacity. Proposals will be permitted where they do not have an adverse impact on the nature conservation, fisheries, public access or water related recreation use of the rivers in the County.

Proposals will wherever possible be required to make efficient use of water resources.'

Policy EP3: Sustainable Drainage

'Proposals for development will be required to demonstrate that the impact of surface water drainage, including the effectiveness of incorporating Sustainable Drainage Systems (SUDS), has been fully investigated.

The details and options resulting from the investigation must show that there are justifiable reasons for not incorporating SUDS into the scheme in accordance with section 8 of TAN 15.'

Strategic Flood Consequence Assessment

2.3.2 The South West Wales Strategic Flood Consequence Assessment (SFCA) was published in 2022. The SFCA aims to understand the risks of various flooding sources that South West Wales may face, take proactive steps to mitigate these risks, raise awareness across communities and prepare for any such event. Local flood risk is any flood risk that derives from surface runoff, groundwater, or ordinary watercourses. Relevant information has been referenced throughout this report.

2.4 Climate Change

2.4.1 TAN15 states that when considering new development proposals, it is necessary to take account of the potential impact of climate change over the lifetime of development. Solar panel development is assumed to have a lifetime of 45years. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk on the Flood Map for Planning to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change.

2.4.2 In line with TAN15, the climate change allowances have been informed by latest available information on climate change projections and different scenarios of carbon dioxide (CO_2) emissions to the atmosphere. Allowances are provided for different epochs (periods) of time over the next century. This guidance will be reviewed when more up-to-date climate change research is available.

2.4.3 Both the central and upper end allowances should be assessed to understand the range of impact. As a minimum, proposals should be assessed against the central allowance to inform design levels. It is recommended that the 2080s changes are used when considering any time beyond 2115.

2.4.4

2.4.5 **Table 2** presents the peak river flow allowances for the Severn River Basin catchment. Table 3 presents the expected change to Extreme Rainfall Intensity. The climate change allowances are based on UKCP09 and emerging UKCP18 research data.

Table 2. Peak River Flow Allowances by Severn River Basin District (use 1961 to 1990 baseline)

River Basin District	Allowance Category	Total potential change anticipated for '2020s' 2015-2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for the '2080s' (2070-2115)
West Wales	Upper Estimate	25%	40%	75%
	Central Estimate	15%	25%	**30%**
	Lower Estimate	5%	10%	**15%**

Table 3. Change to Extreme Rainfall Intensity Compared to a 1961-90 Baseline

Change to Extreme Rainfall Intensity			
Applies across all of Wales	Total potential change anticipated for '2020s' 2015- 2039)	Total potential change anticipated for '2050s' (2040- 2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	**20%**

2.4.6 The guidance recommends that the central estimate, or change factor, for the 2080s for the relevant river basin district and peak rainfall intensity should be used to assess the potential impact of climate change as part of a FCA. As such the 30% allowance should be used for the peak river flow; and 20% should be used for the extreme rainfall intensity.

3 CONSULTATION

Natural Resource Wales

3.1.1 The FCA has been prepared in consultation with the Partnership and Strategic Overview Team at NRW. NRW stated that they were not able to provide any information. The correspondence with NRW can be found in **Appendix A**.

Welsh Water

3.1.2 Consultation with Welsh Water regarding sewer flooding has been undertaken as part of the assessment. They state they have no records of flooding at the Site as there are no sewers in the vicinity. The correspondence with Welsh Water can be found in **Appendix B**.

Internal Drainage District

3.1.3 The Site is not located within an IDD.

Carmarthenshire County Council

3.1.4 CCC have been consulted as part of the assessment. They confirm they hold no records of flooding at the Site and do not hold any modelled data. The consultation with CCC can be found in **Appendix C**.

4 SITE SETTING

4.1 Site Location

4.1.1 The Site is located on Land at Maes Mawr and Treforris Fawr Farm, Ferryside, Carmarthenshire with the nearest postcode SA17 5YD. The Site is centred on grid reference is SN 40378 10832 and encompasses an area of approximately 81.78 ha. The Site is split across two areas Solar Area West and Solar Area East, connected by an unnamed road.

4.1.2 Solar Area West has an area of approximately 54.66 ha, and Solar Area East has an area of approximately 25.09 ha. The underground cable route covers 0.48 ha and the construction access route covers 1.55 ha.

4.1.3 **Figure 1** below shows approximate Site boundaries.

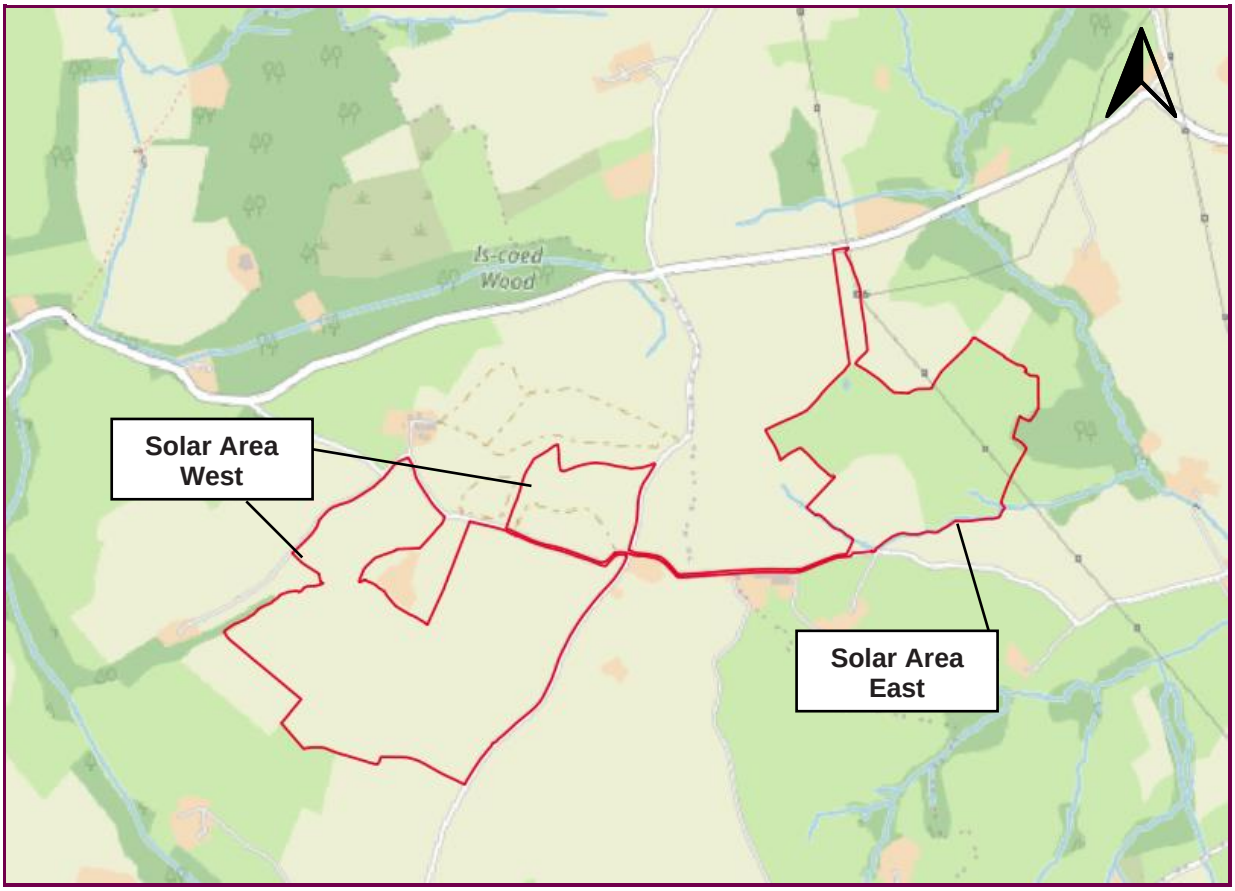


Figure 1. Site Location

4.2 Existing Land Use

4.2.1 The Site occupies approximately 81 ha of pastural and arable agricultural land with field boundaries delineated by hedgerows and trees.

4.2.2 Unnamed roads bisect the Site, connecting to Llandyfaelog in the northeast, small settlements in the north and south, and Ferryside in the west.

4.2.3 The Site is currently 100% soft landscaping.

4.3 Surrounding Land Uses

4.3.1 The south the Site is bordered by agricultural land and woodland, with residential and agricultural buildings located in close proximity.

4.3.2 There are no designated sensitive areas (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI)) on-Site or within close proximity to the Site.

4.3.3 Notwithstanding the above, the Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC is located approximately 1.7km west and 3km south of the Site. The Afon Tywi SSSI is located approximately 1.7m west of the Site and the Pembrey Coast SSSI is found approximately 3km south of the Site. The Gwel y Coed SSSI is also found approximately 1.5km southwest of the Site.

4.3.4 OS mapping shows the ordinary watercourse through the southern section of the Solar Area East outfalls into the Nant Morlais approximately 380m east of the Site. The Nant Morlais then flows southeast for 1.2km before joining the Gwendraeth Fach which continues south/southwest for approximately 7km where it becomes the Gwendraeth Fawr and discharges into Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd (SAC).

4.3.5 Another unnamed ordinary watercourse is present through the western section of Solar Area West. The watercourse flows in a westerly direction before joining another unnamed watercourse and flowing north for approximately 1km where it joins the Cwm Mill Stream. This then flows in a westerly direction before reaching the River Towy (SSSI) and Carmarthen Bay and Estuaries (SAC) where it flows south and eventually discharges into Carmarthen Bay (SPA) some 6.5km downstream of the Site.

4.3.6 From OS mapping there does not appear to be any hydrological connectivity between the Site and the Gwel y Coed SSSI.

4.4 Topography

4.4.1 LiDAR data from the National LiDAR Program, presented within **Appendix D**, shows that Site levels fall from a high point of 126m AOD (meters above ordnance datum) within the north-western extent of Solar Area West to approximately 84m AOD within Solar Area West and 75m AOD in Solar Area East.

5 PROPOSED DEVELOPMENT

5.1.1 The Proposed Development will comprise a solar farm, including associated ancillary infrastructure and temporary laydown areas on land at Maes Mawr and Treforris Fawr Farm, Ferryside, Carmarthenshire.

5.1.2 The main components of the Proposed Development are:

- Solar arrays comprising solar panels and frames;
- Inverters;
- Transformers;
- Cabling;
- Perimeter fencing;
- Communications tower;
- Control room;
- Spare parts container;
- Substation; and
- Internal access tracks.

5.1.3 The Proposed Layout Plan, and plans of the development components, can be found in **Appendix E**.

5.1.4 The Proposed development is classified as 'Less Vulnerable' in accordance with TAN15.

5.1.5 The Proposed Development is temporary and fully reversible; the land can be returned in a condition suitable for continued agricultural use at the end of the facility's planned life.

5.1.6 The potential to provide surface water attenuation, including the use of Sustainable Drainage Systems (SuDS), has been considered as part of the preliminary design process (see Section 10 – Surface Water Management).

6 HYDROLOGICAL SETTING

6.1 Nearby Watercourses

6.1.1 OS mapping shows the presence of an unnamed ordinary watercourse through the southern section of Solar Area East. The watercourse outfalls into the Nant Morlais approximately 380m east of the Site.

6.1.2 Another unnamed ordinary watercourse is present through Solar Area West. The watercourse flows in a westerly direction before joining another unnamed watercourse and flowing north for approximately 1 km where it joins a tributary of the River Towy.

6.1.3 No significant artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1 km of the Site.

6.2 Fluvial Flood Risk Classification

6.2.1 The new NRW Flood Map for Planning is included as **Figure 2**. These Flood Zone classifications take account of the anticipated impacts of climate change.

6.2.2 The Flood Zones are divided into the following categories:

- Flood Zone 1 (Rivers) are areas with a less than 0.1% (1 in 1000) chance of flooding from rivers each year, including the effects of climate change.
- Flood Zone 2 (Rivers) are areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers each year, including the effects of climate change.
- Flood Zone 3 (Rivers) are areas with more than 1% (1 in 100) chance of flooding from rivers each year, including the effects of climate change.

6.2.3 The Site is situated wholly within Zone 1. Areas of Flood Zones 2 and 3 are present 600 m northwest and 200m east of the Site, associated with an unnamed river and the Nant Morlais respectively.

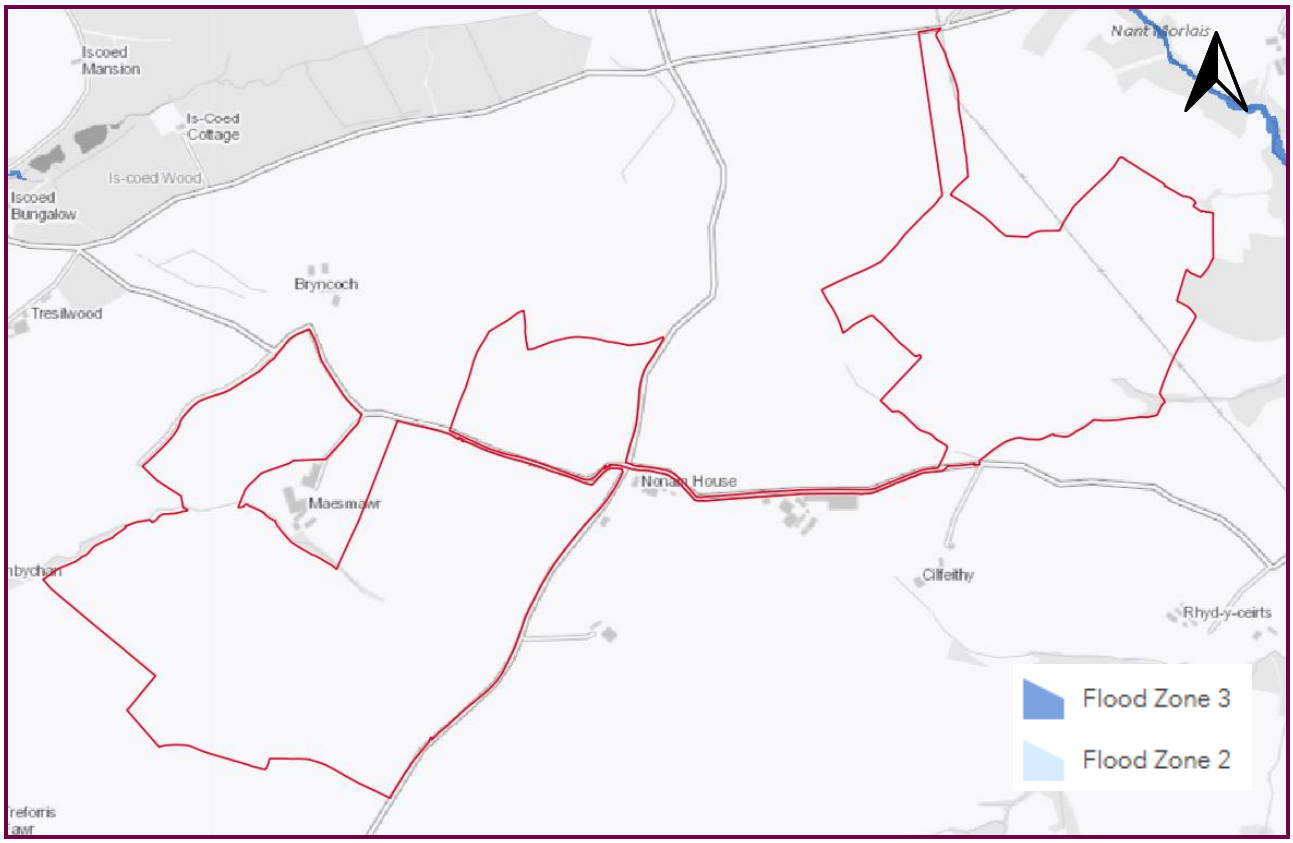


Figure 2. NRW Flood Map for Planning (Rivers and Sea)

6.2.4 NRW National Flood Maps - Flood Risk from Rivers mapping is further used to assess flood risk to the Site with risk of flooding divided into the following categories:

- High risk: The area has a chance of flooding of greater than 1 in 30 (3.3%) each year.
- Medium risk: The area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) each year.
- Low risk: The area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%) each year.
- Very low risk: The area has a chance of flooding of less than 1 in 1000 (0.1%) each year.

6.2.5 The current NRW Flood Risk from Rivers map, presented within in **Figure 3** indicates that the Site is considered to have a very low risk of fluvial flooding.

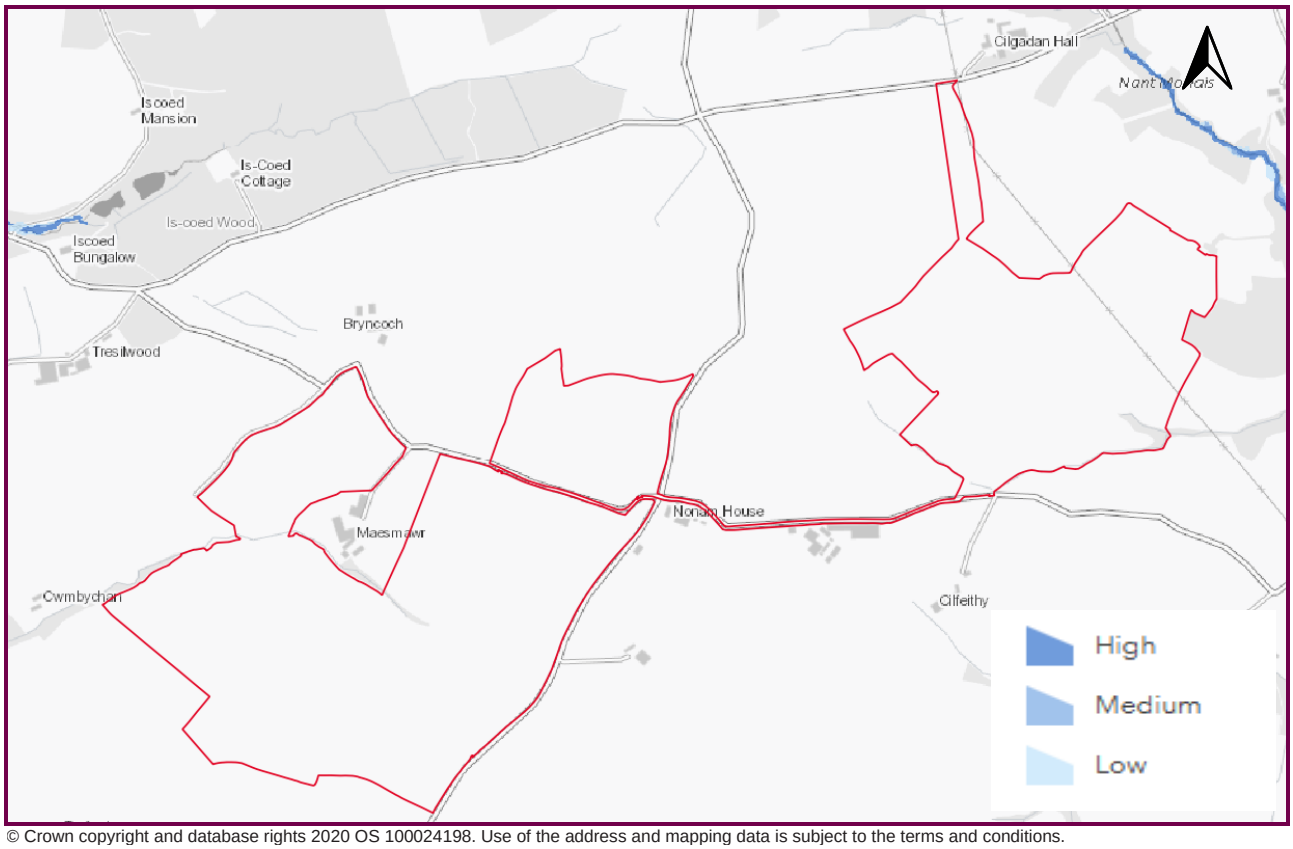


Figure 3. Natural Resources Wales Flood Risk from Rivers Map

NRW Response

6.2.6 Consultation was undertaken with NRW regarding flood risk at the Site. NRW stated that flood data was not available for the Site given its location within Flood Zone 1. The consultation with NRW can be found in **Appendix A**.

Flood Warnings

6.2.7 The Site is not located within a Flood Warning Area.

Flood Defences

6.2.8 The NRW Flood Risk from River's map indicates no flood defences present in close proximity of the Site.

Historical Flood Events

6.2.9 NRW recorded flood extents mapping does not show any recorded flood events within the Site or to its immediate proximity. The Lead Local Flood Authority (LLFA) state they hold no records of flooding at the Site.

6.3 Sea/Tidal Flood Risk Classification

6.3.1 The current NRW Flood Risk from the Sea map indicates that the Site is not considered at risk of flooding from the sea.

6.4 Surface Water Flood Risk Classification

NRW Flood Risk

6.4.1 NRW's new Flood Map for Planning includes Flood Zones for surface water and small watercourses with consideration for climate change and how it will affect flood risk extents over the next century.

6.4.2 The risk has been displayed in **Figure 4**, which shows small areas of the Site in Flood Zones 2 and 3. The DNO access tracks crosses Flood Zones 2 and 3.

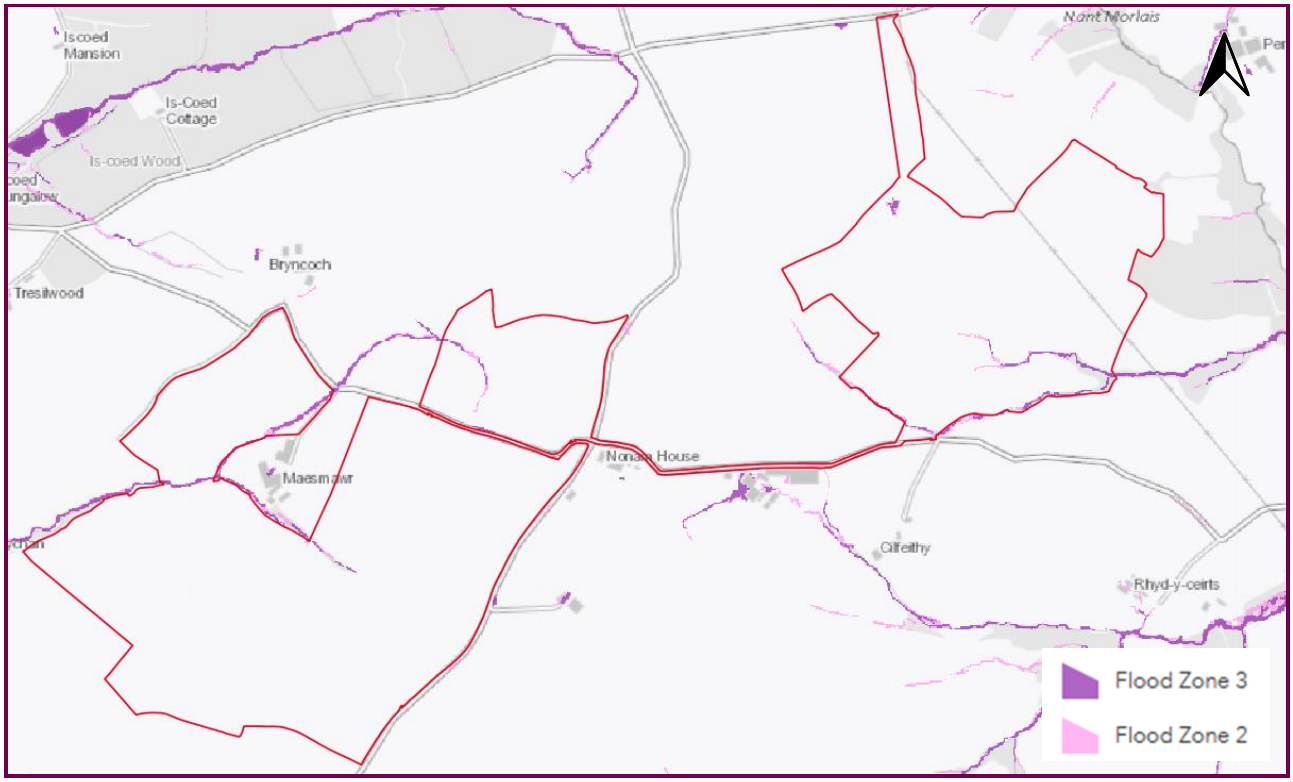


Figure 4. NRW Flood Map for Planning (Surface Water)

6.4.3 NRW's Flood Risk Assessment Wales Mapping provides surface water flood extents for the 1 in 30, 1 in 100 and 1 in 1,000-year return periods. The mapping is presented within **Figure 5** and demonstrates the Site has a predominantly 'very low' risk of flooding from surface water. Areas of low to high risk are seen where small watercourses and drains/ditches are present within the Site.

6.4.4 The risk classifications correspond to the following return periods:

- High risk – areas which have a chance of flooding greater than 1 in 30 year (3.3%);
- Medium risk – areas which have a chance of flooding between 1 in 100 year (1%) and 1 in 30 (3.3%);
- Low risk – areas which have a chance of flooding between 1 in 1000 year (0.1%) and 1 in 100 year (1%); and,
- Very low risk – areas which have a chance of flooding less than 1 in 1000 year (0.1%).

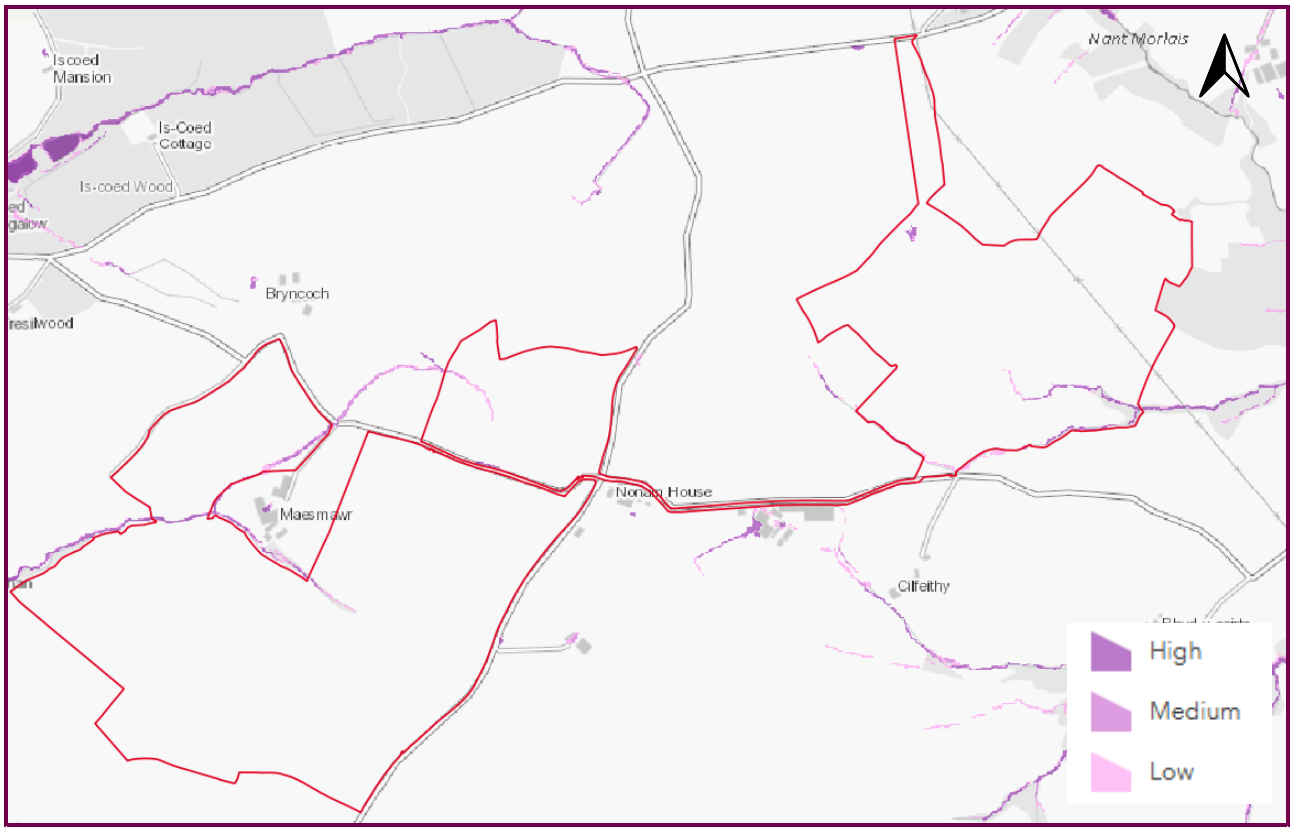


Figure 5. NRW Surface Water Flood Risk Map

6.5 Reservoir Flooding

6.5.1 NRW's Reservoir Flood Map indicates that the Site is not at risk of reservoir flooding.

6.6 Southwest Wales SFCA, 2022

6.6.1 Southwest Wales - Stage 1 Strategic Flood Consequences Assessment (November 2022), Appendix A2 Flood Risk Mapping contains mapping relevant to Carmarthenshire. Information from the Appendix is summarised below:

6.6.2 The Site is located within the Flood Map for Planning (Rivers and Sea) Flood Zone 1.

- Areas of Surface water and small watercourses Flood Zones 2 and 3 are seen within the Site.
- The Site is outside historic flood extents.
- The Site is not at risk of reservoir flooding.

6.6.3 The Site is shown to have a low risk of groundwater flooding.

6.7 Western Wales River Basin District PFRA, 2018

6.7.1 The Western Wales River Basin District PFRA was published in December 2018, and states that groundwater flooding in Wales is rare due to the geology and steep sided valleys.

7 HYDROGEOLOGICAL SETTING

7.1.1 British Geological Survey (BGS) Geology Viewer (1:50,000 scale) indicates that the Site is underlain partly by superficial deposits of Devensian Till, in Solar Area East near the unnamed watercourse. The Site is underlain entirely by argillaceous rocks and sandstone of the Milford Haven Group.

7.1.2 No borehole records are available for the Site. A borehole adjustment record is available approximately 1.5 km southwest of the Site however it contains no information of relevance. Other nearby records are private.

7.1.3 The majority of soil at the Site is described as ‘freely draining slightly acid loamy soils’ by the National Soils Research Institute. Soils in some parts of the eastern and Solar Area West is described as ‘slowly permeable seasonally wet acid loamy and clayey soils’.

7.1.4 According to the NRW Aquifer Typology Mapping, the bedrock is classified as a Secondary A Aquifer. These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers. The superficial deposits are classified as Secondary Undifferentiated aquifers, these formations have varying characteristics in different locations.

7.1.5 According to NRW mapping, the majority of the Site is identified to have ‘High’ groundwater vulnerability. Solar Area East has a ‘medium’ vulnerability.

7.1.6 NRW online groundwater Source Protection Zone (SPZ) mapping indicates that the Site is not located within a groundwater SPZ.

8 FLOOD RISK VULNERABILITY CLASSIFICATION

Vulnerability Classification

8.1.1 In accordance with TAN 15 (2025), the Proposed Development is classified as a 'Less vulnerable' development in flood risk terms.

8.1.2 The required design standard for new development is to be flood free during the 1% river flood (i.e. a flood with a 1 in 100 chance of occurring in any year) and the 0.5% flood from the sea (i.e. a flood with a 1 in 200 chance of occurring in any year), plus an allowance for climate change over the lifetime of a development.

Table 4. Flood events in which a development must remain flood free

Vulnerability Classification		Flood Event Type	
		Rivers	**Sea**
Highly Vulnerable	Emergency Services	0.1% +CC	0.1% +CC
	All other types	1% +CC	0.5% +CC
Less Vulnerable Development		1% +CC	0.5% +CC
Water Compatible Development that may be occupied by people			

8.1.3 As the Proposed Development is classed as 'Less Vulnerable' (as it is a renewable energy generation facility), it will need to remain flood free during the 1% +CC event for fluvial and 0.5% +CC event for tidal flooding.

9 FLOOD RISK AND MITIGATION

9.1.1 The key sources of flooding that could potentially impact the Site are discussed below:

Fluvial / Tidal Flooding

9.1.2 NRW Flood Risk from Rivers Map, as seen in Figure 2, indicates that the Site is located within Flood Zone 1. The annual probability of flooding is classified as less than 1 in 1,000 year (0.1%) in the absence of any defences.

9.1.3 NRW stated they were not able to provide flood data for the Site (**Appendix A**) given its location within Flood Zone 1.

9.1.4 The risk from fluvial and tidal sources can be considered **low** and no mitigation is required.

Flooding from Sewers

9.1.5 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.

9.1.6 Given the rural nature of the Site, it is unlikely that surcharging sewers will pose a risk to the Proposed Development.

9.1.7 Furthermore, Welsh Water confirmed that they hold no records of flooding in the Site vicinity as they have no sewers in the area (**Appendix B**).

9.1.8 Therefore, the risk of sewer flooding can be classified as **low** and no mitigation is required.

Surface Water Flooding (Overland Flow)

9.1.9 Surface water flooding can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.

9.1.10 NRW's surface water flood mapping indicates that the Site predominantly has a negligible risk of surface water flooding. There are localised areas of 'Low' to 'High' risk in Solar Area East and Solar Area West, associated with low lying land. 'Low' risk is associated with a chance of flooding between 0.1% and 1% for any given year and 'High' risk of flooding is associated with a chance of flooding of greater than 2.2% in any given year.

9.1.11 The LLFA confirmed that they hold no records of flooding in the area (**Appendix C**).

9.1.12 Establishment of watercourse buffers and approval of land drainage consents where applicable.

9.1.13 In regards to mitigation to ensure flood risk from this source is not increased, the following measures are proposed:

9.1.14 Therefore, the risk of surface water flooding can be considered predominantly **low**, with some areas at **moderate** risk along ditches and drains within the Site boundary. Mitigation measures listed below within 9.1.21 will ensure flood risk from this source is not increased with development.

Groundwater Flooding

9.1.15 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures.

9.1.16 BGS mapping indicates the Site is underlain by superficial Devensian Till and Head deposits. The bedrock consists of argillaceous rocks and sandstone of the Milford Haven Group.

9.1.17 The Western Wales PFRA determines groundwater flooding to be unlikely in Wales due to the local topography and geology.

9.1.18 Therefore, the risk of groundwater flooding can be considered **low** and no mitigation is required.

Other Sources

9.1.19 There is a limited risk of flooding occurring as a result of a break in a water main.

9.1.20 The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be **low** given the absence of any such structures in the Site vicinity. As such no mitigation is required.

Mitigation Measures

9.1.21 The following mitigation measures are proposed to ensure flood risk from surface water and small watercourses is not increased:

- Volume 2, Figure 2.1: Site Layout Plan has incorporated 8 m buffers between the banks of ordinary watercourses and any proposed infrastructure.
- During the construction phase, the Outline CEMP, Volume 3, Appendix 4.4: Outline CEMP includes industry good practice measures to ensure prevention of surface water flooding arising from increased runoff from construction areas. A final CEMP to be prepared and submitted for approval by the relevant local authorities prior to the commencement of construction
- There is a residual flood risk arising from additional surface water runoff during the operational and maintenance phase resulting from an increase of impermeable areas within the Proposed Development site.
- Surface water runoff during this phase will be mitigation via the Conceptual Drainage Strategy and has been prepared for the proposed development to ensure surface water flood risk is not increased as a result of additional impermeable areas.

Event Exceedance

9.1.22 The mitigation measures proposed as part of the Proposed Development outlined above in 9.1.21 are considered appropriate to help mitigate against event exceedance scenarios.

10 POTENTIAL IMPACTS

10.1 Impermeable areas

Solar Arrays

10.1.1 The majority of the Proposed Development will be occupied by solar arrays. Although arrays have a large land take, the actual ground impact is negligible. The only intrusion will be from the pile-driven posts. There will be one post for about 6-7 panels, so there is likely to be 6-7m between each post. Posts are made of galvanized steel and are not solid poles. Traditional fixed solar arrays have surface area ground impact in the range of 0.0012 m^2 - 0.0014 m^2. The number of the modules in the Proposed Development would be approximately 74,340 with a panel width of 1.3 m. Assuming that there will be posts every 6 m the total number of posts would be 16,107.

10.1.2 Based on this, if the 0.0014 m^2 per post is assumed, the total solar farm ground impact would be 22.5 m^2 on an 81.78 ha (817,800 m^2) Site. This means that what covers the majority of the land as "development" will have a ground impact of approximately 0.002% of the Site.

Ancillary Features

Inverters and Transformers

10.1.3 A conservative assumption notes that a total of 10 Central Inverters will be placed across the Site. The Central Inverters are 2m (L) and 3m (W). Per Central Inverter the area is 6m^2. As such the total conservative impermeable area proposed for Central Inverters is 60m^2.

10.1.4 A total of 5 Transformers will be placed across the Site. The Transformers are 5.36m (L) and 2.35m (W). Per transformer the area is 12.6m^2. As such the total conservative impermeable area proposed for the transformers is 62.98m^2.

10.1.5 Therefore, the above ancillary features will create a total of 112.98m^2 of new impermeable areas within the Site which equates to a ground impact of 0.01% across the Site.

Spares Container

10.1.6 One Spares Container will be located at the Site. This is anticipated to be approximately 12.2m (L) x 2.447m (W), a total area of 29.9m^2. Therefore, the spares container will create a total of 29.9m^2 of new impermeable areas within the Site which equates to a ground impact of 0.003% across the Site.

Control Rooms

10.1.7 One DNO Control Room will be located at the Site. This is anticipated to be approximately 10m (L) x 5m (L), a total area of 50m^2.

10.1.8 One Customer Control Room is proposed. This is anticipated to be approximately 10m (L) x 4m (W), a total area of 40m^2.

10.1.9 Therefore, control rooms will create a total of 110m^2 of new impermeable areas within the Site, which equates to a ground impact of 0.013% across the Site.

Access Tracks

10.1.10 It is proposed that the internal access tracks will be comprised of gravel and fully permeable with no tarmac or other hardstanding type surface. Most will follow existing farm tracks so would not even be new access routes. New and existing access tracks will have no impact with respect to surface water drainage. Geotextile membrane layers will help to secure the aggregate to prevent it sinking into the soil and this will help prevent ground compaction.

10.1.11 Where required, access tracks and roads will be upgraded to facilitate the construction stage including transportation of transformers and other infrastructure.

10.1.12 After the construction of the solar farm the heaviest vehicles likely to use the tracks are occasional van or 4x4 type vehicles. There will be less intensive traffic around the Site compared to existing farm use. This means there is low risk of over-use causing compaction that could compromise permeability.

10.1.13 During construction there will be no HGVs using the internal access tracks around the Site except from the highway into the Site or where access tracks have been upgraded. All HGVs making deliveries to the Site for construction will drop off in temporary construction compounds at the access point, as shown on the Location of Temporary Construction Compounds drawing (reference: HEO-PL-04). Materials will then be delivered around the Site by tractor-trailer type vehicles which are the same as vehicles that currently use these routes around the working farm. This means there is low risk of traffic/vehicles causing excess soil compaction either in construction or during operation which could limit the efficacy of the tracks' permeability.

Panel Runoff

10.1.14 The nature of the Proposed Development means that precipitation would be intercepted by between 25% to 40% of the surface of the Site that is typically over-sailed by solar panels. A known concern is the risk of water "sheeting" off a solar array façade. As a result of the construction of the solar panels, some rainfall will be intercepted by the surface of the arrays before reaching ground level. Intercepted rainfall will either run down the face of the panels and drip onto the ground below or will be lost due to evaporation from the face of the panels. Without mitigation there is a risk of erosion of the ground on which rainwater drips. This could then result in the formation of rivulets which could increase the speed at which runoff discharges from the Site.

10.1.15 However, the potential for erosion to occur as a result of the 'drip effect' is appropriately mitigated by features of the solar arrays themselves, as per the images below. The drawings typically submitted with planning applications are usually simplified. They show what looks to be a solid façade when, in actuality, a typical solar array has gaps between each panel which allows surface water to fall off in many locations onto fully vegetated ground beneath.

10.1.16 Figure 6 below is an extract from an elevation plan for a typical (fixed) array and highlights the gaps between the panels making up the solar array. The approx. 15–25-degree pitch (typically 20 degrees) means water is less likely to run down with velocity that helps it to "jump" the gaps. Rather, water runs off at a reduced speed due to the pitch, and drips down through the gaps. There is no actual risk of water sheeting down in one area at the lower edge of the arrays. Figure 7 shows the underside of an array providing a helpful visual aid to show what the gaps are like. These images are provided for context and comparison only.

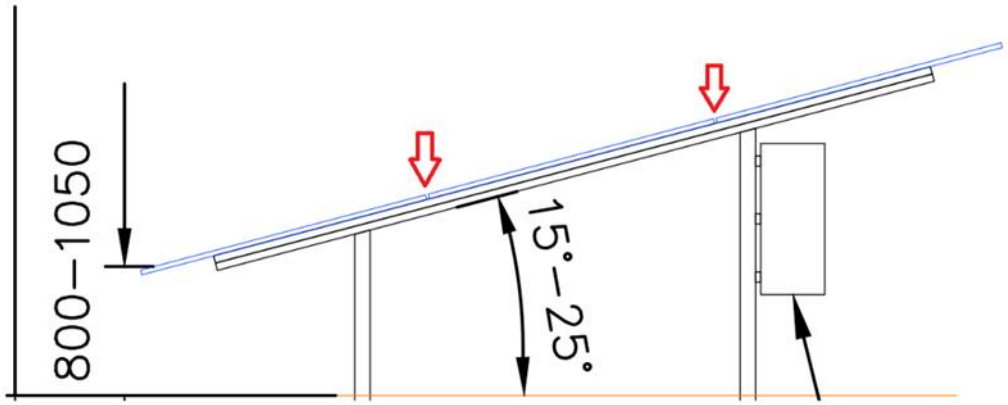


Figure 6. Typical Solar Panel Array

Figure 7. Underside of a Solar Panel

Vegetated Ground

10.1.17 In addition to the above, appropriate seeded vegetation will be provided below and between rows of the solar panels to act as a level spreader/energy dissipater to promote low erosivity sheet flow during operation of the solar farm. The vegetation will be managed organically and will either be mowed or used for light grazing. The grassland will not only grow between array gaps, it will also grow under the arrays. This means that, excluding the access tracks and ancillary buildings, most of the Site will be fully vegetated, species rich pastoral grassland.

10.1.18 This full year-round coverage will be a positive improvement compared to existing grazing use. Without any additional development being required the gaps between the arrays are natural filter strips (SuDS).

10.1.19 The following photos are from UK solar farms where grazing is used for grounds management. Although land may also be managed through quarterly mowing, especially in the early years while

the newly operational solar farm is “bedding in”, it can be seen that the ground coverage is good even under arrays. Some of these images include arrays at a steeper pitch and there is nothing to suggest that water pools or creates surface water erosion channels. A solar farm with year-round ground coverage is an improvement with respect to surface water infiltration compared to the existing agricultural use where the ground is intensively grazed with sometimes only patchy vegetation.

Figure 8. Grazing Ground Management

10.1.20 The key takeaway is that the majority of the Site has mitigation and SuDS inherently designed-in. The arrays are designed to avoid sheeting/pooling/erosion. Water drips off at multiple points onto vegetated ground below. In addition, there is significant space between rows (typically around 4-6m) to act as natural filter strips with vegetated ground that slows the movement of surface water.

11 SURFACE WATER MANAGEMENT

11.1 Introduction

11.1.1 The Proposed Development comprises a 40MW solar farm and will create an impermeable area of 255.88 m^2 (or 0.026 ha), including solar arrays, inverters, transformers, a spares container and control rooms.

11.1.2 Access tracks are to be constructed using crushed road stone, Type 3 or similar, and have therefore not been included in the impermeable area calculations.

11.1.3 The substation has not been included in these calculations due to its minimal ground coverage. The infrastructure within the substation that contains potential contaminants will be bunded to prevent contaminated runoff from entering the wider environment. The remainder of the substation area will be surfaced with gravel (Type 3 or similar) to allow for infiltration and can therefore be assumed to be permeable.

11.1.4 The Proposed Development is assumed to have a design life of 45 years. Therefore, for the purposes of this assessment, taking into account NRW's climate change allowances (published in September 2021), a 20% increase in peak rainfall intensity has been included as climate change allowance, which caters up to the year 2100. No climate change guidance is available beyond 2100.

Existing Surface Water Runoff Rates

Greenfield Runoff Rate

11.1.5 The greenfield nature of the Site means that surface water will slowly soak into the ground (infiltrate), be intercepted by vegetation, or runoff by ways of overland flow, according to the soil characteristics and following the topography of the Site.

11.1.6 The impermeable area at the Site has been described in **Section 10**.

11.1.7 The greenfield runoff rate for the proposed impermeable areas have been calculated using the FEH Statistical Method, based on an area of 1 ha. The calculation can be found in **Appendix F**, and the outputs have been summarised in

11.1.8 **Table 5** below.

Table 5. Equivalent greenfield runoff rates

Return Period (years)	Runoff Rate (l/s)
1 in 1	10.1
Q_{BAR}	10.6
1 in 30	20.4
1 in 100	24.9

Q_{BAR} = mean annual flood low
l/s = litres per second

Post Development Surface Water Runoff Rates

11.1.9 The Proposed Development will result in the creation of some hardstanding. The solar panels themselves will be raised above the ground, with minimal ground impact as discussed.

11.1.10 However, the ancillary units will be placed on a gravel subbase to provide appropriate attenuation for the 1 in 100 year plus climate change event. This is detailed below.

Consideration of Drainage Hierarchy

11.1.11 The Welsh Government[1] advises of the following hierarchy for the disposal of surface water;

1. Rainwater Reuse;
2. Infiltration;
3. To a surface water body;
4. To a surface water sewer, highway drain or another drainage system; or
5. To a combined sewer.

11.1.12 The drainage hierarchy has been considered as follows.

Rainwater Reuse

11.1.13 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the storage tank is not full. There are limited opportunities for water re-use at the Site and therefore, rainwater harvesting has not been proposed at the Site as part of this initial attenuation strategy.

Infiltration

11.1.14 BGS mapping indicates that the Site is partially situated on superficial Devensian Till deposits, in Solar Area East. The Site is underlain entirely by bedrock comprising argillaceous rocks and sandstone of the Milford Haven Group.

11.1.15 The National Soils Research Institute classifies the soils in the area as ‘freely draining, slightly acid loamy soils’ in some areas, and as ‘slowly permeable, seasonally wet acid loamy and clayey soils’ in other areas.

11.1.16 Infiltration testing has yet to be undertaken at this Site and is anticipated to be required to clarify the feasibility of surface water discharge via infiltration. Given the nature of the Site, it is proposed to use the worst-case infiltration rate on Causeway Flow for the calculations, 1×10^{-7} m/s for the soil identified at the Site, taken from table 25.1 on the CIRIA C753 SuDS Manual (2015).

11.1.17 It is proposed to discharge surface water at the Site via infiltration.

To a Surface Water Body

11.1.18 Since it is proposed to use infiltration to manage surface water, the use of a surface water body has not been considered.

To a Surface Water Sewer, Highway Drain or Another Drainage System

11.1.19 Since it is proposed to use infiltration to manage surface water, the use of a sewer has not been considered.

[1] statutory-national-standards-for-sustainable-drainage-systems.pdf

To a Combined Sewer

11.1.20 Since it is proposed to use infiltration to manage surface water, the use of a sewer has not been considered.

Attenuation Requirements

11.1.21 The Conceptual Drainage Strategy is provided within **Appendix G** and is summarised below.

Ancillary Buildings

Inverters and Transformers

11.1.22 Plans show that there are 10 inverters and 5 transformers located across the Site. Each inverter unit covers an area of 6m^2 and each transformer is 12.6m^2. The Site Layout Plan shows there are two inverters next to every one transformer, a combined impermeable area of 26.6m^2. A conservative estimate of 30m^2 has been assumed as impermeable.

11.1.23 The required attenuation for the 30m^2 impermeable area has been modelled in Causeway Flow as c. 2.5m^3 to accommodate flows from the 1 in 100 year critical storm event, with a 20% uplift to account for climate change. The surface water calculations are provided in **Appendix H**.

11.1.24 For the inverter and transformer unit surface water calculations, a worst-case infiltration coefficient of 1 x 10^{-7} m/s has been used.

11.1.25 Surface water attenuation can be provided within a 30m^2 gravel base with depth 300mm and 30% void ratio beneath the inverters and transformers to store runoff.

11.1.26 Due to the small size of the units, and the widespread nature of their locations across the Proposed Development, it is impractical to connect them into a drainage scheme. Also, the proposed gravel subbase will have a betterment on porosity compared to the existing soil. Water runoff from these units will slowly drain into the underlying ground through infiltration.

Spares Container

11.1.27 Plans show that one spare container will be located at the Site, covering an area of 29.9m^2. This will be underlain by a 300mm gravel subbase with a 30% void ratio. This will provide surface water attenuation before infiltration into the ground.

11.1.28 The required attenuation has been modelled in Causeway Flow using c. 2.5m^3 which will appropriately accommodate flows from the 1 in 100 year critical storm event, with a 20% uplift to account for climate change. The surface water calculations are provided in **Appendix H**.

11.1.29 For the spares container, a worst-case infiltration coefficient of 1 x 10^{-7} m/s has been used. Water runoff from the container will slowly drain into the underlying ground through infiltration.

Control Rooms

11.1.30 Plans show that one DNO Control Room and one Customer Control Room are proposed. These are anticipated to cover an area of 47m^2 and 40m^2 respectively.

11.1.31 Causeway flow estimates included in **Appendix H** indicate that 5m^3 attenuation is required for the DNO substation and 3.6m^3 is needed for the customer substation during the 1 in 100 year +20% climate change scenario. The surface water calculations are provided in **Appendix H**.

11.1.32 Attenuation can be provided in 400mm deep gravel bases with 30% void ratio beneath the control rooms.

11.1.33 For the control rooms, a worst-case infiltration coefficient of 1 x 10^{-7} m/s has been used. Water runoff from these buildings will slowly drain into the underlying ground via infiltration.

Solar Panel Arrays

11.1.34 The majority of the Heolddu Solar Farm will be occupied by solar arrays. Although arrays have a large land take, the actual ground impact is negligible. The only intrusion will be from the pile-driven posts. There will be one post for about 6-7 panels, so there is likely to be 6-7m between each post. Posts are made of galvanised steel and are not solid poles. Traditional fixed solar arrays have a surface area ground impact in the range of 0.0012m^2 – 0.0014m^2.

11.1.35 It is estimated that the number of modules on this solar farm will be up to 74,340. Assuming a panel width of 1.3m, and that posts will be every 6m, this would result in a total of roughly 16,107 poles across the Site.

11.1.36 Based on this, if the 0.0014 m^2 per post is assumed, the total solar farm ground impact would be 22.5 m^2 on an 81.78 ha (817,800 m^2) Site. This means that what covers the majority of the land as "development" will have a ground impact of approximately 0.002% of the Site.

11.1.37 As a result of the construction of the solar panels, some rainfall will be intercepted by the surface of the arrays before reaching ground level. Intercepted rainfall will either run down the face of the panels and drip onto the ground or will be lost due to evaporation. Without mitigation, there is a risk of erosion on the ground on which rainwater drips. This could then result in the formation of rivulets which could increase the speed at which runoff discharges from the Site. Where possible, reasonably spaced interceptor channels can be placed between panel arrays. This will be investigated and incorporated at detailed design stage if required.

Access Tracks

11.1.38 The internal access tracks will be permeable with no tarmac or other hardstanding type surface. After the construction of the solar farm, the heaviest vehicles likely to use the tracks are vans or 4x4 type vehicles. Site users during the operational phase of the Proposed Development will be limited to maintenance workers, meaning there is a low risk of over-use, causing compaction that could compromise permeability. Despite this, it will be reasonable to include monitoring and maintenance of the internal accesses over the lifetime of the solar farm.

Exceedance

11.1.39 During events exceeding the 1 in 100 + 20% climate change events, the resulting above-ground flooding will mimic current Site conditions. Pre- and post-development exceedance plans are included in **Appendix I**.

11.1.40 During public consultation events, members of the public expressed concerns about some fields experiencing additional flows from the road. To mitigate this, vegetated interceptor channels will be placed where flows enter fields to slow the flow of water and encourage infiltration.

Pollution Mitigation

11.1.41 It is assumed that infrastructure within the substation that contains potential contaminants will be suitably bunded to prevent contaminated runoff from entering the wider environment.

11.1.42 Surface water runoff should be managed by SuDS that are designed to attenuate flows and to avoid water quality impacts downstream. To demonstrate that surface water arising from the Proposed Development will be appropriately treated prior to discharge the Simple Index Approach, as outlined within the SuDS Manual (CIRIA C753) has been followed.

11.1.43 As stated in the SuDS Manual 2015 (C753), the risk posed by surface water runoff to the receiving environment is a function of:

- The pollution hazard at a particular site (i.e. the *pollutant source*)

11.1.44 The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, groundwater (i.e. the *pollutant pathway*)

- The sensitivity of the receiving environment (i.e. the *environmental receptor*).

11.1.45 The pollution hazard level for this type of development is 'low'. This type of development has identified pollutant hazard indices as per the SuDS Manual (CIRIA C753) Tables 26.2 and 26.3, which are outlined in **Table 6** below.

Table 6. Pollutant hazard indices, SuDS Manual

Land Use / SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Proposed Land Uses			
Other roofs (typically commercial/industrial roofs)	0.3	0.2	0.05
Mitigation			
Gravel Subbases	0.4	0.4	0.4

11.1.46 As illustrated in **Table 6**, the identified mitigation indices (the SuDS Manual, CIRIA C753, Table 26.2 and 26.3) of the proposed gravel subbase exceed the maximum anticipated pollutant hazard indices for the 'low' 'other roofs'. This confirms that surface water arising from the Proposed Development will receive an appropriate level of treatment in advance of discharge from the Site.

Maintenance of Sustainable Drainage Systems

Maintenance Schedules

11.1.47 As discussed above, SuDS are to be implemented into the drainage design of the solar farm by placing inverters, transformers, the spares container and control rooms on permeable gravel subbases capable of storing the 1 in 100 year + 20% climate change event. A maintenance plan has been included in **Appendix J**.

12 SUMMARY AND CONCLUSIONS

12.1.1 The aim of the FCA is to outline the potential for the Site to be impacted by flooding, the potential impacts of the Proposed Development on flooding both on-Site and in the vicinity, and the proposed measures which can be incorporated into the Proposed Development to mitigate the identified risks. The report has been prepared in accordance with the guidance detailed in TAN15. Reference has also been made to the Construction Industry Research and Information Association SuDS manual (C753), the SFCA and following consultation with NRW.

Flood Risk

12.1.2 The potential flood risks to the Site, and the measures proposed to mitigate the identified risks, are summarised in Table 7.

Table 7. Proposed mitigation

Source of Flooding	Identified Risk			Mitigation Proposed	Residual Risk		
	L	M	H		L	M	H
Fluvial	✓			None.	✓		
Tidal	✓			None.	✓		
Sewers	✓			None.	✓		
Surface Water	✓			Whilst there are some small surface water flow pathways, the solar panels are raised by nature of their design to prevent obstruction of flow.	✓		
Groundwater	✓			None.	✓		
Other Sources (e.g. reservoirs, water mains)	✓			None.	✓		

12.1.3 The Site is located wholly in Flood Zone 1.

12.1.4 The Site is at low risk of flooding from all known sources.

12.1.5 Whilst small surface water flow pathways have been identified within the Site, the solar panels will be raised off the ground and, as such, the Proposed Development is unlikely to cause an obstruction to the flow paths. In addition, key electrical elements of the panels will be adequately waterproofed to reduce the potential for water to impact these components. The Site is therefore assessed to have a low risk of flooding from the source when accounting for the Proposed Development.

Surface Water and Soil Management Measures

12.1.6 SuDS techniques (such as gravel sub-bases and natural filter strips) shall be incorporated into the design, when and where required, and will work in conjunction with existing field drainage to manage the discharge of any excess water from the Site.

12.1.7 Where construction has resulted in soil compaction, the areas between panel rows would be tilled / scarified to an appropriate depth and reseeded with an appropriate vegetation cover. An Outline Soils Management Plan is to be prepared for the Proposed Development, outlining measures to ensure impact on soils is mitigated.

12.1.8 All areas of the Site, where appropriate, will have vegetation cover at all times.

Conclusions

12.1.9 In summary, the Proposed Development is at ‘low’ risk of flooding from all sources assessed, and with appropriate surface water and soil management measures, would cause negligible effects on the existing hydrological regimes.

APPENDICES

Appendix A

NRW Consultation

Moody, Penelope

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 31 March 2025 11:38
To: Evans, Caitlin
Subject: ATI-28206a -: Flood Data Request: Ferryside, Carmarthenshire

Good morning,

Thank you for your data request.

Unfortunately, the flood map in this area is based on a nationally generated FRAW model, this was last updated in 2020. FRAW modelling uses LIDAR data to generate flood outlines with assumptions made about the channel capacity. This modelling was carried out for the production of flood extents only and is not suitable for detailed site specific assessments, therefore we are not able to provide any flood products for your site.

Kind Regards

Owen Jones
Swyddog Trwyddedu Data / Data Licensing Officer
Cyswllt Cyfoeth / Customer Hub
Cwsmeriaid, Cyfathrebu a Masnach / Customer, Communications and Commercial Directorate

Cymraeg

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.
Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

From: Data Distribution
Sent: 18 March 2025 15:37
To: Evans, Caitlin <Caitlin.Evans@rps.tetratech.com>
Subject: RE: Flood Data Request: Ferryside, Carmarthenshire

Dear Ms Evans,

Thank you for your email concerning the above.

Flood history – Recorded Flood Extents | DataMapWales (gov.wales)

Defences – Flood Defence Structures | DataMapWales (gov.wales) & Areas Benefiting from Flood Defences | DataMapWales (gov.wales) & Natural Resources Wales / Find flood defence structures near you (The National Flood Asset Database)

For everything else, we will be in touch in due course.

Yn gywir/ Yours sincerely
Enw / **Name Michelle Lewis**
Teitl swydd / Job title Data Licensing Officer
Adran / Department Customer, Communications and Commercial
Rhif ffôn / Phone number 07917243096
Dyddiau gweithio (os yn berthnasol) / Working days Mon-Fri
Yn Ardystiedig o ran Llythrennedd Carbon/Certified Carbon Literate

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.
Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

From: Evans, Caitlin <Caitlin.Evans@rps.tetratech.com>
Sent: 18 March 2025 15:16
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: Flood Data Request: Ferryside, Carmarthenshire

Good afternoon,

We are currently undertaking a Flood Consequence Assessment for a site located near Ferryside, Carmarthenshire. Please see location plan attached.

Please could you forward my email on to the relevant team?

The Site lies wholly within Flood Zone A according to the Natural Resources Wales (NRW) Development Advice Map meaning that the Site is not at risk of flooding from rivers or the sea. The emerging NRW Flood Map for Planning also identifies the Site as being located within Flood Zone 1 and represents the most up-to-date source of flood risk information. There are small areas of surface water flooding identified within the Site associated with small watercourses.

We would like to request:

- Any modelled flood data you may have that affects the site.
- Any flood history associated with the site.
- Any information on flood defence structures in the vicinity of the site

Any queries, please don’t hesitate to get in touch.

Many thanks,
Caitlin

Caitlin Evans
Graduate Consultant-Hydrology
RPS | Consulting UK & Ireland
20 Farringdon Street
London, EC4A 4AB, United Kingdom
T +44 20 3691 0500
E caitlin.evans@rps.tetratech.com

Appendix B

Welsh Water Consultation

Evans, Caitlin

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 15 April 2025 09:06
To: Evans, Caitlin
Subject: RE: Sewer Flood History - Ferryside, Camarthenshire

Our Reference: EIR/2142/2025

Dear Caitlin,

Request for information

We write further to your request for information received on 18th March 2025, which we have been considering under the Environmental Information Regulations 2004.

We can confirm that we have no records of flooding in the vicinity of the site as we have no sewers in the area.

We hope that this response is clear. Should you have any questions, you can contact us by email at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Linea, Fortran Road, St Mellons, Cardiff CF3 0LT.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

Yours sincerely,

Dŵr Cymru Welsh Water

From: Environmental Information Requests
Sent: 21 March 2025 15:47
To: Evans, Caitlin <Caitlin.Evans@rps.tetratech.com>
Subject: RE: Sewer Flood History - Ferryside, Camarthenshire

Dear Caitlin,

Request for information

We refer to your request for information, which was received on 18th March 2025.

We are dealing with your request as one made under the Environmental Information Regulations 2004 ("the Regulations").

In accordance with the Regulations, we will respond to your request within 20 working days of the date of receipt.

For completeness, we advise that the Information Commissioner's Office states that the time period for responding should be calculated from the day after the request is received.

In the meantime, if you have any queries, please contact us on email EnvironmentalInformationRequests@dwrcymru.com.

We have assigned reference **EIR/2142/2025** to your request. Please kindly note this in all correspondence with us regarding this matter.

Yours sincerely,

Dŵr Cymru Welsh Water

From: Evans, Caitlin <Caitlin.Evans@rps.tetratech.com>
Sent: 18 March 2025 15:38
To: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Subject: Sewer Flood History - Ferryside, Camarthenshire

******** External Mail ********
Good afternoon,

We are currently undertaking a Flood Consequence Assessment for a site located near Ferryside, Carmarthenshire. Please see location plan attached.

Please could you advise if you hold any sewer flood history in the vicinity of the site?

Any queries, please don't hesitate to get in touch.

Many thanks,
Caitlin

Caitlin Evans
Graduate Consultant-Hydrology
RPS | Consulting UK & Ireland
20 Farringdon Street
London, EC4A 4AB, United Kingdom
T +44 20 3691 0500
E caitlin.evans@rps.tetratech.com

Appendix C

CCC Consultation

Moody, Penelope

From: Flood Defence & Coastal Protection <FDCP@carmarthenshire.gov.uk>
Sent: 25 March 2025 16:37
To: Evans, Caitlin
Cc: Planning Hwb; Sustainable Drainage Approval Body
Subject: RE: FCA and Drainage Info request

Hello Caitlin,

To address your questions.

1. We do not have any modelled data for the site.
2. We have no record of any flooding incidents on the site.
3. We have no record of Groundwater flooding at the site.
4. We have no record of Sewerage issues, however DCWW would be best placed to answer this query.
5. You should consult NRW in regards to Flood Risk. Natural Resources Wales / Check your flood risk on a map (Flood Risk Assessment Wales Map)

Diolch,

Cofion Cynnes/ Kind Regards,

Jake Bevan

Peiriannydd Cynorthwyol Amddiffyn rhag Llifogydd a Diogelu'r Arfordir | Flood Defence and Coastal Protection Assistant Engineer

Amddiffyn Rhag Llifogydd a Gwarchod yr Arfordir / Flood Defence and Coastal Protection

Adran Lle a Seilwaith a Datblygu Economaidd / Department of Place Infrastructure and Economic Development

☎ Rhif ffôn /Tel: 07815 471147

sirgar.llyw.cymru | carmarthenshire.gov.wales

Mae croeso i chi gysylltu â ni yn Gymraeg neu Saesneg

You are welcome to contact us in Welsh or English

From: Planning Hwb <PlanningHwb@carmarthenshire.gov.uk>
Sent: 20 March 2025 11:10
To: Flood Defence & Coastal Protection <FDCP@carmarthenshire.gov.uk>
Subject: FW: FCA and Drainage Info request

Please see email below. Are you able to respond.

Sian Thomas
Arweinydd Tîm Hwb Cynllunio | Planning Hwb Team Leader
Lle, Seilwaith & Datblygiad Economaidd | Place, Infrastructure and Development

01267 228828

sirgar.llyw.cymru | carmarthenshire.gov.wales
Mae croeso i chi gysylltu â ni yn Gymraeg neu Saesneg
You are welcome to contact us in Welsh or English

From: Evans, Caitlin <Caitlin.Evans@rps.tetratech.com>
Sent: 18 March 2025 15:38
To: SAB Registrations <SABRegistrations@carmarthenshire.gov.uk>
Cc: Planning Hwb <planningHWB@carmarthenshire.gov.uk>
Subject: FCA and Drainage Info request

Good afternoon,

We are currently undertaking a Flood Consequence Assessment for a site located near Ferryside, Camarthenshire. Please see location plan attached.

Please could you forward my email onto the relevant team?

The NRW Flood Map for Planning indicates that majority of the site is in Flood Zone 1. The Development Advice Map states the site is located in Zone A. The site is mainly at very low to low risk from surface water flooding, with localised areas at higher risk associated with the surface flow pathways and drains that run across the south of the site.

We will be proposing a conceptual drainage strategy to manage surface water and submitting a SAB application. At this stage, could you advise if greenfield (QBAR) rates would be a suitable restriction rate to incorporate in the conceptual strategy?

We would also like to request:

- Any modelled flood data you may have that affects the site.
- Any flood history associated with the site.
- Details of any groundwater flooding issues in the area
- Details of any sewerage flood risk at the site.
- Details of any other (reservoir, Canal etc) flood risk at the site.

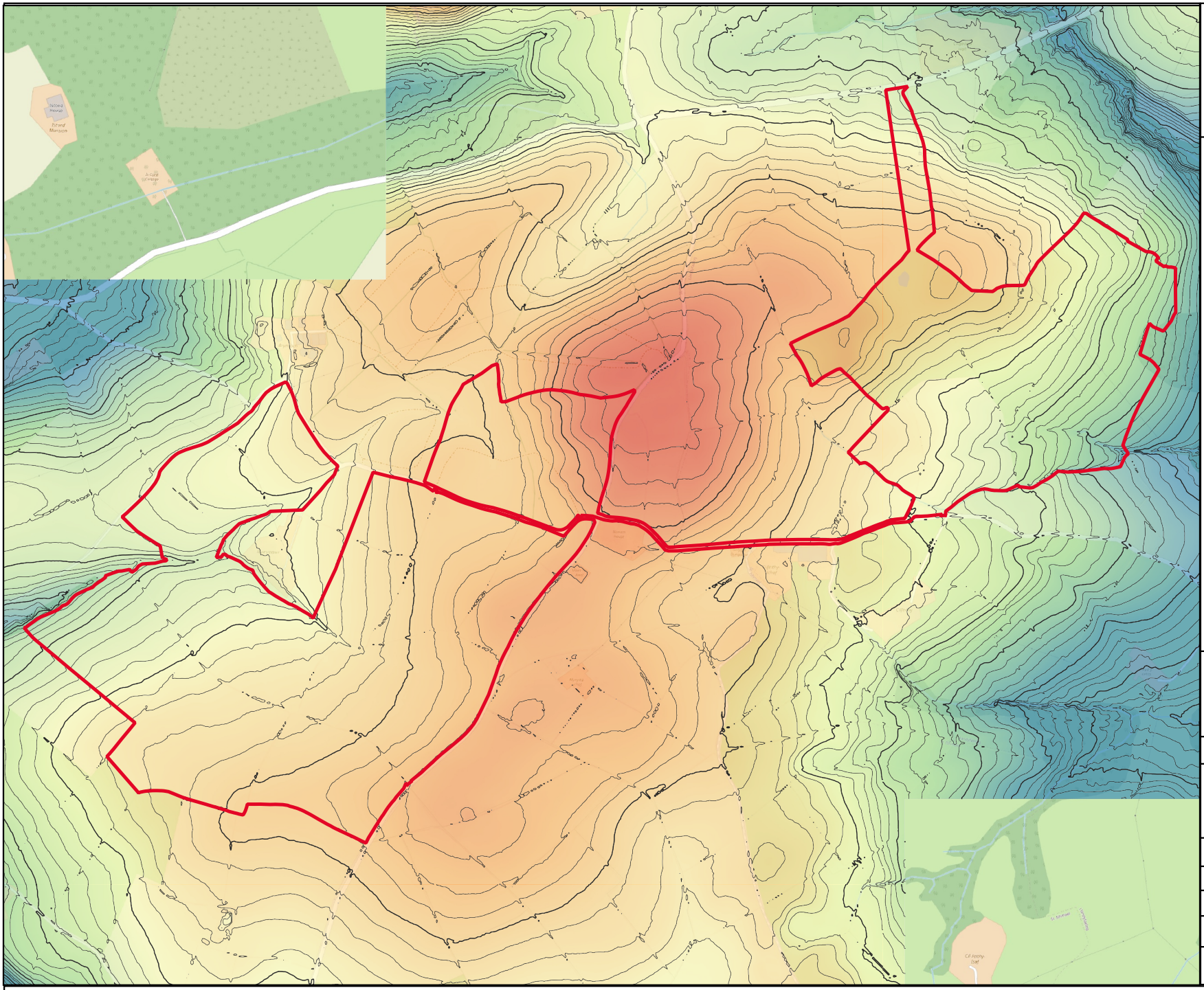
Any queries, please don’t hesitate to get in touch.

Many thanks,
Caitlin

Caitlin Evans
Graduate Consultant-Hydrology
RPS | Consulting UK & Ireland
20 Farringdon Street
London, EC4A 4AB, United Kingdom
T +44 20 3691 0500
E caitlin.evans@rps.tetratech.com

Appendix D

LiDAR



Notes

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Legend

Redline boundary

Contours (m)

2

10

LiDAR

(m AOD)

130

70

A TETRA TECH COMPANY

20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices
@rpsgroup.com

Client: Qualitas Energy

Title: Topography

Site: Heolddu Solar Farm

Date: 19-08-2025

Scale: 1:10,000 | Size: A4

Job Ref: 794-ENV-HYD-21663 | Rev: 01

Drawn	Checked	Approved
CE	JM	JM

0 30 60 90 m

N

rpsgroup.com

Appendix E

Proposed Development Layout

A1

Revisions:

Revision	Date	Revision Notes	Drawn	Inspected
A	28.04.25	First Issue	JM	ID
B	03.06.25	Amended in line with Comments	JM	ID
C	20.06.25	Amended in line with Comments	JM	ID
D	24.06.25	Amended in line with Comments	JM	ID
E	04.08.25	Amended in line with Comments	JM	ID

LEGEND:

- PLANNING APPLICATION BOUNDARY
- PROPOSED DNO ACCESS
- PROPOSED INTERNAL ACCESS
- PROPOSED SITE ACCESS
- EXISTING WATERCOURSE
- PERIMETER DEER FENCELINE
- FP — FP — FP FOOTPATH
- PROPOSED O/H CABLE ROUTE

SERVICES:

- HV 132kV — ELE 132kV O/H CABLE ROUTE

VEGETATION:

- EXISTING VEGETATION

SOLAR SITE INFRASTRUCTURE:

- PV SOLAR PANELS
- CCTV CAMERA
- DEER FENCELINE SECURITY GATE
- POINT OF CONNECTION
- INVERTER
- TRANSFORMER

N

Project:

Heolddu Solar Farm

Client:

Qualitas energy

Drawn by:

CADmando
2D , 3D CAD & BIM SERVICES

CADmando Design & Draughting Solutions Ltd
Unit B2, The Courtyard, Severn Drive, Tewkesbury Business Park, GL20 8GD

Tel: +44 (0) 1684 850019
Mob: +44 (0) 7814436910

Status:

PLANNING

Drawing Title:

Site Layout Plan (West)

Drawn:	Checked:	First Issued:
JM	ID	28.04.2025

Project Code:	Drawing Number:
HEO-	PL-02

Sheet Size:	Scale:	Revision:
A1	1:2000	E

2 HEOLDDU SOLAR FARM SITE LAYOUT PLAN (WEST)

Scale: 1:2000@A1

20 40 60 80 100 120 140 160 180 200m

SCALE 1:2000

A1

Revisions:

Revision	Date	Revision Notes	Drawn	Inspected
A	28.04.25	First Issue	JM	ID
B	03.06.25	Amended In line with Comments	JM	ID
C	20.06.25	Amended In line with Comments	JM	ID
D	23.06.25	Construction Access Amended	JM	ID
E	04.08.25	Amended In line with Comments	JM	ID

LEGEND:

- PLANNING APPLICATION BOUNDARY
- PROPOSED DNO ACCESS
- PROPOSED INTERNAL ACCESS
- PROPOSED SITE ACCESS
- TEMPORARY CONSTRUCTION ACCESS
- EXISTING WATERCOURSE
- PERIMETER DEER FENCELINE
- PERIMETER FENCELINE
- FP FP FP FOOTPATH
- PROPOSED O/H CABLE ROUTE

SERVICES:

- HV 132kV ELE 132kV O/H CABLE ROUTE

VEGETATION:

- EXISTING VEGETATION

SOLAR SITE INFRASTRUCTURE:

- PV SOLAR PANELS
- CCTV CAMERA
- SECURITY GATE
- DEER FENCELINE SECURITY GATE
- SPARE PARTS CONTAINER
- COMMUNICATIONS TOWER
- POINT OF CONNECTION
- 132kV SUBSTATION
- DNO CONTROL ROOM
- CUSTOMER CONTROL ROOM
- INVERTER
- TRANSFORMER

N

Project:

Heolddu Solar Farm

Client:

Qualitas energy

Drawn by:

CADmando
2D , 3D CAD & BIM SERVICES

CADmando Design & Draughting Solutions Ltd
Unit B2, The Courtyard, Severn Drive, Tewkesbury Business Park, GL20 8GD

Tel: +44 (0) 1684 850019
Mob: +44 (0) 7814436910

Status:

PLANNING

Drawing Title:

Site Layout Plan (East)

Drawn:	Checked:	First Issued:
JM	ID	28.04.2025

Project Code:	Drawing Number:
HEO-	PL-03

Sheet Size:	Scale:	Revision:
A1	1:2000	E

3 HEOLDDU SOLAR FARM SITE LAYOUT PLAN (EAST)

Scale: 1:2000@A1

20 40 60 80 100 120 140 160 180 200m

SCALE 1:2000

A1

Revisions:

Revision	Date	Revision Notes	Drawn	Inspected
A	28.04.25	First Issue	JM	ID
B	03.06.25	Amended in line with Comments	JM	ID
C	20.06.25	Amended in line with Comments	JM	ID
D	23.06.25	Construction Access Amended	JM	ID
E	04.08.25	Amended in line with Comments	JM	ID

LEGEND:

- PLANNING APPLICATION BOUNDARY
- PROPOSED DNO ACCESS
- PROPOSED INTERNAL ACCESS
- PROPOSED SITE ACCESS
- TEMPORARY CONSTRUCTION ACCESS
- EXISTING WATERCOURSE
- PERIMETER DEER FENCELINE
- PERIMETER FENCELINE
- FP — FP — FP FOOTPATH
- PROPOSED O/H CABLE ROUTE

SERVICES:

- HV 132kV — ELE 132kV O/H CABLE ROUTE

VEGETATION:

- EXISTING VEGETATION

SOLAR SITE INFRASTRUCTURE:

- PV SOLAR PANELS
- CCTV CAMERA
- SECURITY GATE
- DEER FENCELINE SECURITY GATE
- SPARE PARTS CONTAINER
- COMMUNICATIONS TOWER
- POINT OF CONNECTION
- 132kV SUBSTATION
- DNO CONTROL ROOM
- CUSTOMER CONTROL ROOM
- INVERTER
- TRANSFORMER

N

Project:

Heolddu Solar Farm

Client:

Qualitas energy

Drawn by:

CADmando
2D, 3D CAD & BIM SERVICES

CADmando Design & Draughting Solutions Ltd
Unit B2, The Courtyard, Severn Drive, Tewkesbury Business Park, GL20 8GD

Tel: +44 (0) 1684 850019
Mob: +44 (0) 7814436910

Status:

PLANNING

Drawing Title:

Site Layout Plan Overall

Drawn:	Checked:	First Issued:
JM	ID	28.04.2025

Project Code:	Drawing Number:	
HEO-	PL-01	

Sheet Size:	Scale:	Revision:
A1	1:4000	E

1 HEOLDDU SOLAR FARM SITE LAYOUT PLAN (OVERALL)

Scale: 1:4000@A1

40 80 120 160 200 240 280 320 360 400m

SCALE 1:4000

Appendix F

UK SuDS Calculations

Greenfield runoff rate estimation tool

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.

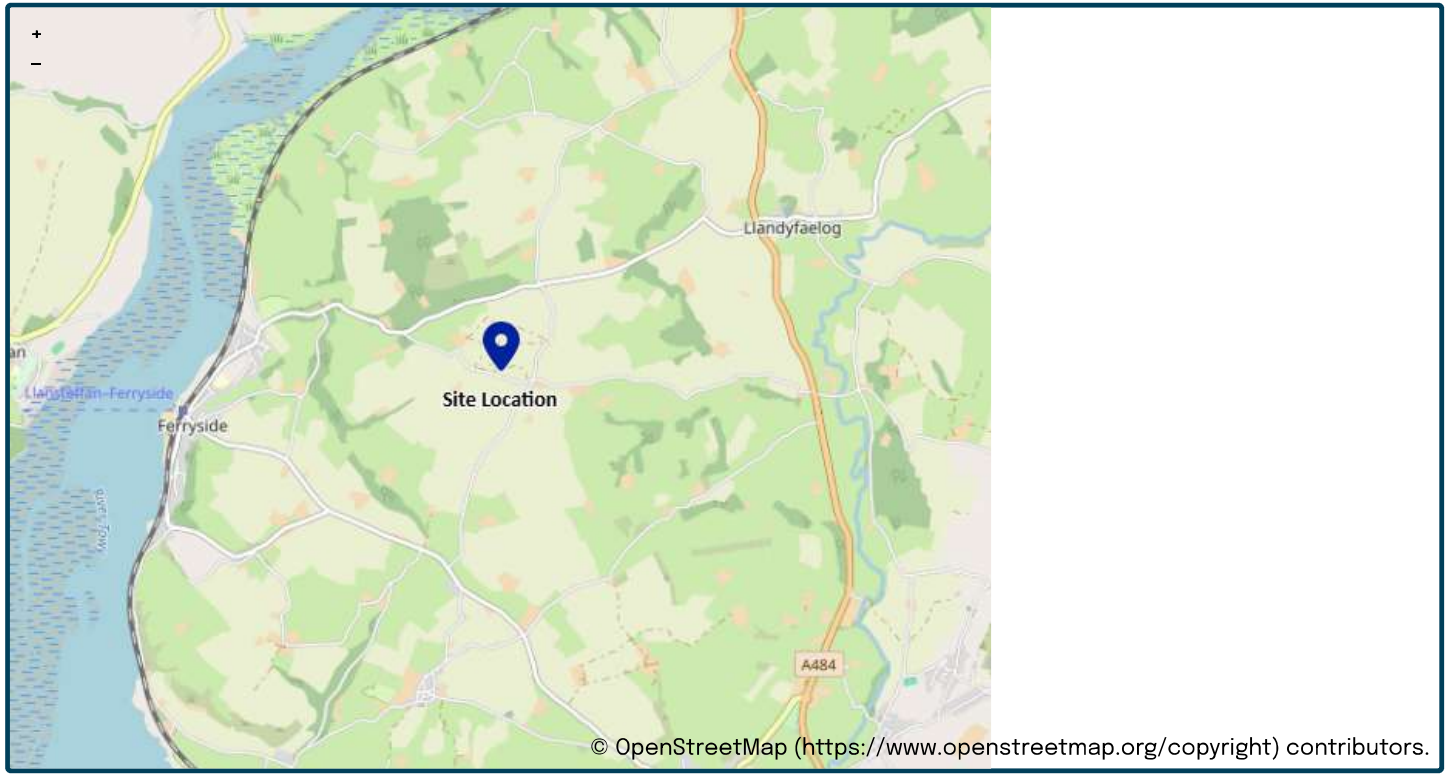
Project details

Date	05/06/2025
Calculated by	
Reference	
Model version	2.0.1

Location

Site name: Heolddu Solar Farm

Site location:



Site easting: 239144

Site northing: 210450

Site details

Total site area (ha): 1 ha

Greenfield runoff

Method

Method	FEH statistical

FEH statistical

	My value		Map value
SAAR (mm)	1243 mm		1243
BFIHOST	0.46		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	10.6 l/s		
QBar (FEH statistical) (l/s)	11.4 l/s		

Growth curve factors

	My value		Map value
Hydrological region	9		9
1 year growth factor	0.88		
2 year growth factor	0.93		
10 year growth factor	1.42		
30 year growth factor	1.78		
100 year growth factor	2.18		
200 year growth factor	2.46		

Results

Method	FEH statistical	
Flow rate 1 year (l/s)	10.1	l/s
Flow rate 2 year (l/s)	10.6	l/s
Flow rate 10 years (l/s)	16.2	l/s
Flow rate 30 years (l/s)	20.4	l/s
Flow rate 100 years (l/s)	24.9	l/s
Flow rate 200 years (l/s)	28.1	l/s

Disclaimer

Appendix G

Conceptual Drainage Strategy

Notes

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PRELIMINARY

SUBJECT TO DETAILED DESIGN

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KEY

Gravel Sub Base

Vegetated Ground

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Gravel Sub Base Beneath Inverters and Transformers

Area: 30m²
Porosity: 30%
Sub Base Depth: 300mm
Storage Volume: 2.7m³

Vegetated Ground

Appropriately seeded vegetation to be provided below and between rows of solar PV modules

Vegetated interceptor channels to slow flows from road network

METRES @ 1:1250 0 10 25 50 125

Rev	Description	By	Ckd	Date
P03	Red Line Boundary Updated	CE	FC	19.08.25
P02	Altered Interceptor Channels	CE	JM	08.07.25
P01	Preliminary	PM	FC	09.06.25

A TETRA TECH COMPANY

20 Farringdon Street, London, EC4A 4AB
T: +44 20 3691 0500 E: rpshydrologyservices@rpsgroup.com

Client: Qualitas Energy

Project: Heolddu Solar Farm

Title: Conceptual Drainage Strategy (1)

Status	Scale	Date Created
Preliminary	1:1,250@A0	09.06.25

Task Team Manager	Information Author	Task Information Manager
JM	PM	FC

Document Number: 21663-RPS-SD-ZZ-DR-D100-P03

RPS Project Number: 794-HYD-ENV-21663

Revision: P03

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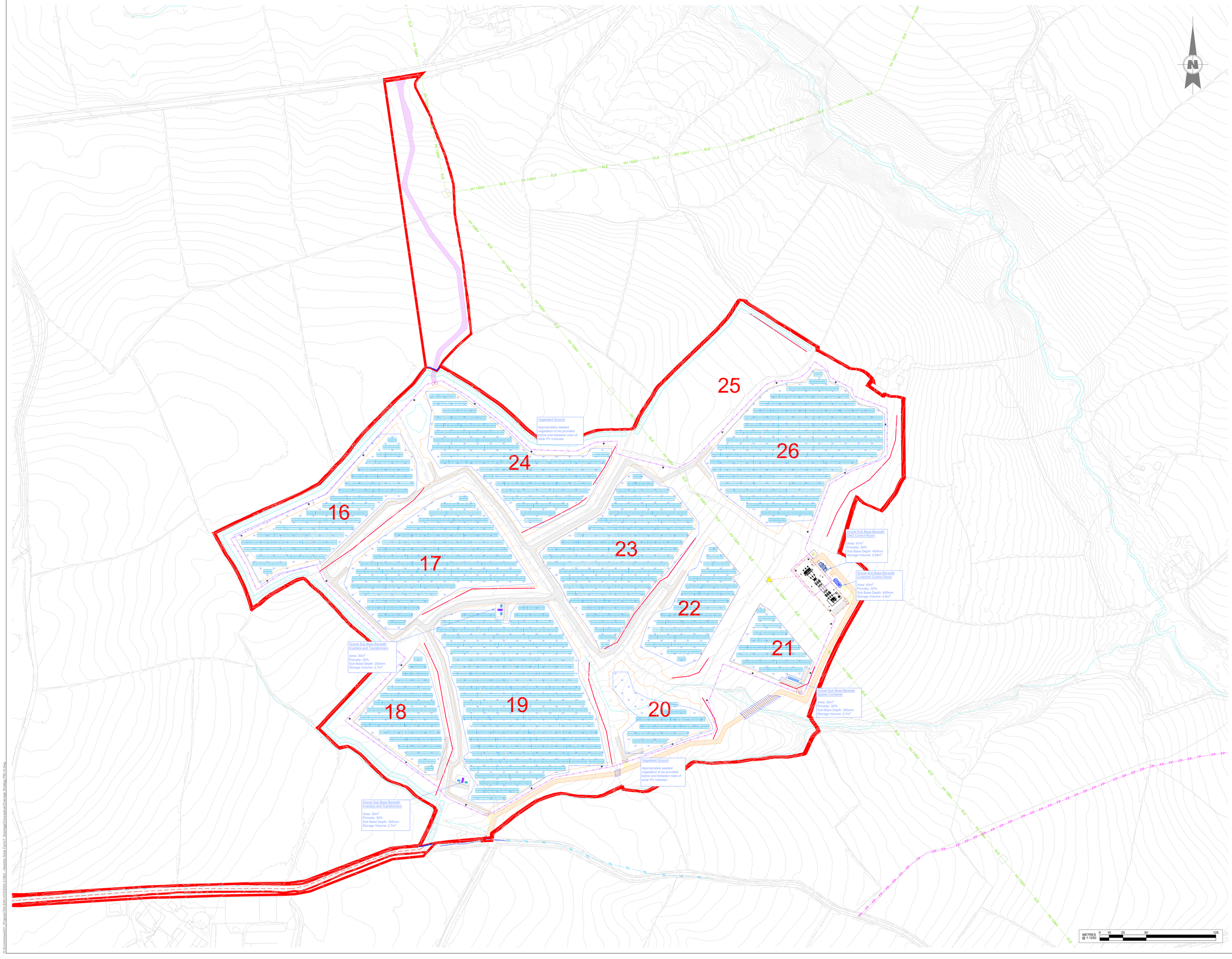

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PRELIMINARY
SUBJECT TO DETAILED DESIGN

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KEY

Gravel Sub Base

Vegetated Ground

Rev	Description	By	Ckd	Date
P03	Red Line Boundary Updated	CE	FC	19.08.25
P02	Altered Interceptor Channels	CE	JM	08.08.25
P01	Preliminary	PM	FC	09.06.25

A TETRA TECH COMPANY
20 Farringdon Street, London, EC4A 4AB
T: +44 20 3691 0500 E: rpshydrologyservices@rpsgroup.com

Client: Qualitas Energy

Project: Heolddu Solar Farm

Title: Conceptual Drainage Strategy (2)

Status	Scale	Date Created
Preliminary	1:1,250@A0	09.06.25

Task Team Manager	Information Author	Task Information Manager
JM	PM	FC

Document Number: 21663-RPS-SD-ZZ-DR-D100-P03

RPS Project Number: 794-HYD-ENV-21663

Revision: P03

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Appendix H

Causeway Flow Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	1.000
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

225 | 300

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	1		5.00	100.000	Manhole	Adoptable	1200	1010.000	1000.000	0.300
✓	2-SOAKAWAY	0.005	5.00	100.000	Manhole	Adoptable	1200	1020.000	1000.000	0.400

Node 2-SOAKAWAY Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00108	Safety Factor	2.0	Invert Level (m)	99.600
Side Inf Coefficient (m/hr)	0.00108	Porosity	0.30	Time to half empty (mins)	1667

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	47.0	47.0	0.300	47.0	47.0

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	1	1980	99.910	0.210	0.0	0.2378	0.0000	OK
2880 minute winter	2-SOAKAWAY	1980	99.910	0.310	0.1	4.7254	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
2880 minute winter	1	1.001	2-SOAKAWAY	0.0	-0.001	0.000	0.3920
2880 minute winter	2-SOAKAWAY	Infiltration		0.0			

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	1.000
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	1		5.00	100.000	Manhole	Adoptable	1200	1010.000	1000.000	0.300
✓	2-SOAKAWAY	0.003	5.00	100.000	Manhole	Adoptable	1200	1020.000	1000.000	0.400

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	2880	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	20	0	0

Node 2-SOAKAWAY Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00108	Safety Factor	2.0	Invert Level (m)	99.600
Side Inf Coefficient (m/hr)	0.00108	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	30.0	0.0	0.300	30.0	0.0

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1020	99.836	0.136	0.0	0.1538	0.0000	OK
1440 minute winter	2-SOAKAWAY	1110	99.836	0.236	0.1	2.3894	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute winter	1	1.001	2-SOAKAWAY	0.0	-0.002	0.001	0.3242
1440 minute winter	2-SOAKAWAY	Infiltration		0.0			

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	1.000
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

225	300

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	1		5.00	100.000	Manhole	Adoptable	1200	1010.000	1000.000	0.300
✓	2-SOAKAWAY	0.004	5.00	100.000	Manhole	Adoptable	1200	1020.000	1000.000	0.400

Node 2-SOAKAWAY Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00108	Safety Factor	2.0	Invert Level (m)	99.600
Side Inf Coefficient (m/hr)	0.00108	Porosity	0.30	Time to half empty (mins)	1667

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	40.0	0.300	40.0	40.0

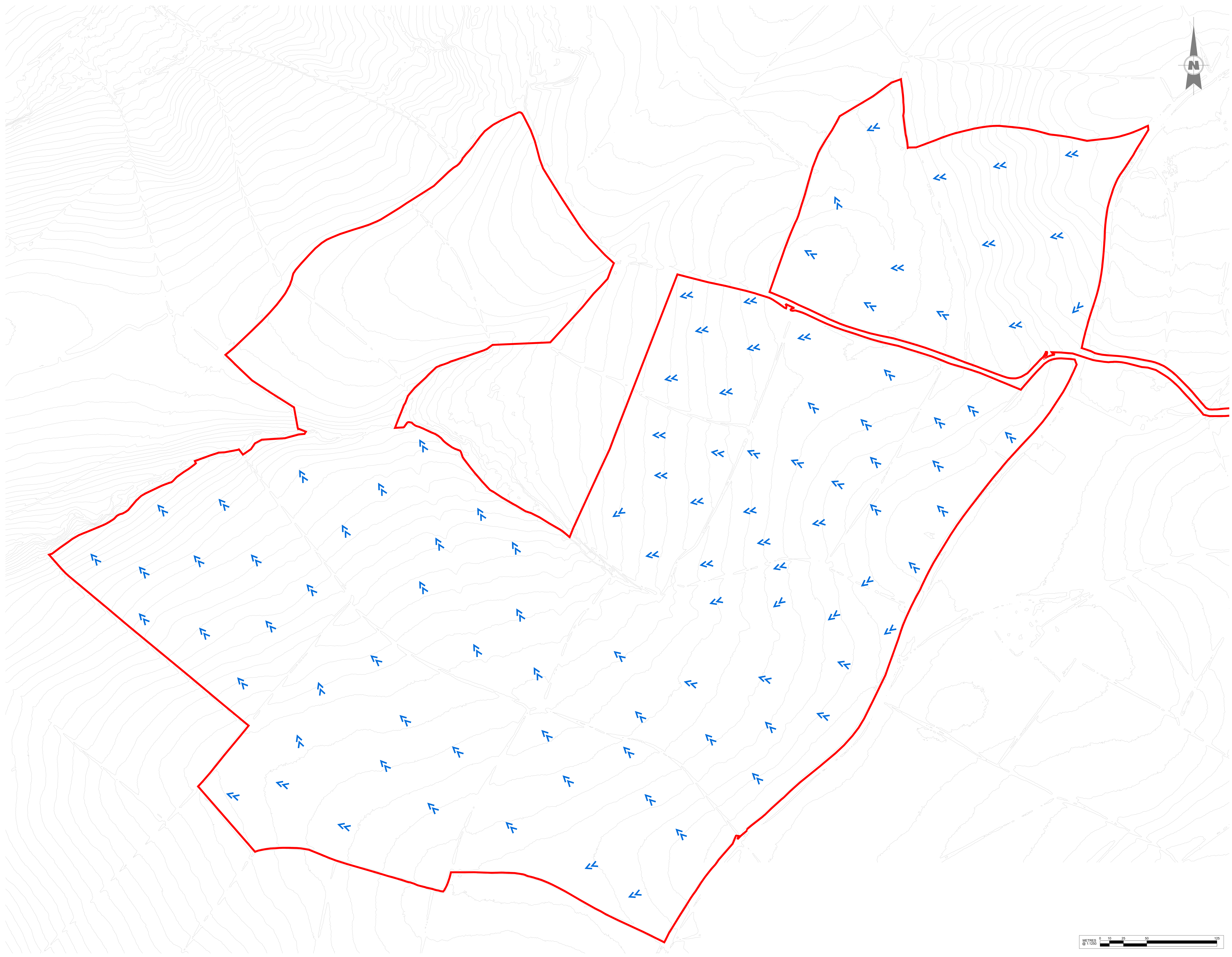
Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	1	1500	99.867	0.167	0.0	0.1888	0.0000	OK
2160 minute winter	2-SOAKAWAY	1500	99.867	0.267	0.1	3.5055	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
2160 minute winter	1	1.001	2-SOAKAWAY	0.0	-0.001	0.000	0.3568
2160 minute winter	2-SOAKAWAY	Infiltration		0.0			

Appendix I

Pre and Post Exceedance Flows



Notes

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PRELIMINARY
SUBJECT TO DETAILED DESIGN

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KEY

Indicative overland flow exceedance route

Rev	Description	By	Ckd	Date
P02	Redline Boundary Updates	CE	FC	19.08.25
P01	Preliminary	PM	FC	09.06.25

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Client: Qualitas Energy

Project: Heolddu Solar Farm

Title: Pre-Development Exceedance Flow Routes (1)

Status	Scale	Date Created
Preliminary	1:1,250@A0	09.06.25

Task Team Manager	Information Author	Task Information Manager
JM	PM	FC

Document Number: 21663-RPS-SD-ZZ-DR-D100-P02

RPS Project Number: 794-HYD-ENV-21663

Revision: P02

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KEY

Indicative overland flow exceedance route

Rev	Description	By	Ckd	Date
P02	Redline Boundary Updates	CE	FC	19.08.25
P01	Preliminary	PM	FC	09.06.25

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Project: Heolddu Solar Farm

Title: Pre-Development Exceedance Flow Routes(2)

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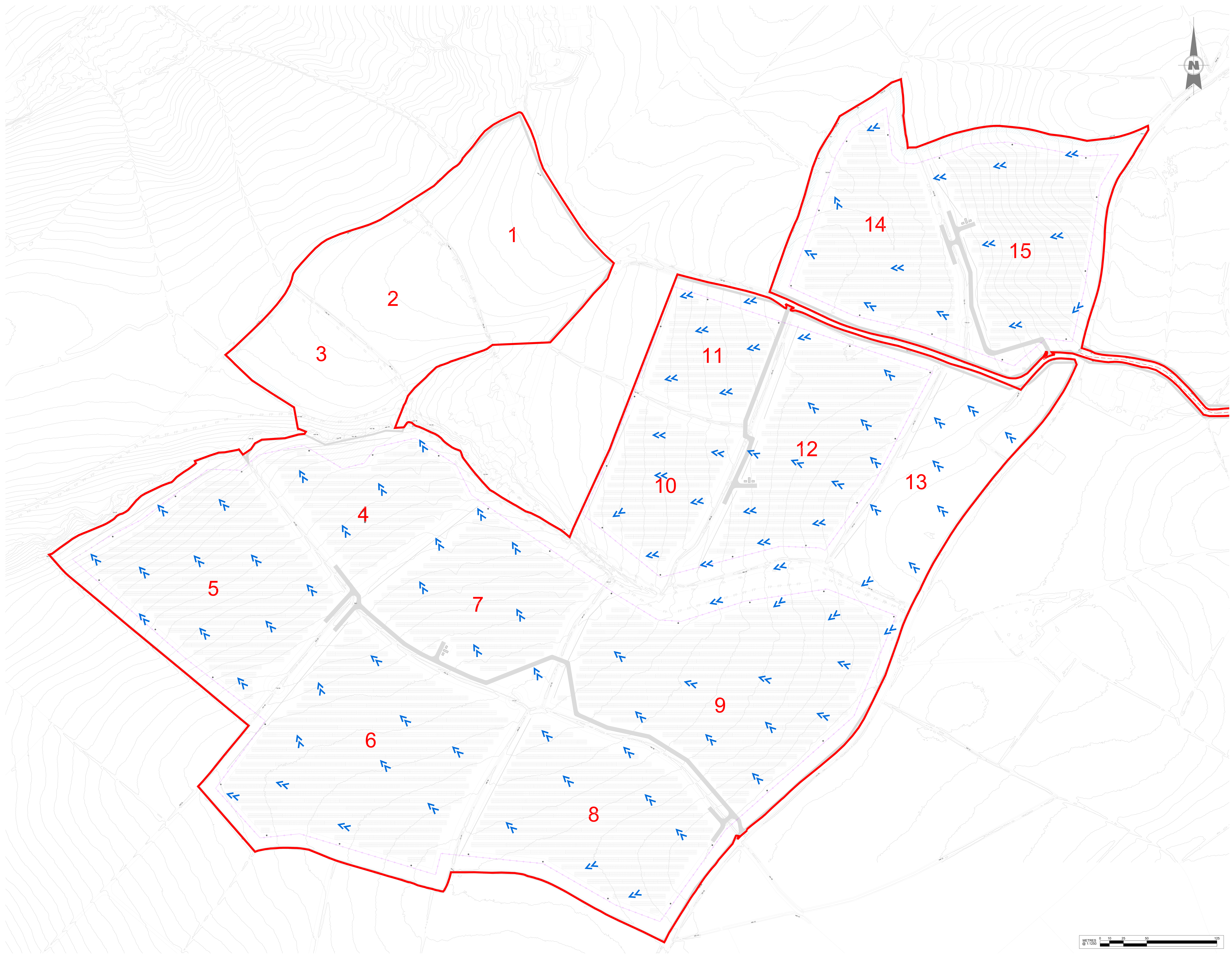

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Indicative overland flow exceedance route

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Project Heolddu Solar Farm

Title Post-Development Exceedance Flow Routes (1)

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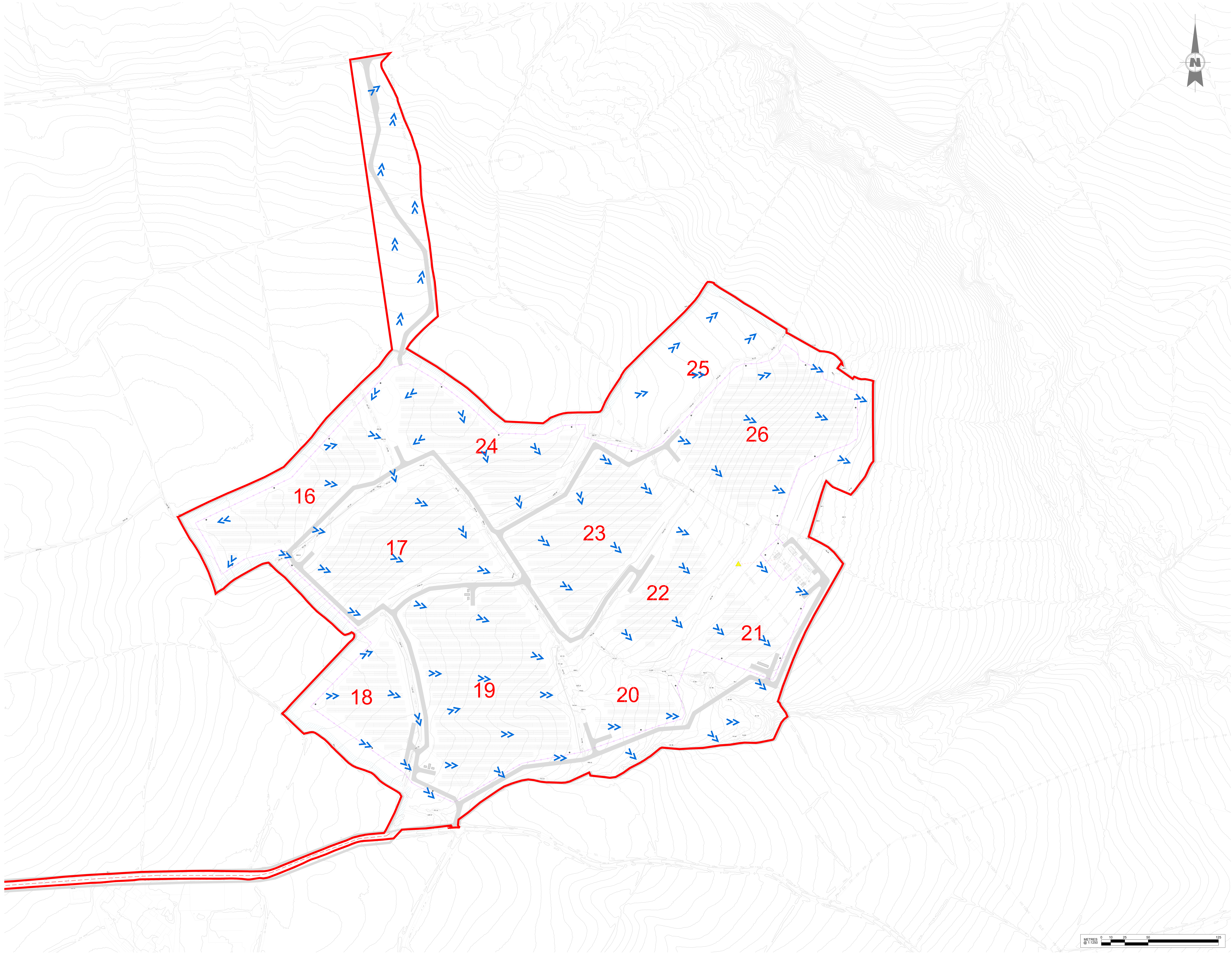

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Indicative overland flow exceedance route

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Appendix J

SuDS Maintenance Plans

Gravel Subbase Maintenance Schedule

Maintenance Schedule	Require Action	Typical Frequency
Regular Maintenance	Remove litter (including lead litter) and debris from gravel surface, access chambers and pre-treatment devices.	Monthly (or as required)
	Inspect grave surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Monthly
	Inspect pre-treatment systems, inlets ad perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.	Six monthly
	Remove sediment from pre-treatment devices.	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NUUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium.	Five yearly, or as required
	Clear perforated pipework of blockages.	As required

Filter Strip Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Mow amenity grass access paths.	Monthly or as required
	Mow filter strips.	Monthly or as required
	Where marsh or wetland develops due to wet conditions then cut annually, or as required, at 100mm cuttings to wildlife piles on site.	Annually or as required
Occasional Maintenance	Where there is a build-up of silt on the filter strip, remove and spread on site	As required
Remedial Actions	All damage to be made good to design profile unless there is a design flaw.	As required

Land/Ground Cover Suggested Maintenance

Maintenance Schedule	Require Action	Typical Frequency
Regular Maintenance	Litter/debris removal	Monthly
	Manage vegetation	Monthly at start, then as required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly or as required
	Weed killing	Monthyl during growing season, or as required
	Burn out fence lines	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth (wildflower mix meadows), alter plant type to better suit conditions if required.	As required
Remedial Maintenance	Repair erosion or other damage by reseeding wildflower mix meadows.	As required