Appendix G: Water Environment Environmental Appraisal Report

Binn Farm Solar & BESS

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Basis of Report

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Table of Contents

Tables in Text

Annexes

Acronyms and Abbreviations

BESS	Battery Energy Storage System
BGS	British Geological Survey
BNG	British National Grid
CAR	Controlled Activities Regulations
CEMP	Construction Environmental Management Plan
CIRIA	the Construction Industry Research and Information Association
DIA	Drainage Impact Assessment
DWPA	Drinking Water Protected Area
EASR	Environment Authorisations Scotland Regulations
ECoW	Ecological Clerk of Works
EnvCoW	Environmental Clerk of Works
EU	European Union
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
GPP	Guidance for Pollution Prevention
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LDP	Local Development Plan
m AOD	Metres Above Ordnance Datum
NPF4	National Planning Framework 4
OS	Ordnance Survey
PAN	Planning Advice Notes
PKC	Perth and Kinross Council
PWS	Private Water Supply
SEPA	Scottish Environment Protection Agency
SLR	SLR Consulting Limited
SuDS	Sustainable Drainage Systems
WEWS	Water Environment and Water Services (Scotland) Act
WFD	The Water Framework Directive

NON-TECHNICAL SUMMARY

An appraisal has been undertaken of the potential impacts the Proposed Development could have on the water environment. It considers both the construction and operational phases of the Proposed Development.

Information on the study area was compiled using baseline information from a desk study that was verified by field work prior to completion of the assessment, including private water supply surveys. The assessment was undertaken considering mitigation measures incorporated as part of the development design and industry good practice measures which will be adopted as standard. The appraisal is supported by a set of figures that show the setting of the Proposed Development, and the relative location of potential receptors.

It has been shown that the Proposed Development is not considered to be at risk of flooding and that surface water attenuation measures in accordance with sustainable drainage principles can be provided on Site to control both the rate and quality of discharge from Site, so that flood risk to Site users and downstream land and property is not increased.

Subject to good practice measures and a site-specific Construction and Environmental Management Plan (CEMP), it has been shown that the Proposed Development would have no adverse effects on the water environment. The CEMP would include provision of a Pollution Prevention Plan and Incident Response Plan and would be agreed with the Scottish Environment Protection Agency and Perth and Kinross Council prior to construction.

It has been recommended that the detailed drainage design for the BESS compound is agreed with the Scottish Environment Protection Agency and Perth and Kinross Council prior to construction. This could be secured by a planning condition.

Notwithstanding these safeguards, a programme of predevelopment, construction phase and post construction water quality monitoring is also proposed at the private water supply sources which are located within or in close proximity to the Site. Monitoring results would be used to confirm that the Proposed Development does not have a significant adverse effect on the water environment and nearby private water supplies and, would be used ensure the effectiveness of any good practice or remedial measures implemented.

1.0 Introduction

SLR Consulting Limited (SLR) has been appointed by Trio Power Limited to provide consulting services to support a proposed solar photovoltaic (PV) array and Battery Energy Storage System (BESS) development ('the Proposed Development') at a site near Glenfarg in Perth and Kinross ('the Site').

The report addresses potential impacts on the water environment, including hydrological and hydrogeological receptors. It presents a summary of the existing baseline conditions with respect to the water environment and considers potential impacts the Proposed Development may have on the water environment. It also details the embedded mitigation and good practice measures which would be implemented during construction and operation of the development.

The assessment has been undertaken by SLR and has been overseen by a Technical Director at SLR who has more than 20 years' experience assessing similar developments.

This report is supported by the following technical appendices and figures:

- **Annex 1:** Flood Risk Assessment and Drainage Impact Assessment;
- **Annex 2**: Private Water Supply Risk Assessment;
- **Figure 1**: Local Hydrology;
- **Figure 2**: Soils;
- **Figure 3**: Superficial Geology;
- **Figure 4**: Bedrock Geology;
- **Figure 5:** Regional Hydrogeology; and
- **Figure 6**: Groundwater Vulnerability.

2.0 Scope of Appraisal

The assessment is based on the description of the Proposed Development detailed in **Section 4** of the accompanying Supporting Environmental Information Report (SEIR) and shown on **Figure 4.1.**

2.1 Study Area

The study area encompasses the areas over which all desk based, and field data were gathered to inform the assessment presented in this report. The study area is shown on **Figures 1** to **6** and is defined by a 500 m buffer to the Site boundary. Beyond this distance, any potential effect with respect to the water environment is considered to be so diminished as to be undetectable.

2.2 Legislation, Policy and Guidance

The water environment in Scotland is afforded significant protection through key statutes and the regulatory activities of Scottish Environment Protection Agency (SEPA) and the local authorities. The assessment has been undertaken with respect to environmental legislation, planning policy and general guidance, including the following which are relevant to the water environment.

2.2.1 Legislation

Legislation relevant to the assessment includes:

- European Union (EU) Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environment Act 1995;
- Environmental Protection Act 1990;
- The Flood Risk Management (Scotland) Act 2009;
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act);
- Environmental Authorisations (Scotland) Regulations 2018 (EASR);
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Water Supply (Water Quality) (Scotland) Regulations 2001; and
- Private Water Supplies (Scotland) Regulations 2006.

2.2.2 Policy

The National Planning Framework 4 (NPF4)[1] provides planning guidance and policies regarding sustainable development, tackling climate change and achieving net zero. Policies relevant to this report include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

Additionally, Perth and Kinross Council (PKC) Local Development Plan (LDP)[2] provides planning guidance on the type and location of development that can take place in the region and provides the framework against which planning applications are assessed. Specific policies relevant to this assessment include:

- Policy 33: Renewable and Low-Carbon Energy;
- Policy 38: Environment and Conservation;
- Policy 52: New Development and Flooding; and
- Policy 53: Water Environment and Drainage.

2.2.3 Guidance

The following guidance and technical standards have informed this assessment:

- Planning Advice Notes (PAN):
  - PAN 61 Planning and Sustainable Urban Drainage Systems[3]; and
  - Online Planning Advice on Flood Risk[4].

[1] National Planning Framework 4, last accessed November 2025

[2] Adopted Local Development Plan (LDP2) - Perth & Kinross Council, last accessed November 2025

[3] Planning Advice Note 61: Sustainable urban drainage systems - gov.scot, last accessed November 2025

[4] Flood risk: planning advice - gov.scot, last accessed November 2025

- SEPA Guidance for Pollution Prevention (GPP)[5]:
  - GPP01 Understanding your environmental responsibilities;
  - GPP02 Above Ground Oil Storage Tanks;
  - GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
  - GPP05 Works and Maintenance in or near Water;
  - GPP06 Working at Construction and Demolition Sites;
  - GPP08 Safe Storage and Disposal of Used Oils;
  - GPP13 Vehicle Washing and Cleaning;
  - GPP18 Containing Major Spillages and Firewater at Industrial Sites;
  - GPP21 Pollution Incident Response Planning; and
  - GPP22 Dealing with Spills.
- Construction Industry Research and Information Association (CIRIA) Publications:
  - C532 Control of Water Pollution from Construction Sites (2001)[6];
  - C624 Development and Flood Risk – Guidance for the Construction Industry (2004)[7];
  - C741 Environmental Good Practice on Site (2015)[8]; and
  - C753 The Sustainable Urban Drainage Systems (SUDS) Manual (2015)[9].
- SEPA Publications:
  - Groundwater Protection Policy for Scotland, Version 3 (2009)[10];
  - Technical Flood Risk Guidance for Stakeholders (2022)[11];
  - Flood Risk and Land Use Vulnerability Guidance (2024)[12];
  - Recommended Riparian Corridor Layer for use in Land Use Planning (2024)[13];
  - Climate Change Allowances for Flood Risk Assessment in Land Use Planning (2025)[14]; and

[5] Guidance for Pollution Prevention (GPP) documents | NetRegs | Environmental guidance for your business in Northern Ireland & Scotland, last accessed November 2025

[6] Publication C532 Control of water pollution from construction sites: guidance for consultants and contractors, CIRIA - Publication Index | NBS, last accessed November 2025

[7] Publication C624 Development and flood risk - guidance for the construction industry, CIRIA - Publication Index | NBS, last accessed November 2025

[8] Publication C741 Environmental good practice on site guide. 4th edition, CIRIA - Publication Index | NBS, last accessed November 2025

[9] Publication C753 SuDS manual, CIRIA - Publication Index | NBS, last accessed November 2025

[10] Groundwater Protection Policy for Scotland V3, November 2009, last accessed November 2025

[11] technical-flood-risk-guidance-for-stakeholders.pdf, last accessed November 2025

[12] land-use-vulnerability-guidance.docx, last accessed November 2025

[13] recommended-riparian-corridor-note.docx, last accessed November 2025

[14] climate-change-allowances-guidance_v6.pdf, last accessed November 2025

- Guidance on Assessing the Impact of Development on Groundwater Abstractions (2024)[15].

- Other Guidance:
  - PKC Guidance on Flood Risk & Flood Risk Assessments[16];
  - Scottish Water Sewers for Scotland[17]
  - British Standards Institution (2017), Assessing and Managing Flood Risk in Development – Code of Practice, Report BS-8533:2017[18]

3.0 Consultation

Data requests were issued to SEPA, Scottish Water, and PKC, to obtain information relating to water quality data, groundwater level and flow data, private water supplies, licenced water abstractions and discharges and details on nearby Scottish Water assets.

Pre-application advice and screening opinion was also sought from PKC. **Table 1** summarises the key points relevant to water raised through consultation for the Proposed Development.

Table 1: Consultation Response

Consultee	Response	Comment
PKC Floods Team Pre-application response 25 May 2025	No objection.	Noted. A site-specific flood risk assessment and outline drainage strategy is presented as **Annex 1**.
	SEPA flood maps indicate there may be localised areas with low/medium probability of surface water flooding.	
	Surface Water Management – Land affected by surface water flooding can generally be developed assuming the surface water risk can be managed through the development of the site drainage system and land drainage to manage surface water entering the site from outside its boundaries.	
	Drainage Strategy - The applicant must develop a Drainage Strategy that addresses existing natural drainage systems and site modifications. This strategy should outline how the development will manage surface water, including stormwater runoff and flood prevention while incorporating sustainable drainage techniques.	
	Essential infrastructure - The development is classified as Essential Infrastructure and can be built within a flood-risk area (200yr + Climate Change) as per NPF4 Policy 22a. It should be designed and constructed to be operational during floods, not impede water flow, and not increase the risk of flooding elsewhere.	
PKC Screening Opinion	Screening opinion confirms that a full Environmental Impact Assessment (EIA) Report is not required. Flooding was identified as potentially significantly affected by the Proposed	Noted. A site-specific flood risk

[15] guidance-on-assessing-the-impacts-of-developments-on-groundwater-abstractions.docx, last accessed November 2025

[16] Flood Risk and Flood Risk Assessments, last accessed November 2025

[17] Scottish Water Sewers for Scotland v4.0, last accessed November 2025

[18] BS 8533:2017 Assessing and managing flood risk in development - Code of practice, last accessed November 2025

Consultee	Response	Comment
31 July 2025	Development due to potential for increased runoff from the creation of hard surfaces. Mitigation measures may be required to prevent run off to water courses and other land uses. Submission should be supported by a Flood Risk and Drainage Impact Assessment.	assessment and outline drainage strategy is presented as **Annex 1**.

4.0 Methodology

4.1 Desk Study

An initial desk study has been undertaken to determine and confirm the baseline characteristics by reviewing available information on geology, water and soils. The following sources of information have been consulted in order to characterise the baseline conditions of the study area:

- Ordnance Survey (OS) 1:10,000, 1:25,000 and 1:50,000 scale mapping;
- OS Terrain 5 digital terrain model (DTM);
- UK Centre for Ecology and Hydrology, Flood Estimation Handbook (FEH) webservice[19];
- NatureScot SiteLink[20];
- National Soil Map of Scotland (1:250,000 scale)[21]
- Carbon and Peatland 2016 data[22];
- British Geological Survey (BGS) Onshore Geoindex[23];
- BGS Hydrogeological Maps of Scotland (1:100,000 scale aquifer productivity and groundwater vulnerability datasets)[24];
- SEPA rainfall data[25];
- SEPA flood maps[26]; and
- SEPA environmental data[27].

4.2 Field Survey

Hydrological walkover surveys were carried by SLR on 24 July, 22 August and 04 November 2025 to allow an appreciation of the study area, verify the information that was collected during the desk study and complete a private water supply survey. This information was used to inform the emerging project design and to complete this assessment.

[19] Map - FEH Web Service, last accessed November 2025
[20] SiteLink - Home, last accessed November 2025
[21] National soil map of Scotland | Scotland's soils, last accessed November 2025
[22] Carbon and peatland 2016 map | Scotland's soils, last accessed November 2025
[23] GeoIndex - British Geological Survey, last accessed November 2025
[24] Hydrogeological maps of Scotland - British Geological Survey, last accessed November 2025
[25] Scottish Rainfall Data - provided by Scottish Environment Protection Agency (SEPA), last accessed November 2025
[26] Flood maps | Beta | SEPA | Scottish Environment Protection Agency, last accessed November 2025
[27] Environmental data | Scottish Environment Protection Agency (SEPA), last accessed November 2025

4.3 Assessment of Potential Effects

The assessment of potential effects to receptors identified by the baseline and field study has then been undertaken considering the safeguards incorporated into the site design and industry good practice that would be used during construction and operation of the Proposed Development.

5.0 Baseline Conditions

This section outlines the baseline soil, geology, and water environment conditions within the study area.

5.1 Site Setting

The Site is located approximately 4 km north-west of Strathmiglo, 5 km north-east of Glenfarg and is centred at British National Grid (BNG) E 318188, N 712158. The Site currently comprises agricultural land for grazing and planting purposes.

Ground elevations generally slope from northeast to west, with a high point of approximately 250 m above Ordnance Datum (AOD) along the eastern boundary of the Site, and a low of approximately 140 m AOD at the proposed Site access point off the A912. The majority of the Proposed Development is situated at an elevation of between 180 m AOD and 250 m AOD.

SEPA precipitation data[25] for Rossie Farm rainfall gauge (station ID: 15070), located approximately 7.5 km south-east of the Site, recorded an annual precipitation total of 748.4 mm in 2024.

5.2 Designated Sites

A review of Naturescot SiteLink webpage[20] confirms there are no statutory geological or water dependent designated sites within the study area.

5.3 Soils and Geology

5.3.1 Soils

An extract of the 1:250,000 Soil Map of Scotland[21] is presented as **Figure 2** which indicates that the Site is primarily underlain by brown soils, with a small area of mineral podzols within the eastern extent of the Site.

5.3.2 Peat and Superficial Deposits

An extract of BGS superficial deposit mapping[23] (see **Figure 3**) shows that the entire Site is shown to be absent any superficial deposits, except for the proposed Site access point off the A912 which is shown to be underlain by glacial till deposits. No peat deposits are recorded.

Priority peatland mapping confirms that the Site is underlain by mineral soils (Class 0) which are not considered to represent peatland habitats.

5.3.3 Bedrock Geology

An extract of BGS bedrock and linear features geology mapping is presented as **Figure 4** and shows that the Site is underlain by andesites, basalts and conglomerates of the Ochil Volcanic Formation.

5.4 Hydrogeology

5.4.1 Aquifer Characteristics and Groundwater Vulnerability

An extract of the BGS 1:625,000 scale Hydrogeological Map of Scotland[23] and the 1:100,000 scale Aquifer Productivity and Groundwater Vulnerability datasets[24] are presented in **Figure 5** and **Figure 6** respectively.

Review of **Figure 5** confirms that the igneous bedrock is classified as a low productivity aquifer whereby small amounts of groundwater could be presented in near surface weathered zones, secondary fractures and rare springs yielding groundwater quantities of up to 2l/s.

The Aquifer Productivity and Groundwater Vulnerability dataset classifies the underlying aquifer (superficial and bedrock) according to the predominant groundwater flow mechanism (fracture or intergranular) and the estimated groundwater productivity. Groundwater vulnerability is divided into five classes (1 to 5) with 1 being least vulnerable and 5 being most vulnerable.

Review of **Figure 6** confirms that the bedrock aquifer is a low productivity aquifer. Any groundwater that is present would be confined to shallow depths and found in the upper weathered surface of the rock or in secondary fractures with all current flow through fractures and discontinuities.

The Proposed Development is shown to be underlain by groundwater vulnerability class of 5. Due to the lack of superficial deposits recorded within the Site, there is little attenuation of potential pollutants prior to entry to groundwater.

5.4.2 Groundwater Levels and Flow

SEPA have confirmed that they have no groundwater level monitoring locations within the study area.

Groundwater recharge in the study area is limited due to the following factors:

- steeper topographic gradients will result in rainfall preferentially forming surface water runoff;
- the underlying bedrock (where not weathered or fractured) generally displays a low permeability that limits groundwater recharge and prevents large scale storage and movement of the groundwater.

In the absence of published information or data held by SEPA, it is anticipated that limited quantities of groundwater will be present within the weathered zone, fractures or faults within the bedrock deposits.

5.4.3 Groundwater Quality

All of Scotland’s groundwater bodies have been designated as Drinking Water Protected Areas (DWPA) under the Water Environment (Drinking Water Protected Area) (Scotland) Order 2013 and require protection for their current use or future potential as drinking water resources.

SEPA has identified that the Site is underlain by two groundwater bodies:

- the western extent of the Site is located within the Glenfarg groundwater body (ID: 150527) which has been designated with an overall classification of Good (in 2023, the latest reporting cycle); and

- the eastern extent of the Site is located within the Auchtermuchty groundwater body (ID: 150579) which has been designated with an overall classification of Poor due to poor water quality from diffuse rural pollution.

5.4.4 Groundwater Dependent Terrestrial Ecosystems (GWDTE)

Due to the agricultural nature of the Site, no National Vegetation Classification (NVC) survey has been undertaken. Given the sites current agricultural use and underlying low permeability geology, no GWDTE are expected to be present at the Site and no evidence of GWDTEs were recorded as part of the hydrological walkover.

5.5 Hydrology

5.5.1 Local Hydrology

The local hydrology is shown on **Figure 1**.

The northern, western and south-western extent of the Site is located within the River Farg surface water catchment whilst the south-eastern extent is located within the River Eden surface water catchment specifically the Barroway Burn sub catchment.

The River Farg is located approximately 1.4 km north-west of the Site, at its closest extent. Two tributaries of the River Farg are located within proximity to the Site. The Binn Burn rises to the north of the Site and flows generally north-westwards before discharging into the River Farg approximately 1.4 km north-west of the Site, whilst the Mill Burn flows northwards along the A912. Two tributaries of the Mill Burn are shown to the west of the Site.

Approximately 62% of the Site is located within the River Farg catchment, including the existing access track from the A912, the proposed BESS, temporary compound and solar development within the northern and western extent of the Site.

The entire River Farg surface water catchment has also been designated as a DWPA.

The Barroway Burn and River Eden is located approximately 1.9 km and 2.7 km south of the Site respectively. No tributaries of the Barroway Burn or River Eden rise within the Site. Approximately 38% of the Site is located within the Barroway Burn catchment which includes the remainder of the solar development and proposed access tracks.

5.5.2 Surface Water Quality

The larger watercourses within the study area or hydraulically connected to the study area are monitored by SEPA as part of its responsibility under the WFD. A summary of the SEPA classification for the latest reporting cycle (2023) is shown on **Table 2**. Smaller watercourses within the study area, including the Binn Burn and Mill Burn are not monitored or classified by SEPA.

Table 2: SEPA Surface Water Classifications (2023)

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical	Hydro morphology	Water Quality	Pressures
River Farg (ID: 6701)	Moderate ecological potential	Poor	Good	Poor	Moderate	Heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on water storage for public drinking water.

Watercourse (SEPA ID)	Overall Status	Overall Ecology	Physio-Chemical	Hydro morphology	Water Quality	Pressures
Glassart Burn / Barroway Burn (ID: 6212)	Poor ecological potential	Bad	High	Bad	High	Heavily modified water body on account of physical alterations that cannot be addressed without a significant impact from an increased risk of subsidence or flooding.
River Eden – source to confluence with Rossie Drain (ID: 6201)	Moderate ecological potential	Bad	Moderate	Bad	Moderate	Heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.

5.5.3 Flood Risk

A site-specific Flood Risk Assessment (FRA) is included as **Annex 1**, which assesses the risk of flooding to the Proposed Development. The FRA confirms that the majority of the Proposed Development is not at risk of flooding for the NPF4 design event of 1 in 200-year plus an allowance for climate change except for some small, isolated areas of surface water flooding. It is understood that safe access/egress is to be afforded by the existing tracks and that no alterations to these routes are required. Surface water flood risk areas are discussed further in **Annex 1**.

5.5.4 Watercourse Crossings

The Proposed Development has sought to use existing access tracks where possible. There are no additional watercourse crossings required as part of the Proposed Development.

5.6 Private Water Supplies

As part of this assessment, details of private water supply (PWS) sources within the study area were obtained from PKC. In addition, a programme of site investigation has been undertaken to confirm the location of PWS sources.

The risk the Proposed Development poses to PWS sources has been considered as part of this assessment and is presented as **Annex 2**. It confirms that:

- four PWS sources have been identified within the study area;
- two PWS sources are not considered at risk from the Proposed Development; and
- two PWS sources are considered at risk from the Proposed Development.

5.7 Scottish Water Assets

Scottish Water Asset Plans have been reviewed with regard to any drainage or water distribution assets that may be located within the Site. No assets have been identified within the study area.

5.8 Licenced Sites (Abstractions, Discharges, and Waste)

SEPA has provided details of Controlled Activity Regulations (CAR) authorisations within the study area which shows that there are nine CAR authorisations within the study area, the details of which include:

- four CAR authorisations for private sewage discharges;
- three CAR authorisations for point source discharges from existing sewage treatment systems;
- one CAR authorisation for point source discharge to land from new sewage treatment system; and
- one unknown CAR authorisation.

No licenced abstractions have been recorded within the study area.

6.0 Good Practice and Embedded Mitigation

6.1.1 Embedded Mitigation

Generally, a 50 m buffer has been applied around watercourses and waterbodies as shown on the 1:10,000 scale mapping and in accordance with SEPA's guidance[13] a minimum 10 m buffer has also been applied. It is confirmed that no development is proposed within 10 m of any of the mapped watercourses and the only development located within the 50 m buffer are solar panels within the south-eastern extent of the Site (which are considered water compatible).

In addition, a 100 m buffer has been applied to two PWS sources which are located within Site (see **Annex 2**) and it is confirmed that no development or construction activities are proposed within 100 m of the PWS sources, apart from proposed security fencing.

6.1.2 Good Practice Measures

The Proposed Development will be undertaken in accordance with industry good practice guidance including those detailed in **Section 2.2.3**. As a principal, preventing the release of any pollution or sediment is preferable to dealing with the consequence of any release.

6.1.2.1 Construction Environmental Management Plan

A contractual management requirement of the successful Principal Contractor would be the development and implementation of a comprehensive and site-specific Construction Environmental Management Plan (CEMP). This document would detail how the works would be managed in accordance with the commitments and mitigation detailed in the Environmental Appraisal, statutory consents and authorisations, and industry good practice and guidance.

The CEMP will include measures to ensure that the works minimise the risk to the water environment and would ensure the works are undertaken in accordance with good practice guidance. These include:

- during construction there would be heavy plant and machinery required and as a result it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in GPPs (GPP01);
- in accordance with GPP02 any above ground on-site fuel and chemical storage would be bunded;

- emergency spill response kits would be maintained during the construction works (GPP21);
- a vehicle management system would be put in place wherever possible to reduce the potential conflicts between vehicles and thereby reduce the risk of collision (GPP21);
- suitable access routes would be chosen which minimise the potential requirement for either new temporary access tracks or for tracking across open land which could contribute to the generation of suspended solids;
- a speed limit would be used to reduce the likelihood and significance of any collisions;
- plant nappies would be placed under stationary vehicles which could potentially leak fuel / oils;
- any temporary construction / storage compounds required would be located remote from any sensitive surface water receptors and will be constructed to manage surface water run-off in accordance with best practice;
- any water contaminated with silt or chemicals would not be discharged directly or indirectly to a watercourse without prior treatment; and
- water for temporary site welfare facilities would either be brought to site, or a local surface water or groundwater abstraction would be identified. Any water abstraction would be made in accordance with General Binding Rules or an authorisation would be obtained from SEPA in accordance with the EASR;
- foul water would either be collected in a tank and collected for offsite disposal at an appropriately licensed facility or discharge will be to a septic tank or soakaway in accordance with the EASR; and
- a wet weather protocol would be developed which would detail the procedures to be adopted by all staff during periods of heavy rainfall.

6.1.2.2 Environmental or Ecological Clerk of Works (EnvCoW or ECoW)

To ensure all reasonable precautions are taken to avoid negative effects on the water environment, a suitably qualified Environmental Clerk of Works (EnvCoW) or Ecological Clerk of Works (ECoW) will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all hydrological matters.

The EnvCoW/ECoW will be required to be present on-site during the construction phase and will carry out monitoring of works and briefings with regards to any hydrological sensitivities at the Site to the relevant staff of the Principal Contractor and subcontractors.

With respect to the water environment, the EnvCoW/ECoW will also have responsibility for advising on the maintenance of surface water flow paths and ensuring the quality of surface water and shallow groundwater is maintained.

6.1.2.3 Pollution Risk

Good practice measures in relation to pollution prevention would include the following:

- refuelling would take place at least 50 m from watercourses;
- foul water generated on-site would be managed in accordance with GPP4;
- areas would be designated for production of concrete or washout of vehicles which are a minimum distance of 50 m from a watercourse;

- washout water would also be stored in the washout area before being treated and disposed of, or re-used in concrete production;
- if any water is contaminated with silt or chemicals, runoff would not enter a watercourse directly or indirectly prior to treatment;
- water would be prevented as far as possible, from entering excavations such as trenches and foundations;
- procedures would be adhered to for storage of fuels and other potentially contaminative materials in line with the EASR, to minimise the potential for accidental spillage; and
- a plan for dealing with spillage incidents would be designed prior to construction, and this would be adhered to should any incident occur, reducing the effect as far as practicable. This would be included in the final CEMP for the Proposed Development.

Site investigation (e.g., trial pitting and/or boreholes) will be undertaken at the detailed design stage, prior to any construction works, where excavation will be required to construct the Proposed Development. The site investigation will inform detailed design and construction methods of the Proposed Development to ensure pollution risk is further considered and minimised prior to construction.

6.1.2.4 Erosion and Sedimentation

Good practice measures for the management or erosion and sedimentation would include the following:

- all stockpiled materials would be located out with a 50 m buffer from watercourses;
- water would be prevented as far as possible, from entering excavations such as trenches and foundations through the use of appropriate cut-off drainage;
- where the above is not possible, water would pass through silt/sediment traps to remove silt prior to discharge into the surrounding drainage system;
- clean and dirty water on-site would be separated, and dirty water would be filtered before entering the water environment;
- silt fences would be deployed as required to reduce sediment transport;
- the amount of ground exposed, and time period during which it is exposed, would be kept to a minimum;
- silt/sediment traps, single size aggregate, geotextiles or straw bales would be used to filter any coarse material and prevent increased levels of sediment. Further to this, activities involving the movement or use of fine sediment would avoid periods of heavy rainfall where possible; and
- the EnvCoW/ECoW and the Principal Contractor would carry out regular visual inspections of watercourses to check for suspended solids in watercourses downstream of work areas.

6.1.2.5 Flood Risk

It is typically assumed that solar panels would intercept precipitation and shed this onto the ground along the lower edge of each array (the ‘dripline’). Runoff from each solar panel would continue to infiltrate into the underlying soils locally, in much the same way as existing conditions. It is therefore considered that solar panels will generally not impact floodplain storage or increase peak runoff rates and volumes. Dripline planting will be used to manage

surface water runoff from the solar arrays, preventing channelisation, and mimicking the natural rainfall-runoff regime.

As detailed in **Annex 1**, it is proposed to adopt SuDS to manage surface water runoff from the proposed BESS site. The Drainage Impact Assessment (DIA) outlines a concept drainage design to show how surface water runoff from proposed BESS site can be managed in accordance with current best practice. The concept design presented in **Annex 1** will be developed further as part of the detailed design stage of the project and would be agreed with PKC and SEPA prior to construction. It is anticipated that this will be secured by a planning condition.

6.1.2.6 Fire Water Management

As detailed in **Annex 1,** provision has been made for firewater containment in the BESS site. This is proposed to be provided by lining the proposed detention basin with a low permeability liner and provision of a penstock/shutoff valve on the outfall which can be used in the unlikely event of a fire to contain firewater in the basin, thus preventing a discharge from Site. An outline estimate of the required volume for firewater containment, in accordance with GPP18, is detailed in **Annex 1**. This will again be developed further as part of the detailed drainage design and would be agreed prior to construction.

6.1.2.7 Concrete Pouring

In relation to works involving concrete batching, transport and pouring, the following mitigation would be adopted:

- where concrete transfers are required, measures would be adopted at the point of concrete transfer to prevent accidental spillage of liquid concrete and no transfers would be undertaken in proximity to watercourses or areas of standing water; and
- there would be no wash-out of concrete carrying vehicles (except the concrete chute). Chutes would be washed out to a suitable container, allowed to settle and disposed at suitably licensed facilities.

As part of the proposed investigation works, the ground conditions will be assessed to inform the concrete design which will be used to facilitate the Proposed Development in accordance with best practice. The design of the concrete will ensure that the concrete specification used is appropriate for the environment to minimise degradation and leaching into the surrounding soil and water environment. If necessary, the excavations would incorporate an adequate barrier to prevent the movement of any on-site pollutants to the underlying soils, groundwater and surface water environment. These methods will be specified in the CEMP and agreed with PKC and SEPA prior to construction.

6.1.2.8 Water Quality Monitoring

As detailed in **Annex 2**, water quality monitoring before, during construction and post construction will be undertaken at the private water supplies located within and in close proximity to the Site to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality were implemented. The performance of the good practice measures would be kept under constant review by the water monitoring schedule, based on a comparison of data taken during construction with a baseline data set, sampled prior to the construction period.

The monitoring programme would be secured by a pre-development planning condition to be agreed with PKC.

7.0 Appraisal of Potential Impacts

The following have the potential to impair the water environment:

- the use of machinery and the movement of soils have the potential to generate suspended solids in surface water runoff and/or introduce oils or hydrocarbons to the water environment;
- construction activities could impact private water supplies;
- existing groundwater or surface water drainage paths could be disturbed or altered;
- fire water runoff from the BESS units has the potential to enter the water environment; and
- inadequate hardstanding drainage could increase or exacerbate local surface water ponding and flooding.

7.1 Surface and Ground Water Quality

7.1.1 Construction Phase

The construction of the Proposed Development would be undertaken in accordance with relevant technical guidance, GPPs and other codes of best practice, to limit the potential for contamination of both ground and surface waters. In addition, a site-specific CEMP would be prepared by the Principal Contractor and include a surface and groundwater quality management plan.

The above measures would significantly reduce the likelihood of pollutants, including suspended solids, being discharged to nearby watercourses or groundwater.

7.1.2 Operational Phase

The risk of contamination from the Proposed Development is considered to be very low, as there would be no requirement for the storage of any potentially hazardous substances and runoff from the Site would typically comprise of clean rainwater runoff from areas of hardstanding.

A surface water drainage strategy has been developed and is included in **Annex 1**. The drainage strategy outlines how surface water runoff can be managed, utilising SuDS, to manage the quality and rate of surface water discharged from the hardstanding areas.

The drainage system at the BESS has also been sized to manage firewater, should, in the unlikely event of a fire, water and fire retardants be used to extinguish a fire. Details of the proposed firewater management strategy associated within the proposed BESS will again be developed as part of the detailed drainage design for the Proposed Development, and sizing for the detention basin will accommodate flows as calculated in **Annex 1**. It is anticipated that this will be secured by a planning condition.

The solar panels will be cleaned infrequently and when they are cleaned it would be with clean water only. This will be confirmed and stipulated in an Operational Management Plan which will be agreed with PKC via a planning condition, should the development be consented.

As above, these measures would significantly reduce the likelihood of pollutants, including suspended solids, being discharged to nearby watercourses or groundwater.

7.2 Groundwater Levels and Flow

The proposed solar panels would be secured to the ground with steel piles, minimising the need for significant excavations and soil removal.

As discussed in the baseline assessment, the Proposed Development will be constructed on bedrock deposits that contains little groundwater. No significant deep or expansive earthworks are proposed when compared to the groundwater catchments so there will be no catchment scale impact on groundwater levels and flows.

The detailed design of the Proposed Development will be informed by further site investigation. The site investigation would be used to ensure appropriate safeguards are included in the construction works. No impact on groundwater levels and flow is therefore anticipated.

7.3 Surface Water Flow and Flood Risk

As outlined in **Annex 1**, the Proposed Development is not at risk of surface water flooding.

SuDS will be incorporated as part of the Proposed Development and a concept drainage design has been prepared (see **Annex 1**). This will ensure that increase in surface water runoff, associated with the increase in impermeable areas required to facilitate the Proposed Development, are managed onsite up to and including the 1 in 200-year event plus an allowance for climate change.

With these safeguards and those outlined in **Section 6**, surface water flow and flood risk to the Proposed Development and downstream of the Site can be mitigated.

7.4 Private Water Supplies

The appraisal has confirmed that two spring PWS source (PWS02 and PWS04) are noted within 250 m of the Proposed Development and part of the Proposed Development is noted within the surface water catchments to the springs (see **Annex 2**). It is noted that a 100 m buffer to these sources has been applied as part of the development design and no development except for the proposed security fencing is proposed within this buffer.

The PWS source, and pipeline to the property holding tank would need to be clearly marked and protected. It is noted that further investigations would be required to confirm the source and pipework for PWS03 within the Site boundary.

A detailed description of the safeguards would be given in the project CEMP which would be prepared by the Principal Contractor and agreed with SEPA and THC prior to construction commencing.

It is proposed that confirmatory water quality sampling of PWS02 and PWS04 is undertaken prior to, during and for a period following construction to confirm that Proposed Development has had no effect on the water supplies or resources. Details of the monitoring suite and monitoring frequency, assessment levels and contingency measures that would be adopted in the unlikely event that the water supply is impaired, would also be specified in the CEMP.

8.0 Summary

Existing hydrological and hydrogeological conditions have been confirmed and used to assess the potential effects the Proposed Development might have on the water environment.

Many of the potential impacts associated with a development of this nature have been mitigated by its design. Further, good practice measures that would safeguard the water environment have been committed. Subject to the adoption of the good practice construction

techniques and the committed further works at the detailed design stage of the project, no effects on hydrology or hydrogeology have been identified.

Figures

Appendix G: Water Environment Environmental Appraisal Report

Binn Farm Solar & BESS

Trio Power Limited
SLR Project No.: 405.065788.00001

16 December 2025

316000 316200 316400 316600 316800 317000 317200 317400 317600 317800 318000 318200 318400 318600 318800 319000

713400 713200 713000 712800 712600 712400 712200 712000 711800 711600

N

River Farg DWPA

River Farg

Glassart Burn/Barroway Burn

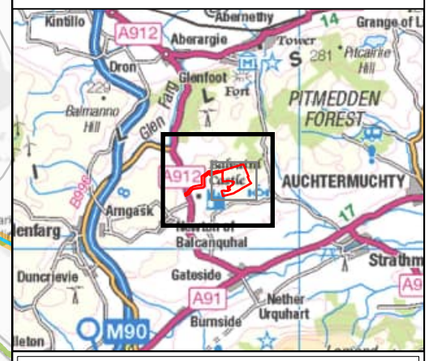
0 100 200
Metres

LEGEND

- Proposed Development Area
- Proposed Development 500 m Buffer
- Proposed Solar Photovolatic Layout
- Proposed Private Substation
- Proposed Distribution Network Operator (DNO) Substation
- Proposed Battery Energy Storage System (BESS)
- Proposed Construction Compound
- Proposed Transformer Station
- Proposed New Access Track
- Proposed Battery Energy Storage System (BESS) Fence
- Proposed Solar Photovoltaic Layout Fence
- Communication Equipment and Replacement Part Storage
- Proposed Welfare
- Proposed Water Tank
- Proposed CCTV Point Location

Local Hydrology

- SEPA CAR Licensed Activity
- SEPA Drinking Water Protected Area (DWPA)
- SEPA Nested Waterbody Catchment
- Riparian Corridor
- Watercourse (OS OpenMap Local)
- Waterbody (OS OpenMap Local)
- Watercourse and Waterbody 50 m Buffer
- Future (2070) Surface Water and Small Watercourses Medium Likelihood Flood Extent (0.5% AEP)
- Future (2080) River Medium Likelihood Flood Extent (0.5% AEP)



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BINN FARM SOLAR PV AND BESS

WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

LOCAL HYDROLOGY

FIGURE 1a

Scale 1:10,000 @ A3

Date DECEMBER 2025

405.065788.00001.0012.1 Local Hydrology

317400 317600 317800 318000 318200 318400 318600

712600 712400 712200 712000

405.065788.00001.0012.1 Local Hydrology

N

River Farg DWPA

River Farg

Glassart Burn/Barroway Burn

0 100 200

Metres

LEGEND

- Proposed Development Area
- Proposed Solar Photovolatic Layout
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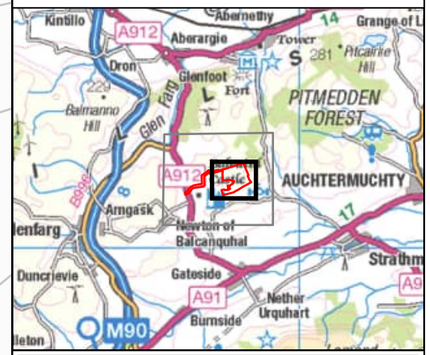
- Riparian Corridor
- Watercourse (OS OpenMap Local)
- Waterbody (OS OpenMap Local)
- Watercourse and Waterbody 50 m Buffer
- Future (2070) Surface Water and Small Watercourses Medium Likelihood Flood Extent (0.5% AEP)



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WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

LOCAL HYDROLOGY

FIGURE 1b

Scale 1:4,000 @ A3

Date DECEMBER 2025

316000 317000 318000 319000

713000 712000

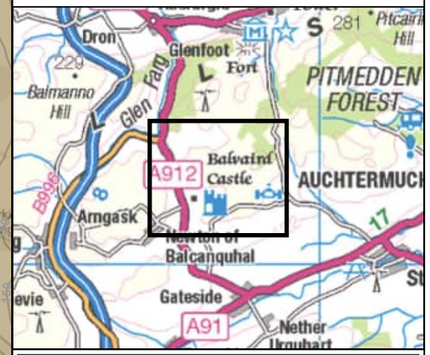
N

LEGEND

- Proposed Development Area
- Proposed Development 500 m Buffer
- Proposed Solar Photovolatic Layout
- Proposed Private Substation
- Proposed Distribution Network Operator (DNO) Substation
- Proposed Construction Compound
- Proposed Battery Energy Storage System (BESS)
- Proposed Transformer Station
- Proposed New Access Track
- Proposed Battery Energy Storage System (BESS) Fence
- Proposed Solar Photovoltaic Layout Fence
- Proposed Welfare
- Proposed Water Tank
- Communication Equipment and Replacement Part Storage
- Proposed CCTV Point Location

Soil Map of Scotland - Generalised Soil Type

- Brown Soils
- Mineral Podzols



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WATER ENVIRONMENT
ENVIRONMENTAL APPRAISAL

SOILS

FIGURE 2

Scale 1:10,000 @ A3

Date DECEMBER 2025

405.065788.00001.0013.1 Soils

316000 317000 318000 319000

713000 712000

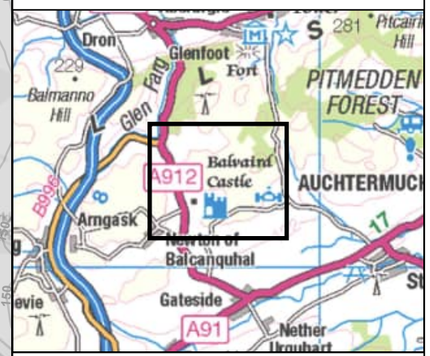
N

LEGEND

- Proposed Development Area
- Proposed Development 500 m Buffer
- Proposed Solar Photovolatic Layout
- Proposed Private Substation
- Proposed Distribution Network Operator (DNO) Substation
- Proposed Construction Compound
- Proposed Battery Energy Storage System (BESS)
- Proposed Transformer Station
- Proposed New Access Track
- Proposed Battery Energy Storage System (BESS) Fence
- Proposed Solar Photovoltaic Layout Fence
- Communication Equipment and Replacement Part Storage
- Proposed Welfare
- Proposed Water Tank
- Proposed CCTV Point Location

Superficial Geology

- Alluvium - Clay, Silt, Sand And Gravel
- Till, Devensian - Diamicton
- Bedrock Near or At Surface



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WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

SUPERFICIAL GEOLOGY

FIGURE 3

Scale 1:10,000 @ A3

Date DECEMBER 2025

0 0.5 1

Kilometres

405.065788.00001.0014.1 Superficial Geology

316000 317000 318000 319000

713000 712000

N

LEGEND

- Proposed Development Area
- Proposed Development 500 m Buffer
- Proposed Solar Photovolatic Layout
- Proposed Private Substation
- Proposed Distribution Network Operator (DNO) Substation
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- Proposed Welfare
- Proposed Water Tank
- Proposed CCTV Point Location

Bedrock Linear Geology

- Coal Seam Inferred
- Glacial Meltwater Channel

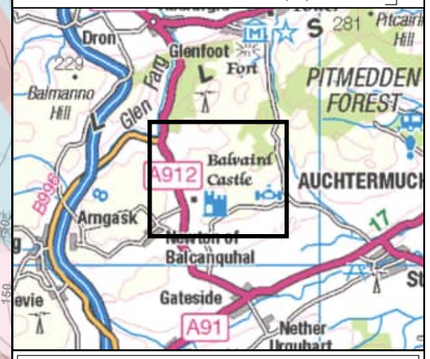
Bedrock Geology

DEVONIAN
- Burnside Sandstone Formation - Conglomerate, Sandstone And Siltstone
- Ochil Volcanic Formation - Conglomerate

Igneous Rocks

CARBONIFEROUS
- Central Scotland Late Carboniferous Tholeiitic Dyke Swarm - Basalt
- Central Scotland Late Carboniferous Tholeiitic Dyke Swarm - Quartz-microgabbro

DEVONIAN
- Ochil Volcanic Formation - Andesite, Hypersthene
- Ochil Volcanic Formation - Andesite, Pyroxene
- Ochil Volcanic Formation - Basalt, Macrophyric
- Ochil Volcanic Formation - Basaltic-andesite (tas)



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WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

BEDROCK GEOLOGY

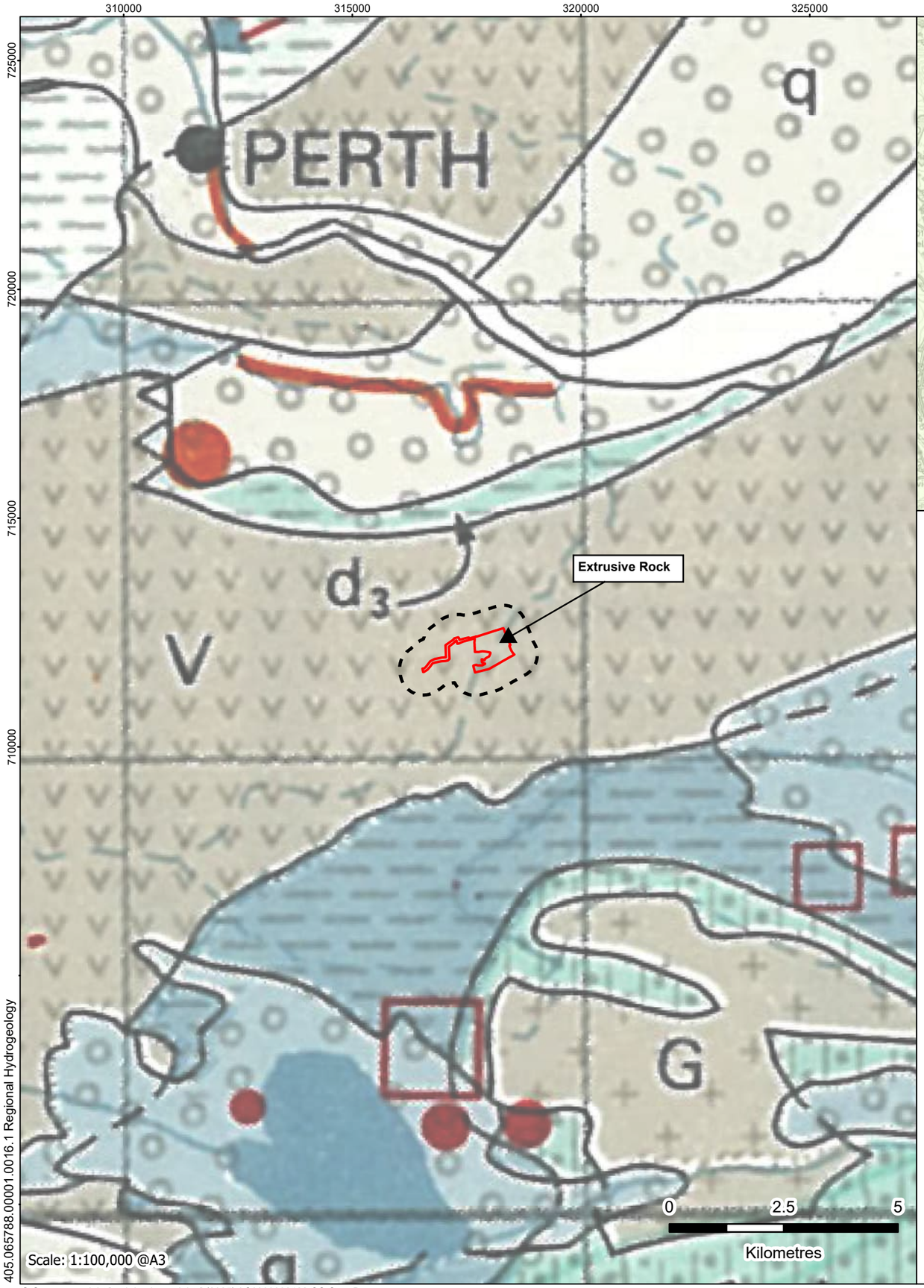
FIGURE 4

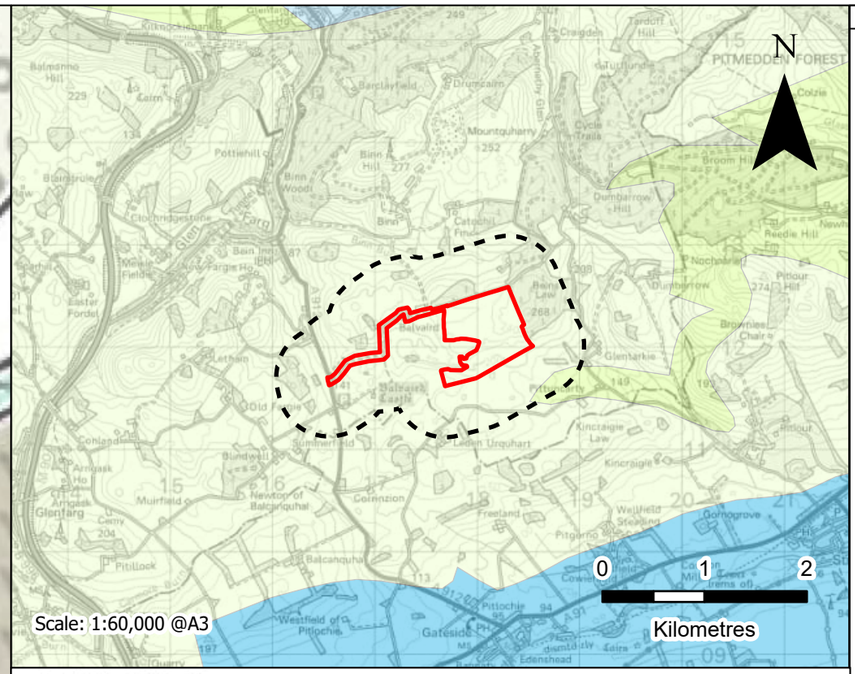
Scale 1:10,000 @ A3

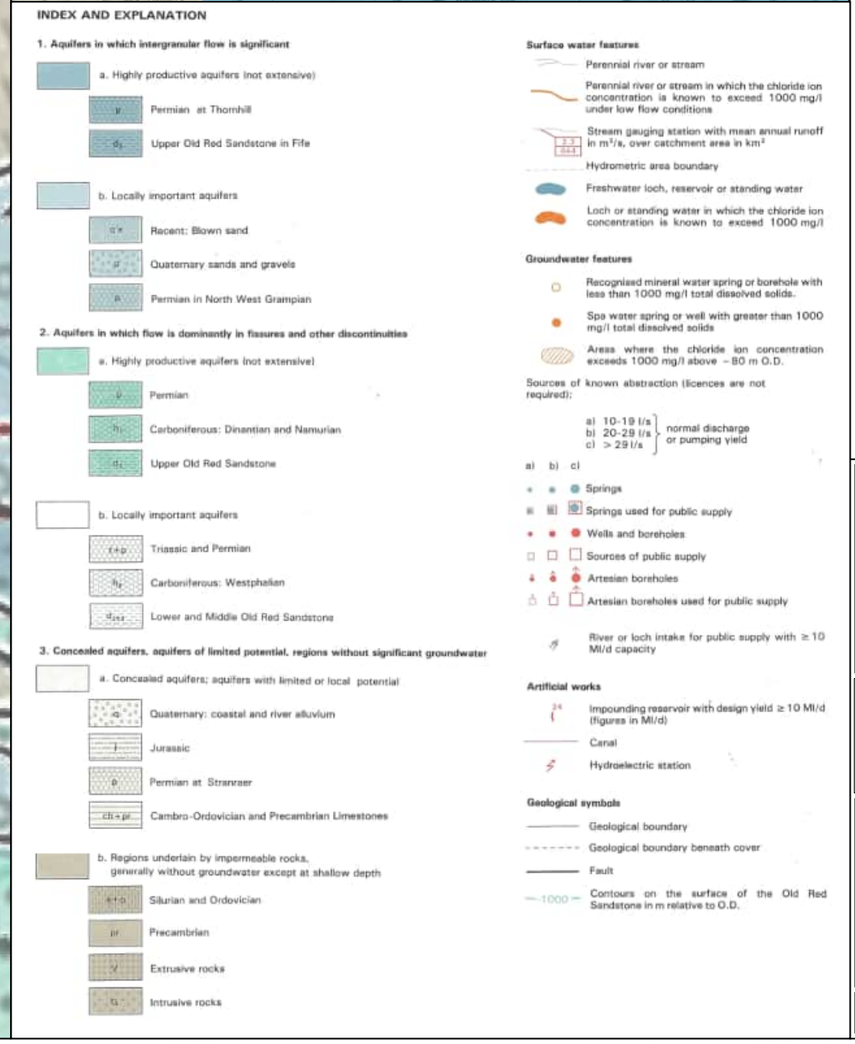
Date DECEMBER 2025

0 0.5 1 Kilometres

405.065788.00001.0015.1 Bedrock Geology







LEGEND

- Proposed Development Area
- Proposed Development 500 m Buffer

Aquifer Classification

- Highly Productive Aquifer
- Moderately Productive Aquifer
- Moderately Productive Aquifer
- Low Productivity Aquifer

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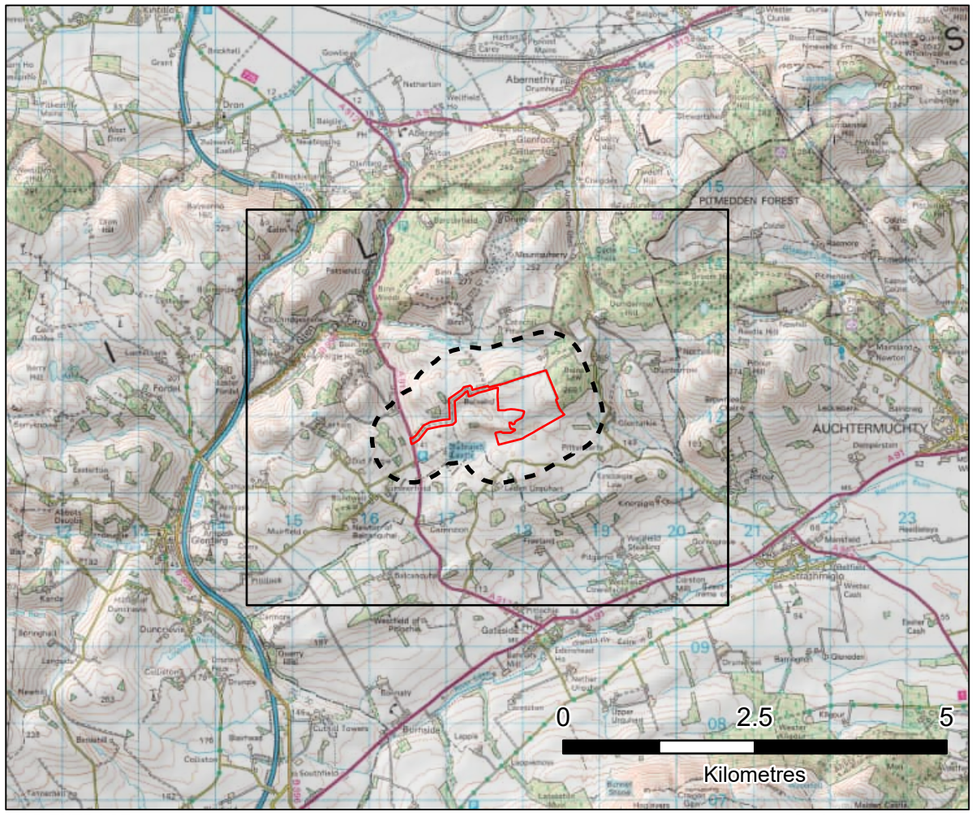
WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

REGIONAL HYDROGEOLOGY

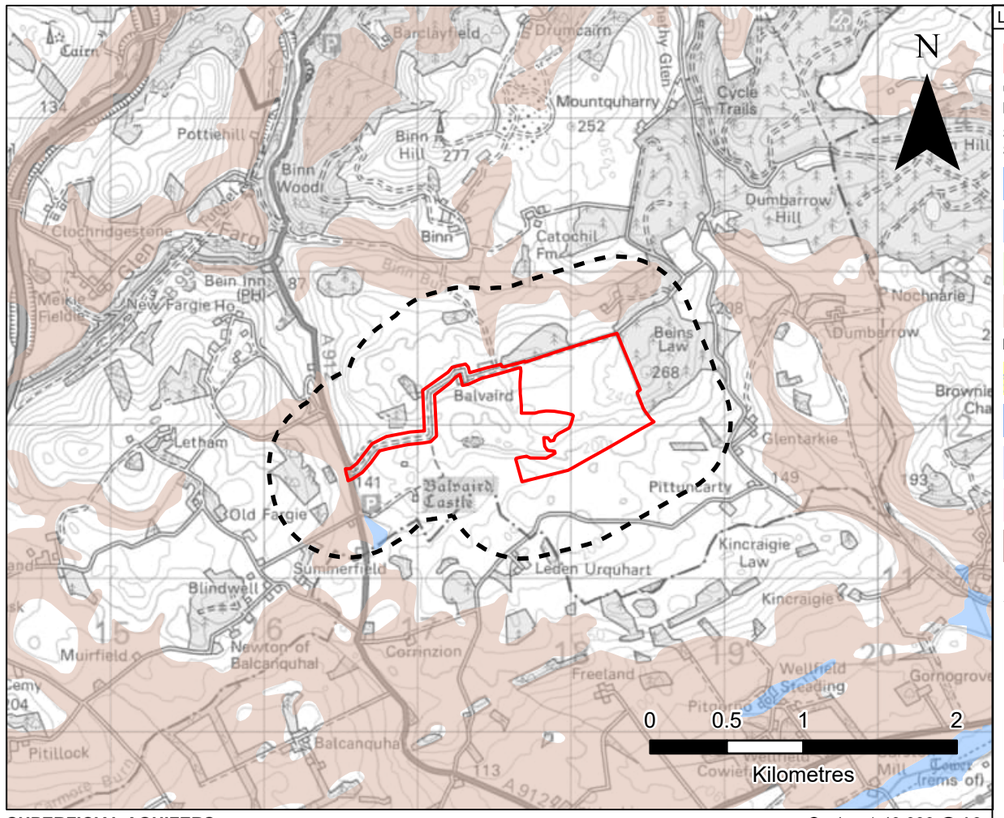
FIGURE 5

Scale	Date
AS SHOWN @ A3	DECEMBER 2025

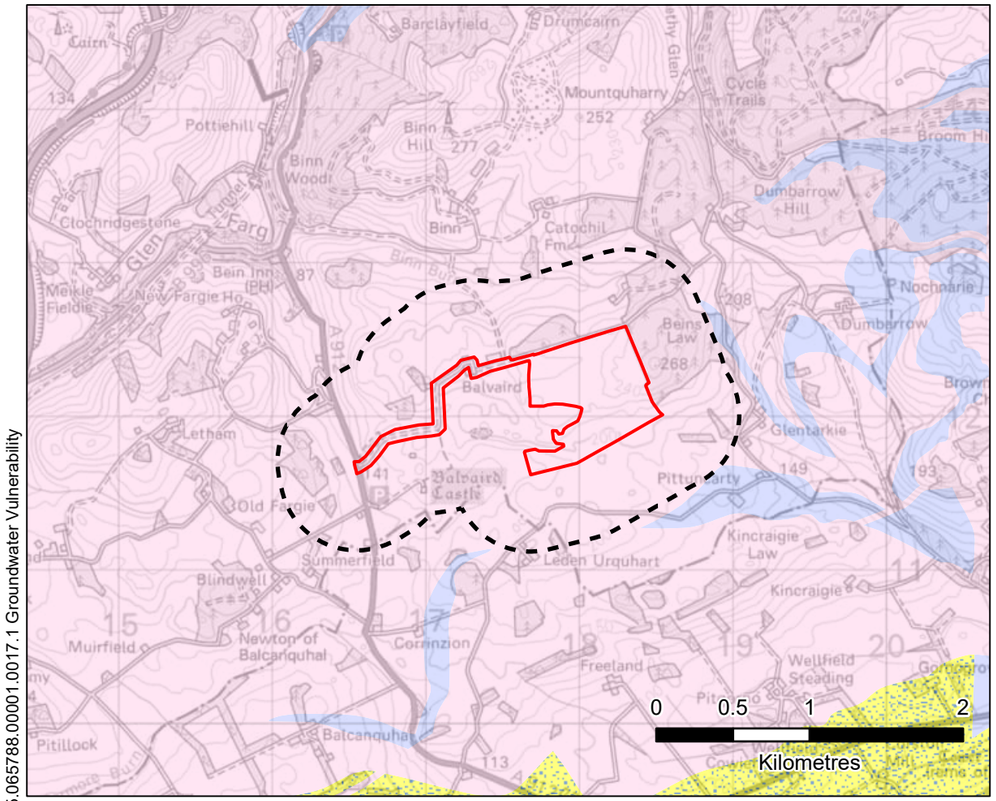
405.065788.00001.0016.1 Regional Hydrogeology



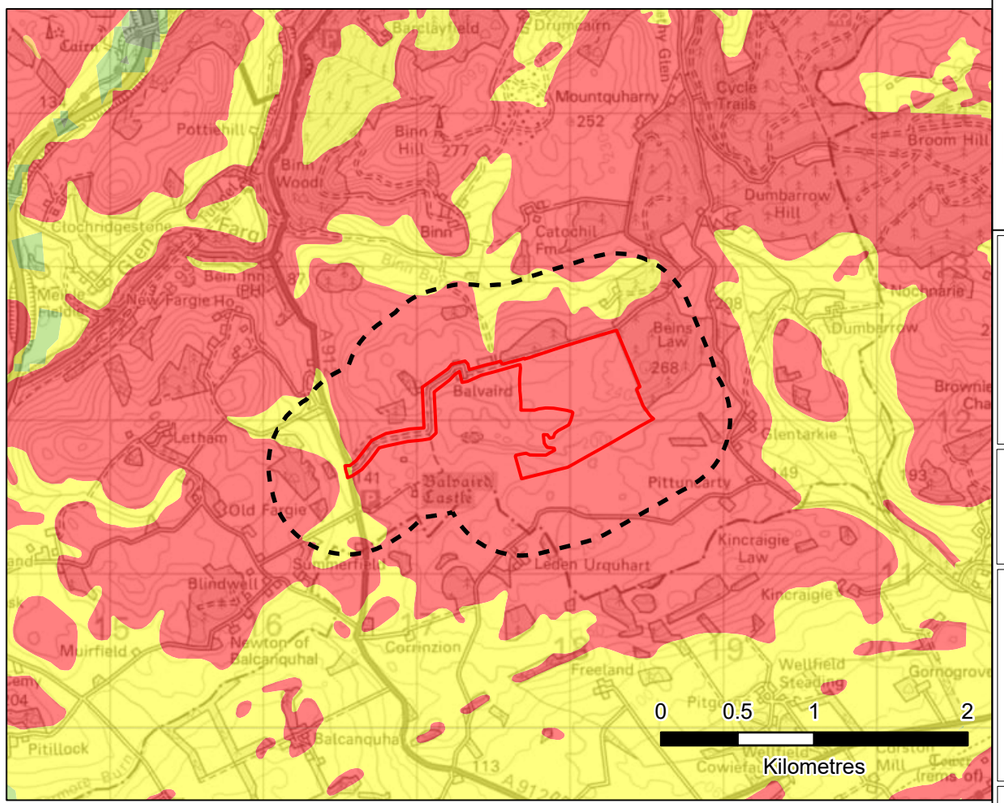
MAP EXTRACT Scale - 1:80,000 @ A3



SUPERFICIAL AQUIFERS Scale - 1:40,000 @ A3



BEDROCK AQUIFERS Scale - 1:40,000 @ A3



GROUNDWATER VULNERABILITY IN THE UPPERMOST AQUIFER Scale - 1:40,000 @ A3

LEGEND

Proposed Development Area

Proposed Development 500 m Buffer

Superficial Deposits Aquifer Productivity Scotland, Version 2

- Intergranular; High Productivity
- Intergranular; Moderate to High Productivity
- Intergranular; Low to Moderate Productivity
- Not a Significant Aquifer

Bedrock Aquifer Productivity Scotland, Version 2

- Significantly Intergranular; Very High Productivity
- Intergranular/Fracture; High Productivity
- Intergranular/Fracture; Moderate Productivity
- Fracture; Low Productivity
- Fracture; Very Low Productivity

Groundwater Vulnerability in the Uppermost Aquifer Vulnerability Class

- 0 - Not sufficient data to classify vulnerability: e.g. below lochs; in urban areas where geological and/or soils data are missing; or where superficial deposits are mapped but not classified.
- 2 - Vulnerable to some pollutants, but only when they are continuously discharged/leached.
- 3 - Vulnerable to some pollutants; many others significantly attenuated.
- 4a - Vulnerable to those pollutants not readily adsorbed or transformed. Less likely to have clay present in superficial deposits (therefore generally higher vulnerability than 4b).
- 4b - Vulnerable to those pollutants not readily adsorbed or transformed. More likely to have clay present in superficial deposits (therefore generally lower vulnerability than 4a).
- 5 - Vulnerable to most pollutants, with rapid impact in many scenarios.

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WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

AQUIFER CLASSIFICATION AND GROUNDWATER VULNERABILITY

FIGURE 6

Scale	Date
SCALE AS SHOWN @ A3	DECEMBER 2025

405.065788.00001.0017.1 Groundwater Vulnerability

Annex 1: Flood Risk Assessment and Drainage Impact Assessment

Binn Farm Solar & BESS

Trio Power Limited

UK House
5th Floor
164-182 Oxford Street
London
W1D1NN

Prepared by:

SLR Consulting Limited

The Tun, 4 Jackson's Entry, Edinburgh, EH8 8PJ

SLR Project No.: 405.065788.00001

16 December 2025

Revision: 01

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	22 November 2025	JP, AH	KR	RW
02	15 December 2025	KR	KR	KR
	Click to enter a date.			
	Click to enter a date.			
	Click to enter a date.			

Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Trio Power Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Table of Contents

Tables in Text

Graphic in Text

Annexes

Acronyms and Abbreviations

AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
CC	Climate Change
CIRIA	Construction Industry Research and Information Association
DTM & DSM	Digital Terrain Model, Digital Surface Model
FEH	Flood Estimation Handbook
FFL	Finished Floor Level
FOI	Freedom of Information
FRA	Flood Risk Assessment
LiDAR	Light Detection and Ranging
NFRA	National Flood Risk Assessment
NPF4	National Planning Framework 4
NGR	National Grid Reference
OS	Ordnance Survey
QA	Quality Assurance
ReFH	Revitalised Flood Hydrograph
RCP	Representative Concentration Pathway
SEPA	Scottish Environment Protection Agency
SPP	Scottish Planning Policy
SuDS	Sustainable Drainage Systems
UKCP18	United Kingdom Climate Projections – 2018 dataset

1.0 Introduction

SLR Consulting Limited (SLR) has been appointed by Trio Power Limited to provide consulting services to support a proposed solar photovoltaic (PV) array and Battery Energy Storage System (BESS) development (the 'Proposed Development') at a site near Glenfarg in Perth and Kinross.

This report addresses the flood risk and outline drainage aspects associated with the Proposed Development.

1.1 Policy and Guidance

This assessment has been completed in accordance with relevant guidance issued by Perth and Kinross Council (PKC), The Scottish Government, and the Scottish Environment Protection Agency (SEPA). It takes cognisance of *National Planning Framework 4*[1] and the *Flood Risk Management (Scotland) Act 2009*[2]. This assessment also references and takes due consideration (where appropriate) of the following principal guidance and policy documents:

- British Standards Institution (2017), Assessing and Managing Flood Risk in Development – Code of Practice, Report BS-8533:2017[3], October 2017;
- CIRIA (2004) Development and Flood Risk – Guidance for the construction Industry, Report C624[4];
- SEPA (2022) Technical Flood Risk Guidance for Stakeholders[5] (Reference SS-NFR-P-002), June 2022; and
- SEPA (2024) Flood Risk and Land Use Vulnerability Guidance[6], July 2024;
- SEPA (2025) Climate Change Allowances for Flood Risk Assessment in Land Use Planning[7], Version 6, February 2025;
- The Perth and Kinross Council Guidance on Flood Risk & Flood Risk Assessments[8];
- Guidance for Pollution Prevention: Containing major spillages and firewater at industrial sites – GPP18[9]; and
- Sewers for Scotland v4.0[10], October 2018.

[1] National Planning Framework 4, last accessed September 2025

[2] Flood Risk Management (Scotland) Act 2009, last accessed September 2025

[3] BS 8533:2017 Assessing and managing flood risk in development - Code of practice, last accessed September 2025

[4] CIRIA Development and flood risk - guidance for the construction industry (C624), last accessed September 2025

[5] SEPA Technical Flood Risk Guidance for Stakeholders, last accessed September 2025

[6] SEPA Flood Risk and Land Use Vulnerability Guidance, last accessed September 2025

[7] SEPA Climate Change Allowances for Flood Risk Assessment in Land Use Planning, Version 6, last accessed September 2025

[8] Flood Risk and Flood Risk Assessments, last accessed October 2025

[9] Guidance for Pollution Prevention: Containing major spillages and firewater at industrial sites - GPP18, last accessed September 2025

[10] Scottish Water Sewers for Scotland v4.0, last accessed September 2025

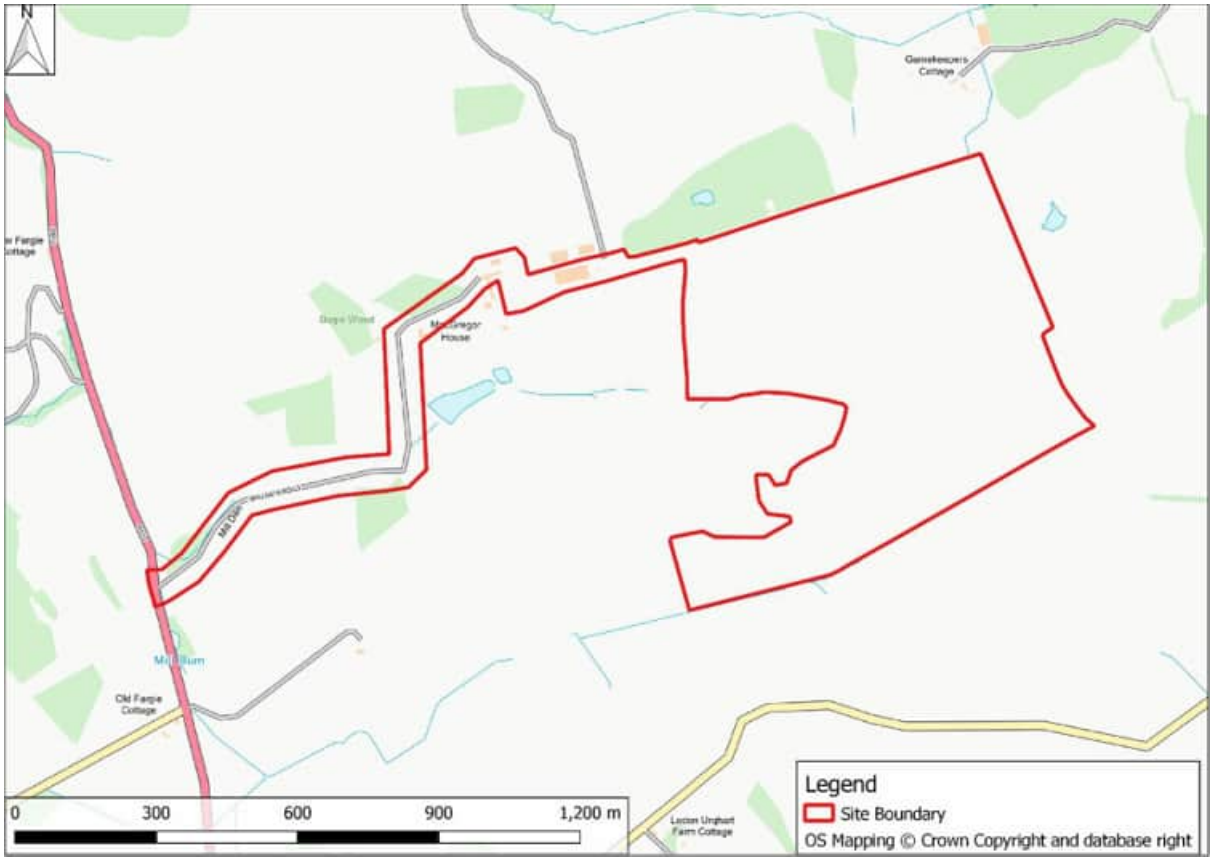
1.2 Site Location

The Site is located approximately 4 km north-west of Strathmiglo and 5 km north-east of Glenfarg and is centred at British National Grid (BNG) E 318188, N 712158. The Site currently comprises agricultural land for grazing and planting purposes.

Access and egress to/from the Site are afforded by Millden Road, which connects to the A912 to the west.

A Site location plan is provided in **Graphic 1**.

Graphic 1 : Site Location

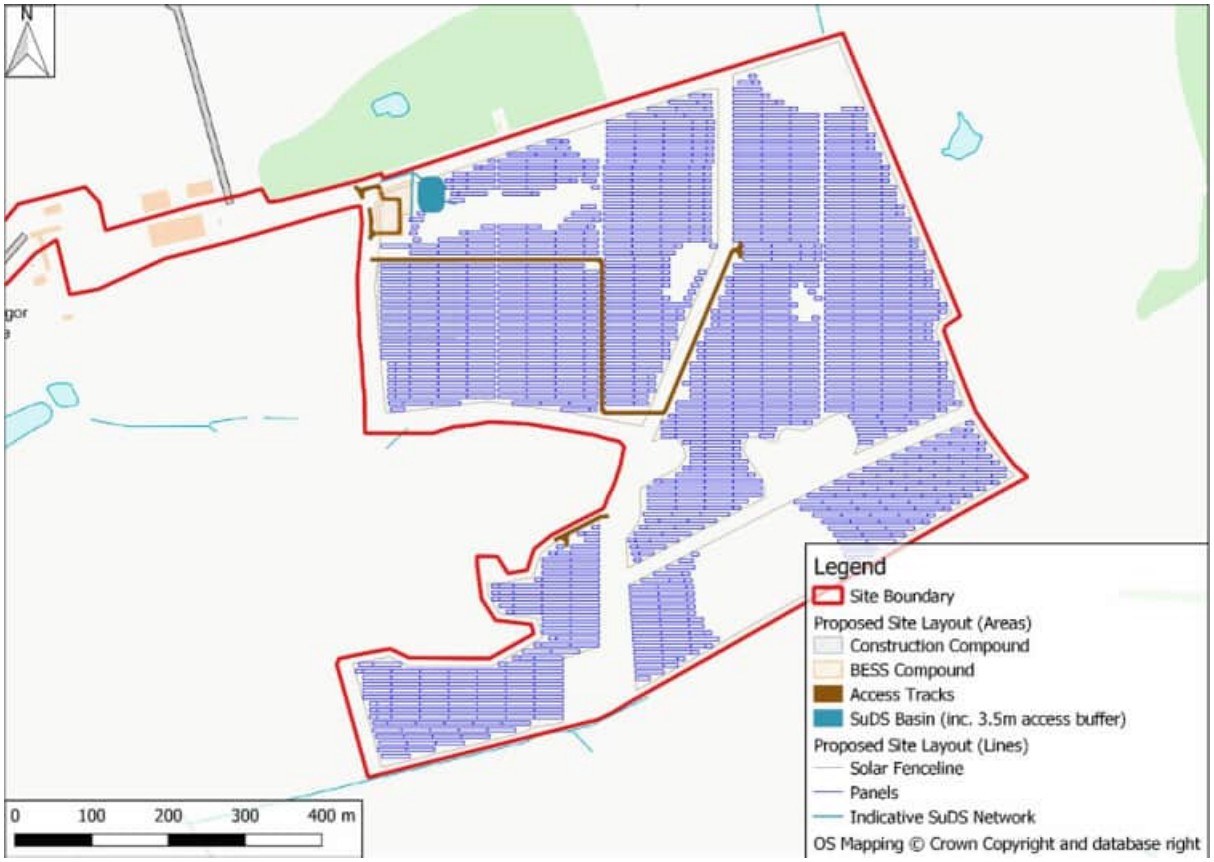


1.3 Proposed Development

The Proposed Development is anticipated to consist of ground mounted solar PV modules with an export capacity of up to 30 MW for solar and 6 MW from a Battery Energy Storage System (BESS), other infrastructure includes; substations, associated electrical equipment and ancillary infrastructure. The Site covers an area of approximately 59 hectares (ha). A full description of the Proposed Development is detailed in **Section 4** of the accompanying Supporting Environmental Information Report (SEIR) and shown on **Figure 4.1**.

A simplified excerpt of the Site layout is provided in **Graphic 2** for reference.

Graphic 2 : Proposed Site Layout



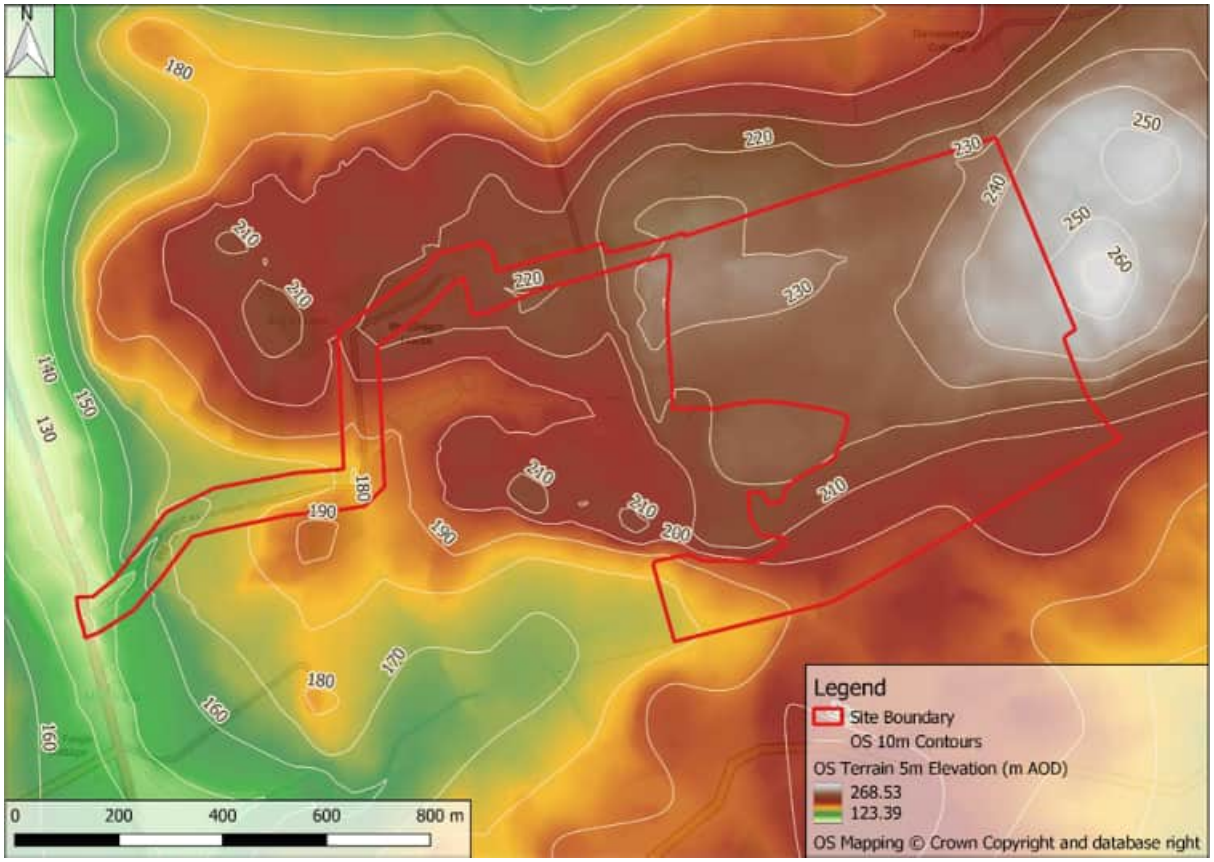
1.4 Topography

The Site topography has been informed by Ordnance Survey (OS) 10 m contours, OS Terrain 5 m elevation data, and the Site walkover.

The Site topography generally slopes from northeast to west, with a high point of approximately 250 m above Ordnance Datum (AOD) along the eastern boundary of the Site, and a low of approximately 140 m AOD at the proposed Site access point off the A912 to the west. It is assumed that no land raising is to be carried out at the Site.

The Site topography is indicated in **Graphic 3**.

Graphic 3 : Local Topography



1.5 Geological Setting

British Geological Survey (BGS) mapping[11] shows that the Site is underlain by andesites, basalts and conglomerates of the Ochil Volcanic Formation.

The bedrock has been classified by the BGS as a low productivity aquifer whereby small amounts of groundwater may be present in the near surface weathered zone, secondary fractures and rare springs yielding groundwater quantities of up to 2 l/s.

The Site is shown on the mapping to be absent of any superficial deposits. The Soil Map of Scotland[12] indicates that the Site is primarily underlain by brown soils, with a small area of mineral podzols within the eastern extent of the Site.

1.6 Local Hydrology

The northern, western and south-western extent of the Site is located within the River Farg surface water catchment whilst the south-eastern extent is located within the River Eden surface water catchment specifically the Barroway Burn sub catchment.

The Barroway Burn and River Eden is located approximately 1.9 km and 2.7 km south of the Site respectively. No tributaries of the Barroway Burn or River Eden rise within the Site.

The River Farg is located approximately 1.4 km north-west of the Site, at its closest extent. Two tributaries of the River Farg are located within proximity to the Site. The Binn Burn rises to the north of the Site and flows generally northwestwards before discharging into the River

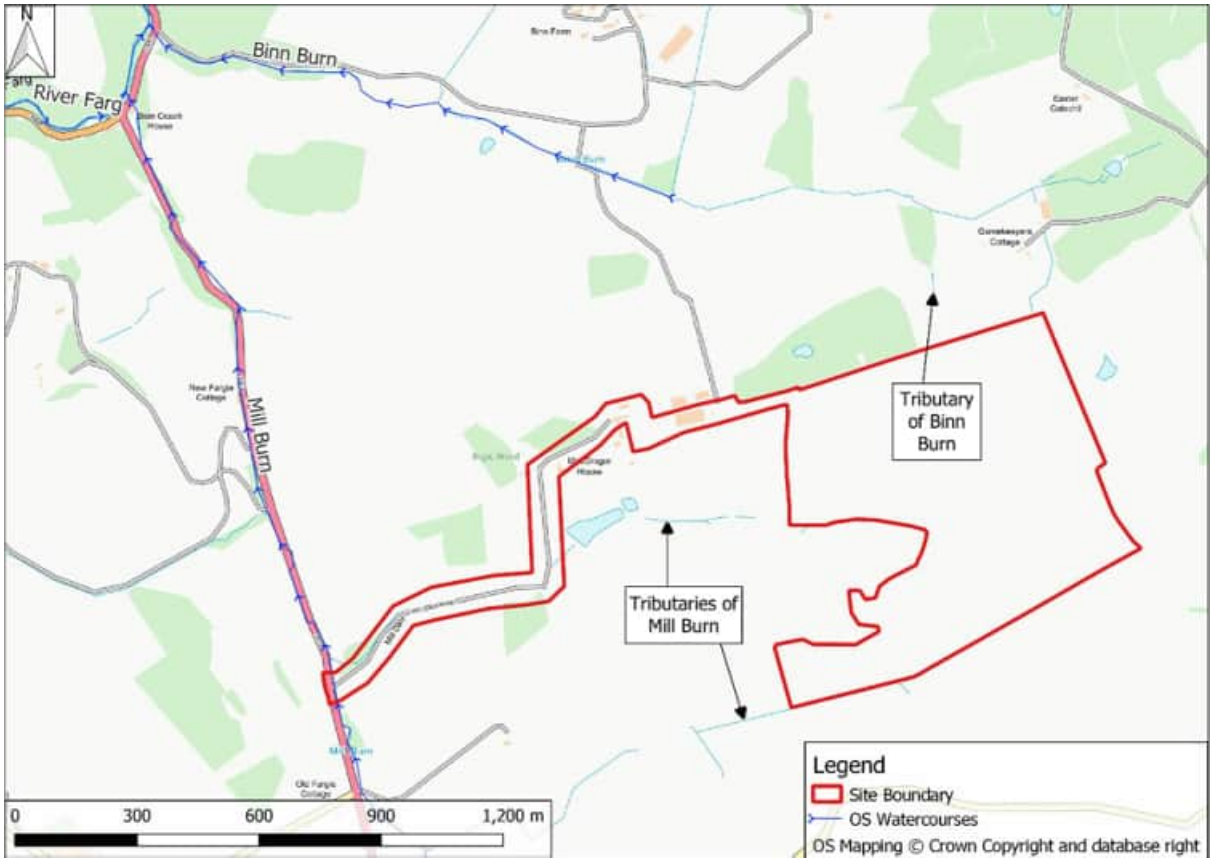
[11] BGS GeoIndex Onshore, last accessed September 2025

[12] Scotland's Soils, last accessed September 2025

Farg approximately 1.4 km north-west of the Site, whilst the Mill Burn flows northwards along the A912. Two tributaries of the Mill Burn are shown to the west of the Site.

The local hydrological context is shown on **Graphic 4**.

Graphic 4 : Local Hydrology



1.7 Storm and Flood Risk Terminology

Flood risks are typically expressed by the probability of the occurrence of a flood event (maximum flood height or other such indicator) of stated magnitude or greater in any one year – termed the Annual Exceedance Probability (AEP). This may be expressed as a percentage (such as 1%, 0.5%, etc.) or by the equivalent chance of occurrence (1:100, 1:200, etc.).

Where flood events have a climate change factor included, the flood event is denoted in this report by “plus CC”. For example, the 1:200 AEP flood event with climate change included is denoted “0.5% AEP plus CC” or “1:200 AEP plus CC”.

2.0 Flood Risk Review – Sources of Information

2.1 National Floodplain Mapping and Assessment

Strategic-level information regarding the tidal, fluvial and surface water flood risk at the Site has been obtained from SEPA via the online SEPA Flood Maps[13]. Information on potential groundwater flood risk has been obtained from the SEPA Flood Risk Management Maps[14]. Information on flooding from reservoirs has been obtained from the SEPA Reservoirs Map[15].

The SEPA flood mapping for the Site and surrounds is shown in **Graphic 5**. The mapping results indicate that the Site is not located within the fluvial floodplain. The SEPA fluvial mapping[16] includes catchments greater than 3 km^2 in area, with smaller catchments being modelled as surface water.

The SEPA surface water and small watercourse flood mapping indicates several surface water flood flow paths are present across the Site, along the Site access (Millden Road) and from the northern and southern Site boundaries. Isolated areas of surface water ponding are noted to occur within the centre of the Site in the areas of proposed panels and tracks, likely due to the presence of topographic depressions. Surface water and fluvial flooding is indicated along the A912 due to breakouts of the Mill Burn.

Graphic 6 shows the surface water flood depths for the design event of 0.5% AEP plus Climate Change (CC). The surface water flooding within the Site boundary is generally indicated to be less than 300 mm in depth, with isolated areas of flooding of up to 1 m and in excess of 1 m being associated with and confined to topographic depressions observed at the time of the Site inspection.

Some flooding of up to 300 mm in depth is indicated for the Site access off Millden Road for the 0.5% AEP + CC event in the location of an existing culvert crossing. It is likely that the culvert has not been accurately represented in the SEPA mapping, and the flooding may be an overestimate in this location. The flooding along the A912 is indicated on the SEPA mapping to be up to 1 m depth in some locations.

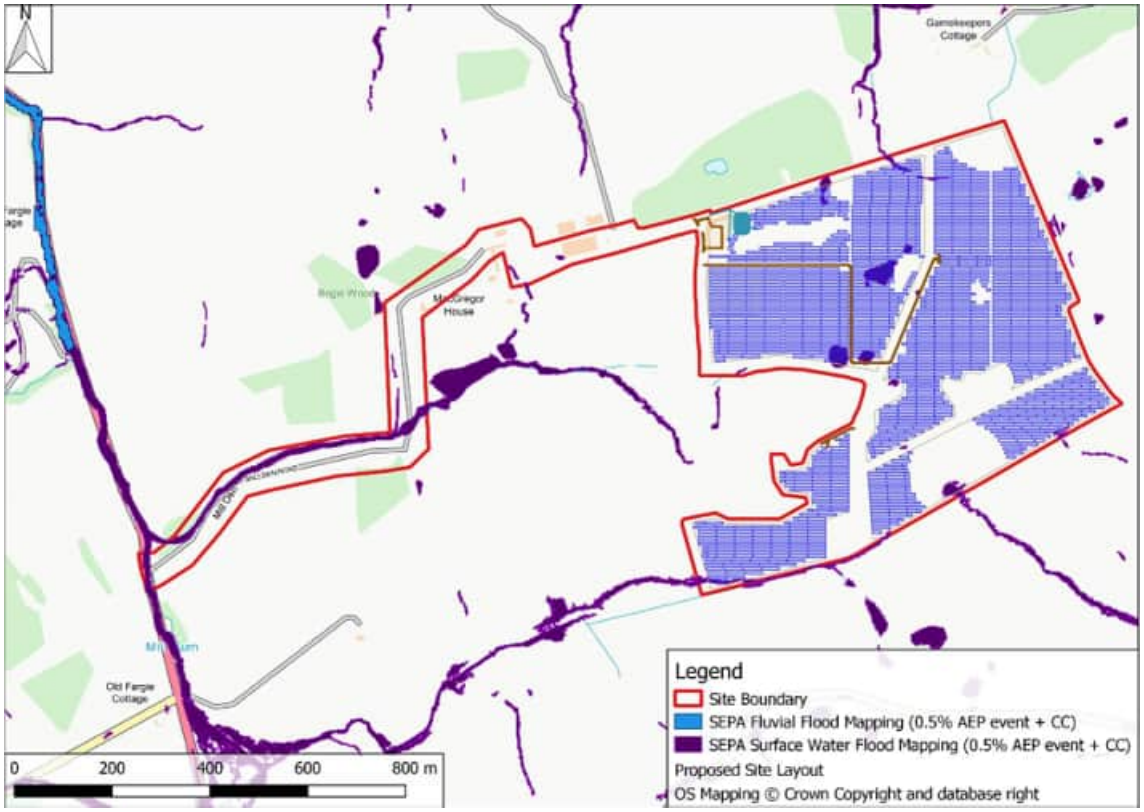
[13] SEPA Flood Maps, last accessed September 2025

[14] SEPA Flood Risk Management Maps, last accessed September 2025

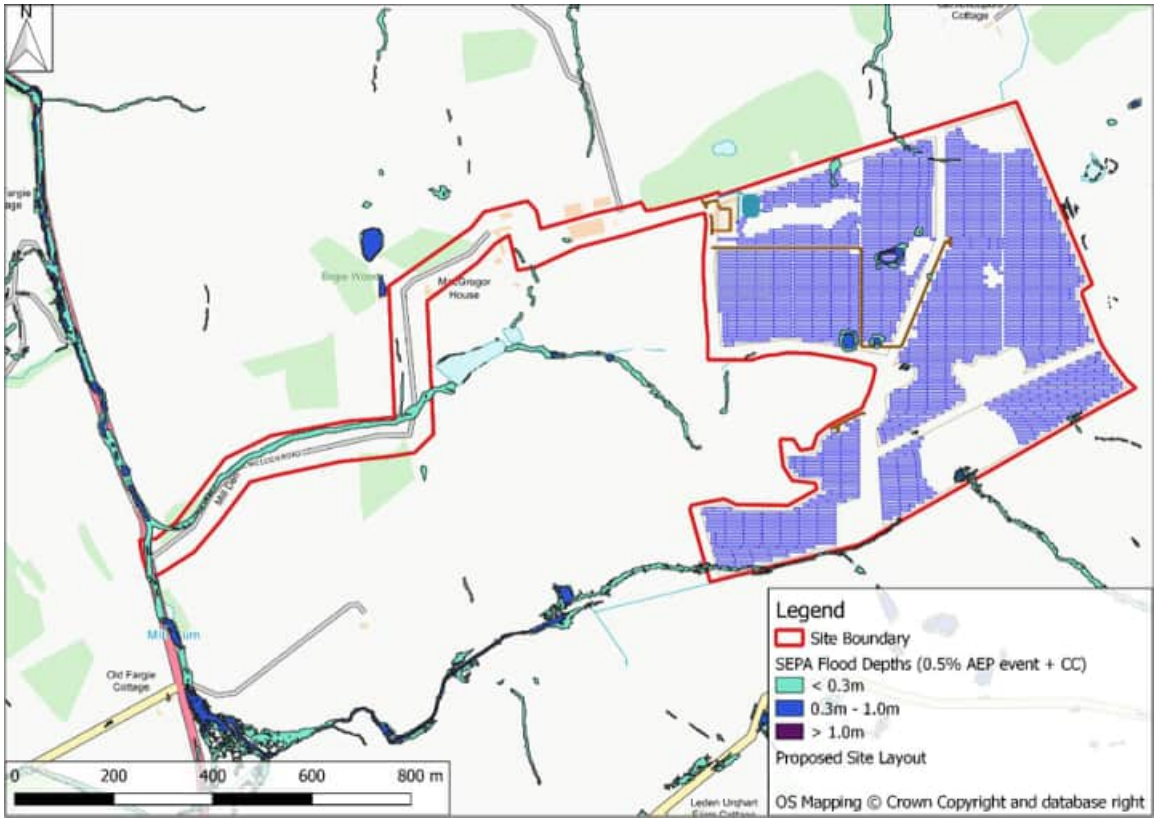
[15] SEPA Reservoirs Flood Map, last accessed September 2025

[16] SEPA River Flooding Summary: Methodology and Mapping, last accessed September 2025

Graphic 5 : SEPA Flood Mapping



Graphic 6 : SEPA Surface Water Flood Depths (0.5% AEP + CC)



2.2 Mapping and Terrain Data

Aerial imagery, OS contour data (10 m intervals), and the Site inspection have been used to assess the context of the Site and its immediate surroundings.

2.3 Flood History and Records

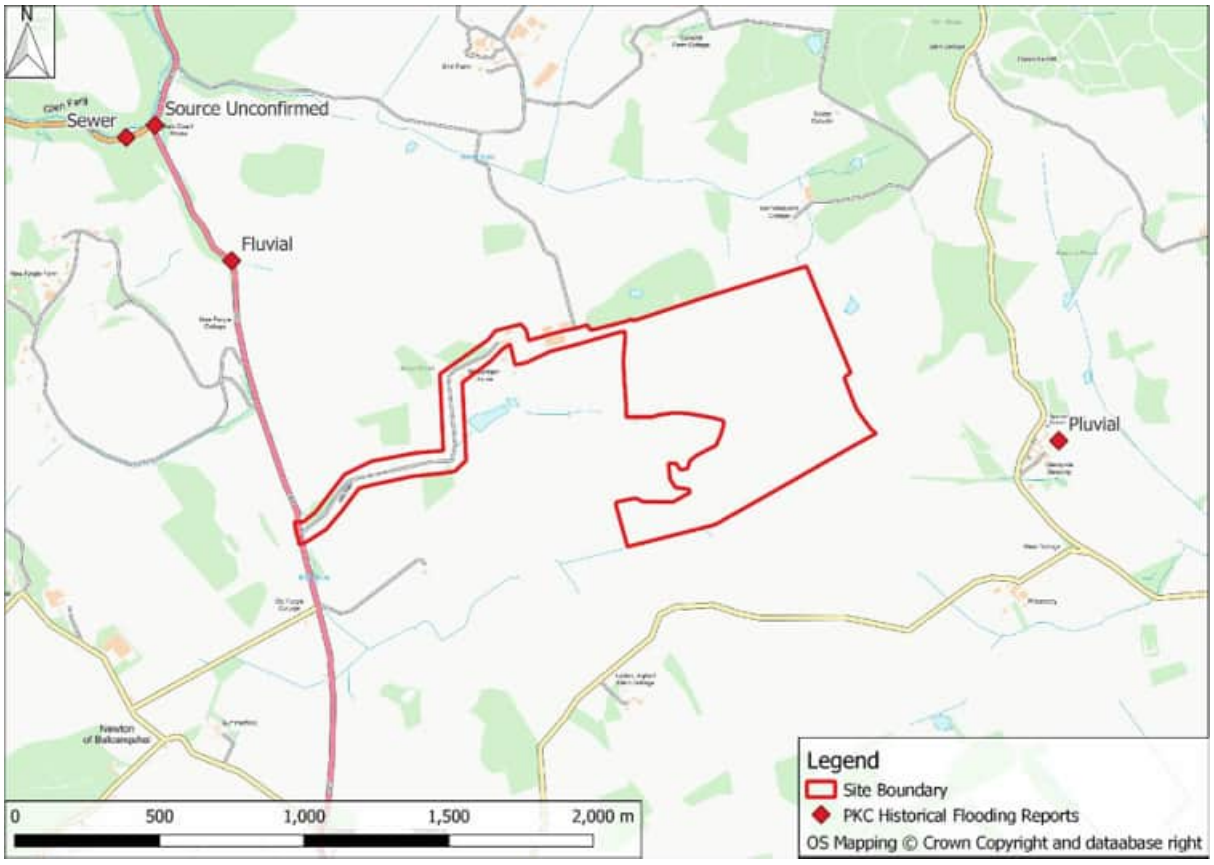
The Site is not designated as a Potentially Vulnerable Area (PVA) by the SEPA National Flood Risk Assessment (NFRA)[17] or the updated SEPA PVAs for 2028-2034[18]. There are no historical flood records for the area indicated on the SEPA NRFA website. The potential flood risks are set out and addressed within **Section 4.0** and **5.0**.

2.4 Consultation

2.4.1 Perth and Kinross Council

A data request with regard to historical flooding in the area or any relevant information on the nearby burns was submitted to the PKC flooding team on 19th July 2025. A response was received on 14th August 2025 which detailed isolated historical flood events in the vicinity of the Site, as shown in **Graphic 7**. No historical flooding has been recorded for the Site itself or its access.

Graphic 7 : PKC Historical Flooding Records



[17] SEPA National Flood Risk Assessment 2018, last accessed September 2025

[18] SEPA Potentially Vulnerable Areas 2018 - 2034, last accessed September 2025

2.4.2 SEPA

A data request with regard to historical flooding in the area or any relevant information on the nearby burns was submitted to SEPA on 19th July 2025. A response was received on 2nd September 2025, which confirmed that SEPA currently hold 34 records of flooding within 5km of the point of interest (NO 18144 12173) between 1876 and 2023. Of the 34 records, 17 are attributed to river flooding, 7 to surface water, 1 to other sources and 9 with no identified source. No spatial data was provided associated with the locations of historical flooding.

2.4.3 Scottish Water

Scottish Water Asset Plans were reviewed with regard to any drainage or water distribution assets that may be located within the Site boundary. No assets were identified at/around the Site on the plans and as such, no consultation with Scottish Water has been carried out at this stage.

3.0 Planning Context

3.1 National Planning Framework 4

National Planning Framework 4 (NPF4)[1] was introduced in February 2023. Flood risk is addressed in Policy 22 of NPF4, which states the following:

a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or,

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long term safety and resilience can be secured in accordance with relevant SEPA advice.

The protection offered by an existing formal flood protection scheme or one under construction can be taken into account when determining flood risk. In such cases, it will be demonstrated by the applicant that:

- all risks of flooding are understood and addressed;
- there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;
- the development remains safe and operational during floods;
- flood resistant and resilient materials and construction methods are used; and,
- future adaptations can be made to accommodate the effects of climate change.

Additionally, for development proposals meeting criteria part iv), where flood risk is managed at the site rather than avoided these will also require:

- the first occupied/utilised floor, and the underside of the development if relevant, to be above the flood risk level and have an additional allowance for freeboard; and,
- that the proposal does not create an island of development and that safe access/ egress can be achieved.

b) Small scale extensions and alterations to existing buildings will only be supported where they will not significantly increase flood risk.

c) Development proposals will:

i. not increase the risk of surface water flooding to others, or itself be at risk.

ii. manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue green infrastructure. All proposals should presume no surface water connection to the combined sewer; and,

iii. seek to minimise the area of impermeable surface.

d) Development proposals will be supported if they can be connected to the public water mains. If connection is not feasible, the applicant will need to demonstrate that water for drinking water purposes will be sourced from a sustainable water source that is resilient to periods of water scarcity.

e) Development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported.

NPF4 defines an area at risk of flooding as follows:

For planning purposes, at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% (1:200 AEP) which must include an appropriate allowance for future climate change.

This risk of flooding is indicated on SEPA's future flood maps or may need to be assessed in a flood risk assessment. An appropriate allowance for climate change should be taken from the latest available guidance and evidence available for application in Scotland. The calculated risk of flooding can take account of any existing, formal flood protection schemes in determining the risk to the site.

Where the risk of flooding is less than this threshold, areas will not be considered 'at risk of flooding' for planning purposes, but this does not mean there is no risk at all, just that the risk is sufficiently low to be acceptable for the purpose of planning. This includes areas where the risk of flooding is reduced below this threshold due to a formal flood protection scheme.

3.2 Local Plan

The PKC Local Development Plan 2[19] sets out guidance with regard to flood risk and drainage.

Policy 52 on Flooding states the following:

Within the parameters as defined by this policy the Council supports the delivery of the actions and objectives to avoid an overall increase, reduce overall, and manage flood risk as set out within the relevant SEPA Flood Risk Management Strategies and the Local Flood Risk Management Plans.

There will be a general presumption against proposals for built development or land raising on a functional flood plain and in areas where there is a medium to high risk of flooding from any source, or where the proposal would increase the probability of flooding elsewhere. In addition, built development should avoid areas at significant risk from landslip, coastal erosion, wave overtopping and storm surges. Where a risk of fluvial/coastal flooding is *known or suspected the Council will use the flood risk framework shown in the diagram overleaf and considers that areas of:*

1. *medium to high flood risk are not suitable for civil infrastructure;*
2. *low to medium flood risk are suitable for most forms of development; and*
3. *little or no flood risk shown present no flood related constraints on development.*

Infrastructure and buildings should generally be designed to be free from surface water flooding in greater than 0.5% rainfall events. A Drainage Impact Assessment (DIA) will be required to consider pluvial flooding for any proposed development greater than 1,000m^2.

*Superseded by NPF4.

Policy 53C on Surface Water Drainage states the following:

All new development will be required to employ Sustainable Urban Drainage Systems (SUDS) measures including relevant temporary measures at the construction phase. SUDS will be encouraged to achieve multiple benefits, such as floodwater management, landscape, green infrastructure, biodiversity and opportunities to experience nature near

[19] Perth and Kinross Local Development Plan 2, last accessed October 2025

where people live. Ecological solutions to SUDs will be sought and SUDS integration with green/blue networks wherever possible.

The Supplementary Guidance on Flood Risk & Flood Risk Assessments[20] sets out the guidance in further detail. This document specifies that the SEPA Checklist and a Compliance Certificate (provided within the guidance document) are required to be submitted with the FRA document. These items are attached as **Annex C** and **Annex D** respectively.

3.3 SEPA Guidance

The SEPA Flood Risk and Land Use Vulnerability Guidance[21] outlines how SEPA assess vulnerability of flooding of different land use with the following Categories:

- Most Vulnerable Uses;
- Highly Vulnerable Uses;
- Least Vulnerable Uses;
- Essential Infrastructure; and,
- Water Compatible Uses.

With reference to Table 1 (SEPA Land Use Vulnerability Classification) of the guidance, the Proposed Development is considered to fall under the **Essential Infrastructure** category as *'All forms of renewable, low-carbon and zero emission technologies for electricity generation and distribution and transmission electricity grid networks and primary sub stations'*. This definition for the Proposed Development has been confirmed by Perth and Kinross Floods Team (see Table 1 in Appendix G: Water Environment Environmental Appraisal).

3.4 Climate Change & Design Event

The relevant SEPA climate change allowances[22] have been assessed for the Site, which lies in the Tay river basin. Based on the small size of the local surface water and fluvial catchments, the recommended allowance for the assessment of flood risk to the Site from these sources and for the outline drainage design would be a 39% uplift applied to peak rainfall intensities. In line with NPF4, this uplift is to be applied to the 0.5% AEP event to assess flood risks to the development.

It is noted that the SEPA surface water and small watercourses mapping[23] that has been used to assess flood risks to the development applies a "worst-case" storm mosaic based on the 1-, 6-, and 12-hour storms. A different climate change allowance is applied to each of these storm durations for each modelled event.

The future surface water flood map (0.5% AEP event plus climate change) applies climate change uplifts for the central estimate (50th percentile) for the 2070 time horizon and for the 100 year return period to the 200 year present-day rainfall depths.

The climate change uplifts applied to each duration are as follows:

- 35% for the 1-hour storm duration;

[20] PKC Flood Risk and Flood Risk Assessments, last accessed September 2025

[21] SEPA Flood Risk and Land Use Vulnerability Guidance, last accessed September 2025

[22] SEPA Climate change allowances for flood risk assessment in land use planning, Version 6, last accessed September 2025

[23] SEPA Surface Water and Small Watercourses Flooding Summary: Methodology and Mapping last accessed November 2025

- 33% for the 6-hour storm duration; and
- 25% for the 12-hour storm duration.

This assessment is therefore based on the worst-case storm mosaic future flood mapping as opposed to the latest SEPA-recommended climate change uplift of 39%. Although the SEPA surface water and small watercourses future flood mapping has a marginally lower climate change allowance (4% for the 1-hour event), the mapping has been recently published and is based on analysis of the UK Climate Projections 18 (UKCP18) high resolution (UKCP Local) projections for Representative Concentration Pathway 8.5 (RCP8.5), and is therefore considered suitable to assess flood risks to the development.

4.0 Potential Sources of Flooding

4.1 Methodology and Best Practice

This FRA report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development outlined in NPF4, SEPA, and PKC guidance.

A screening study has been completed to identify whether there are any potential sources of flooding at the Site which may warrant further consideration. If required, any potential significant flooding issues identified in the screening study are then considered in subsequent sections of this assessment.

4.2 Screening Study

Potential sources of flooding include:

- flooding from the sea or tidal flooding;
- flooding from rivers or fluvial flooding;
- flooding from surface water and overland flow;
- flooding from groundwater;
- flooding from sewers;
- flooding from reservoirs, canals, and other artificial sources; and,
- flooding from infrastructure failure.

Flood risk definitions within the screening assessment are based on qualitative technical assessment considering the information reviewed, risk to Site users and the development itself.

The flood risk from each of these potential sources is assessed in **Table 1**.

Table 1 : Flood Risk Screening

Source of Flood Risk	Description	Flood Risk Assessment
Tidal	The Proposed Development is located approximately 6 km south of the tidal reach of the River Tay and is elevated above a minimum of 140 m AOD at its low point at the Site access via Millden Road off the A912. The Site is generally situated above 200 m AOD. It is therefore considered that the Site is not at tidal flood risk.	No flood risk for planning purposes
Fluvial	The Proposed Development is not indicated on the SEPA mapping to be at fluvial flood risk up to and including the 0.5% AEP plus CC event. Within the SEPA flood mapping, catchments less than 3 km^2 in area are not included in the fluvial flood mapping and are instead modelled as surface water and small catchments. It is therefore considered that the Proposed Development is not at fluvial flood risk, and any flood risks from the minor watercourses in the vicinity of the Site will be assessed as surface water flood risk.	No flood risk for planning purposes
Pluvial (i.e., direct rainfall)	The impermeable areas associated with the BESS are to be served by Sustainable Drainage Systems (SuDS) as outlined in **Section 5.0** of this report. The proposed SuDS systems will be designed to attenuate up to and including the 0.5% AEP event + CC with no flooding. The wider solar development is not considered to be at risk from flooding due to direct rainfall, as the panels will allow the rainfall to run off to ground as per the existing Site. The panels are generally raised a minimum of 1 m from ground level and as such would not be expected to be at risk of flooding due to direct rainfall, other than in some trapped topographical low points. This is detailed further in **Section 5.0**. It is therefore considered that the Site is not at pluvial flood risk.	Flood risks mitigated – **Section 5.0** for surface water flood risk to panels and **Section 7.0** for SuDS design to attenuate direct rainfall.
Surface Water Flows	SEPA mapping indicates surface water flow paths within the Site boundary are generally less than 300 mm in depth, with areas of 300 mm or deeper being associated with and confined to topographic depressions.	No flood risk to BESS for planning purposes, suitable mitigations to

Source of Flood Risk	Description	Flood Risk Assessment
	The solar panels are generally proposed to be elevated a minimum of 1 m from ground levels, and the surface water flow paths shown on the SEPA mapping are indicated to be less than 300 mm in depth, allowing 700 mm freeboard from the expected flow depths on these pathways. Additionally, the surface water flow paths all drain off Site. It is therefore not considered that surface water flow paths present a barrier to the development. There are isolated trapped areas of the Site that are indicated to be subject to surface water ponding of depths of up to 1 m and an area in the northern area of the Site where flood depths are indicated to be in excess of 1 m. Panels are proposed in these areas and as such these areas have been reviewed further in **Section 5.0**. The BESS development is not indicated to flood on the SEPA mapping and is located on a local topographic high point. Flooding from surface water flows is not expected to present an issue to the BESS. Surface water flooding of less than 300 mm in depth is indicated at Millden Road for the 0.5% AEP event plus climate change. This flooding appears to be associated with the unnamed tributary of the Mill Burn. Given the steepness of the local topography, it is expected that the duration of any flooding in this location would be minor. The Site will generally be unmanned, and it is therefore considered that this area of flooding does not pose a risk to the operation of the development. The A912 is indicated to flood up to 1 m in depth for the design event due to breakouts from the Mill Burn and access to the Site may therefore be cut off during times of flood. As the Site will generally be unmanned, the development of an appropriate Flood Emergency Response Plan would be recommended to ensure that the Site is evacuated in a timely manner when heavy rains are forecast. Surface water flooding is therefore not expected to present a flood risk to the Proposed Development.	flood risks to access/egress proposed for planning purposes. Further review of surface water flood risks to panels addressed in **Section 5.0**.

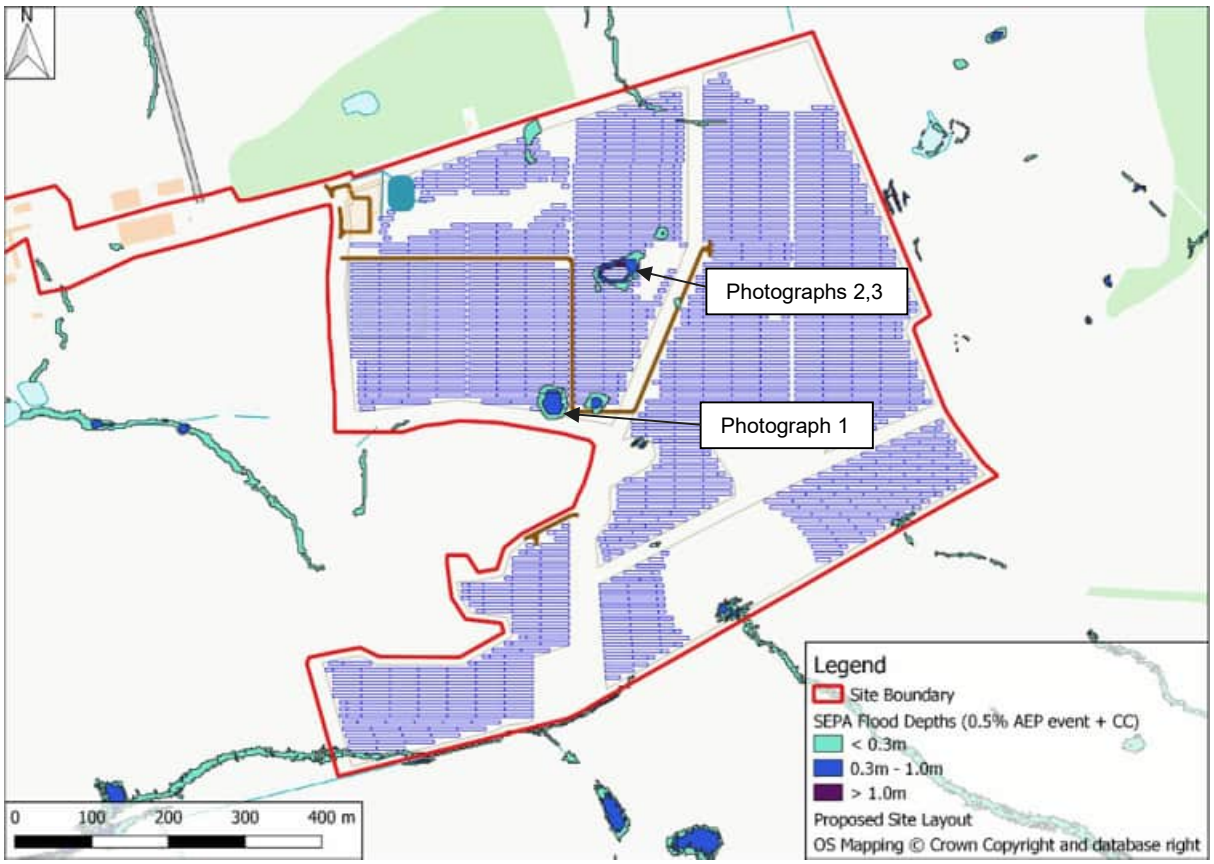
Source of Flood Risk	Description	Flood Risk Assessment
Groundwater	SEPA flood mapping indicates that the Site is not at risk from any wider area groundwater flood risk influences. The Proposed Development is located on high ground with regard to the surrounding topography and it is expected that any groundwater in the local area would drain to the watercourse tributaries. The bedrock underlying the Proposed Development is noted to be a low productivity aquifer, and it is not expected that this will pose a risk to the development. Based on these considerations, there is a negligible risk of groundwater flooding from groundwater rise at the Site.	No flood risk for planning purposes
Sewers and Artificial Drainage Systems, and Water Supply	Review of Scottish Water Asset Plans indicates that there are no known existing drainage systems or public water supplies at the Proposed Development. Any exceedance of the proposed SuDS feature would be expected to follow natural topographical gradients off Site as shown in Graphic 10. Based on the absence of any formal drainage systems or water supplies, there is a negligible risk of flooding from these sources.	No flood risk for planning purposes
Infrastructure Failure (i.e., reservoirs, canals, culvert blockage, etc.)	The Site is not indicated on the SEPA mapping to lie within the breach extents of any reservoirs. A culvert is located under Millden Road and any exceedance or blockage of this culvert could result in flooding of up to 300 mm as demonstrated by the SEPA mapping in this location. It would be expected that any curtailment to access/egress in this area would be short-lived due to the minor upstream surface water catchment. Given the shallow flood depths, the steepness of the local topography, and that the BESS will generally be unmanned, flood risk from this source is not expected to present a significant risk to the development.	No flood risk for planning purposes

5.0 Detailed Flood Risk Review

5.1 Surface Water Flood Risk to Panels

The SEPA surface water mapping for the design event of 0.5% AEP + CC indicates that there are isolated areas of the Site that are subject to surface water flood depths of up to 1 m, as well as an area in the northern area of the Site where flood depths are indicated to be in excess of 1 m. These areas are labelled on **Graphic 8**.

Graphic 8 : Localised Surface Water Ponding



Review of these areas during the Site visit indicated some minor trapped topographical lows as shown in **Photograph 1** through **Photograph 3**. Further review of the ground elevations has been carried out for the area which is indicated on SEPA mapping to flood to depths in excess of 1 m (**Photographs 2** and **3**) in order to determine the required elevations of the panels in this area.

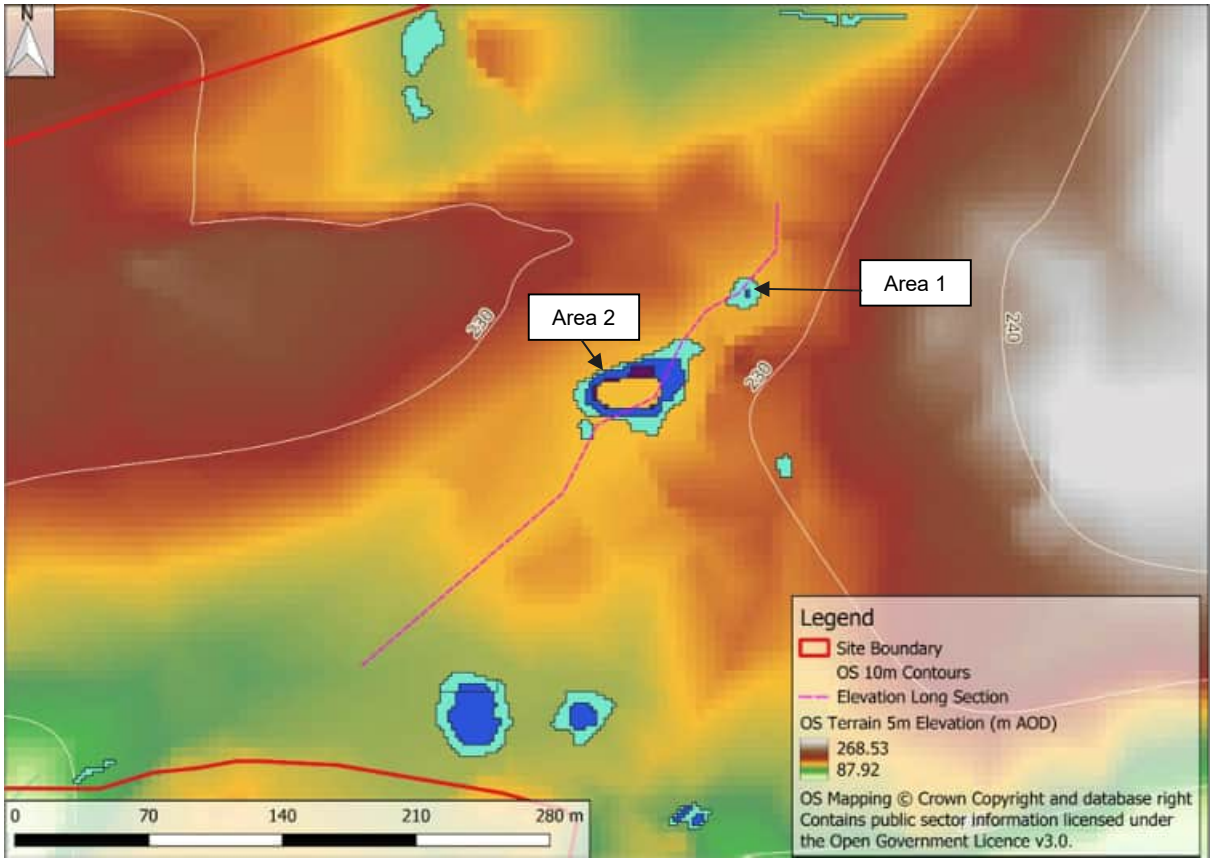
Photograph 1 : Potential ponding area (up to 1 m depth on SEPA mapping), facing north-west

Photograph 2 : Potential ponding area (>1 m depth on SEPA mapping), facing north-west

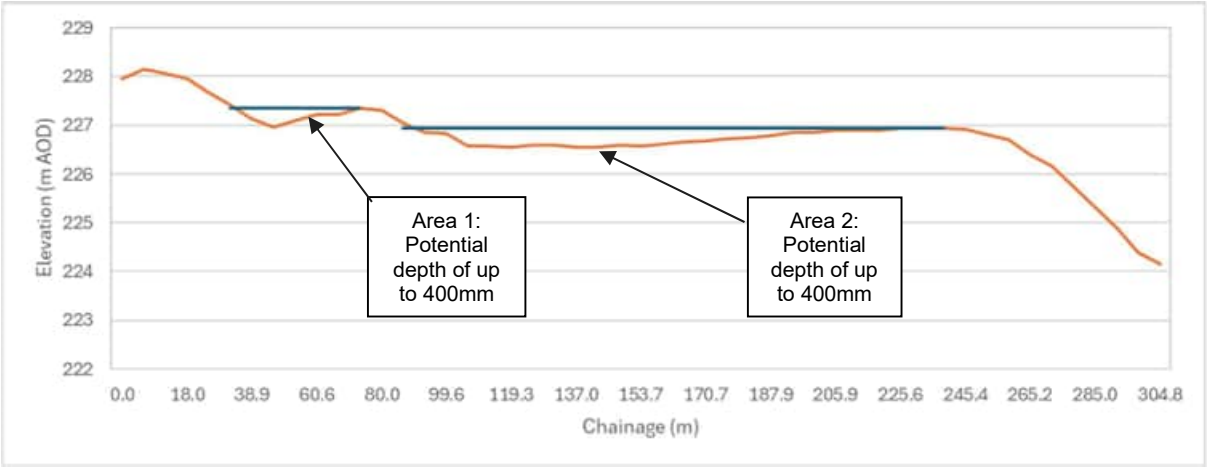
Photograph 3 : Potential ponding area (>1 m depth on SEPA mapping), facing west

The area indicated on the SEPA mapping to flood to depths in excess of 1 m is shown in **Graphic 9** with OS Terrain 5m DTM elevation data and a long section taken through the localised low point to determine the likely maximum flooding depths. The long section with the potential maximum ponding depths are shown in **Graphic 10**.

Graphic 9 : Review of deeper flooding on SEPA mapping



Graphic 10 : Potential ponding



Based on the maximum ponding depths indicated on review of the ground elevations, it is likely that the SEPA depth results of greater than 1 m in this location are a result of model resolution. It appears that the depths in this area would not exceed 400 mm.

6.0 Flood Risk Summary

The NPF4[1] defines an area at risk of flooding as follows:

For planning purposes, at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% (1:200 AEP) which must include an appropriate allowance for future climate change.

It is considered that the Site falls under exception a)i) of NPF4[1] Policy 22, as follows:

a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:

i) essential infrastructure where the location is required for operational reasons.

The Proposed Development satisfies this exception as "*all forms of renewable, low-carbon and zero emission technologies for electricity generation and distribution and transmission electricity grid networks and primary sub stations*" and is required to be located at the Site for operational reasons under this exception of Policy 22 of the NPF4[1] and needs to demonstrate that:

- all risks of flooding are understood and addressed;
- there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;
- the development remains safe and operational during floods;
- flood resistant and resilient materials and construction methods are used; and
- future adaptations can be made to accommodate the effects of climate change.

6.1 All risks of flooding are understood

The flood risk screening presented in **Table 1** indicates that all risks of flooding are understood and addressed in line with NPF4. The SEPA surface water mapping indicates some minor flow paths of depths less than 300 mm on the Site and its access for the design event of 0.5% AEP + CC. Isolated areas of flooding of up to 1 m and in excess of 1 m are noted in topographical low points on the Site for the design event.

The panels are to be elevated on plinths a minimum of 1m from ground levels and would therefore have 700 mm freeboard from areas of surface water flooding up to 300 mm in depth. Flood depths shown on the SEPA flood mapping have been reviewed against available LiDAR information which indicates that flood depth would not exceed 400 mm. Therefore a 600 mm freeboard from the flood levels, in line with SEPA guidance has been maintained.

The BESS development is not at flood risk from any source and would remain safe and operational during flood events.

It is therefore considered that the requirements of NPF4 and the PKC guidance are met with regard to flood risks to the development.

6.2 No reduction in floodplain capacity, increase for others

The Proposed Development is not located within the functional fluvial floodplain and as such does not reduce the functional floodplain capacity nor increase the flood risk to others from this source. Additionally, the solar panels are to be located on plinths and as such would not reduce floodplain capacity nor alter floodplain flow and dynamics. There is therefore no

requirement for compensatory storage or increased risk to others as a result of the Proposed Development.

The BESS development will require additional impermeable areas which could, without mitigation, increase surface water runoff rates and volumes downstream of the Proposed Development. An outline SuDS design has been completed (see **Section 7.0**) in order to reduce runoff from the BESS to greenfield rates.

The solar panels allow the runoff of direct rainfall and for existing overland flow paths to be maintained, and as such are not displacing surface water offsite.

It is therefore considered that the requirements of NPF4 and the PKC Local Development Plan have been met with regard to flood risk to others.

6.3 The development remains safe and operational during floods

SEPA mapping indicates some shallow surface water flooding of less than 300 mm to Millden Road for the design event of 0.5% AEP + CC. Millden Road serves as an existing farm access.

Millden Road is steeply sloped in the area of the watercourse culvert crossing and it is therefore not expected that flooding would reach significant depths in this area in times of flood. Flooding of up to 1 m is indicated on the A912 due to breakouts from the Mill Burn, and it is therefore possible that wider access/egress to/from the Site will be cut off in times of flood.

It is understood that the Proposed Development, when operational, will generally be unmanned and therefore risk to staff during a flood is minimised. For a precautionary approach, staff can register for live information provided by SEPA's Floodline[24] service (quick dial code 21400 for Tayside) to ensure that the Site is not accessed in times of flood and/or is evacuated if heavy rainfall is expected. Staff should also review the Met Office weather warnings[25] and the SEPA Scottish Flood Forecast[26], which offers a 3-day flood forecast.

The panels are be raised a minimum of 1 m above ground levels, which has been shown to be sufficient to allow 600 mm freeboard from maximum surface water flood depths as outlined in **Section 5.0**.

The BESS is situated in an elevated portion of the Site and is to be served by Sustainable Drainage Systems (SuDS) to drain direct rainfall from the compound, as detailed in Section 7.0.

It is therefore considered that there is no significant flood risk to the Site access/egress and the Proposed Development would remain operational and safe during floods.

6.4 Flood resistant and resilient materials and construction methods are used

Given that the BESS development is indicated to be flood-free for the design event of 0.5% AEP + CC, it is considered that flood resistant and resilient materials are not required in this case.

[24] SEPA Live Flooding Information, last accessed September 2025

[25] Met Office UK Weather Warnings

[26] SEPA/Met Office Scottish Flood Forecast, last accessed October 2025

The solar panels are inherently flood resilient given their raised position from ground levels and have over 600 mm freeboard from any areas of SEPA surface water flooding in line with SEPA guidance.

It is therefore considered that this point is addressed.

6.5 Future adaptations can be made to accommodate the effects of climate change

The design of the Proposed Development takes into account of climate change and allows freeboard from any flood levels on Site.

Additionally, the SuDS design detailed in **Section 7.0** has been sized with reference to the latest climate change allowances, and could be adapted in the future with regard to outflow and depth to accommodate any increases in rainfall due to the effects of climate change.

The SuDS design detailed in **Section 7.0** will be developed further as part of the detailed design stage of the Proposed Development and would be agreed with PKC, Scottish Water, and SEPA prior to construction. It is anticipated that this will be secured by a planning condition.

7.0 Drainage Impact Assessment

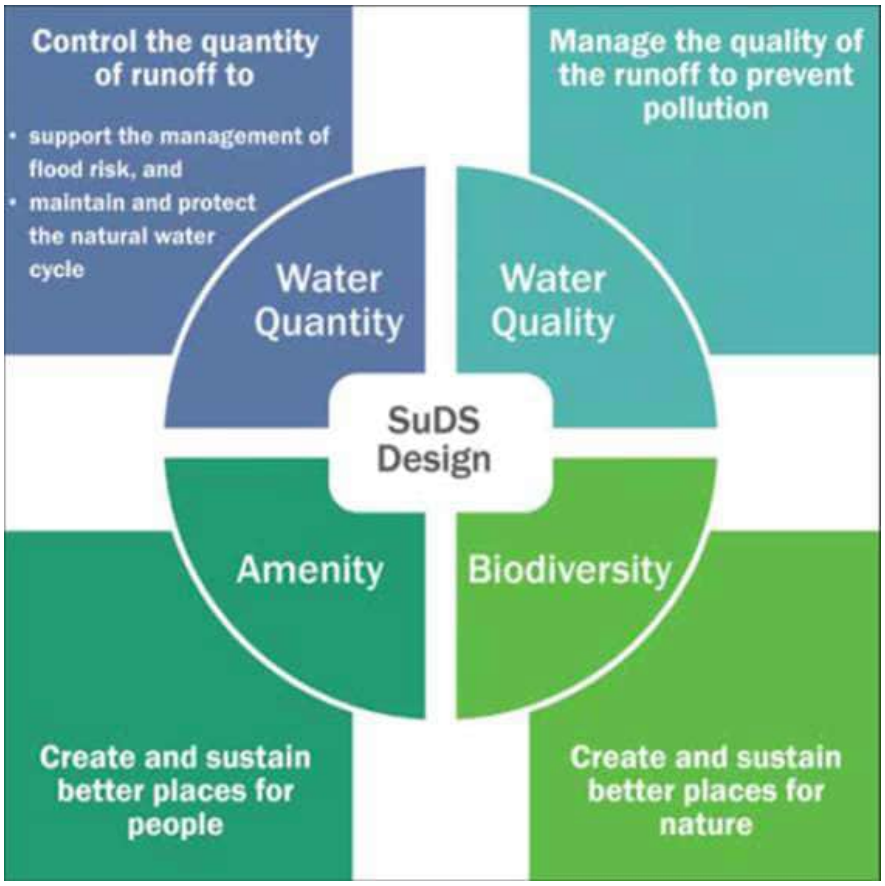
This Drainage Impact Assessment (DIA) sets out high-level principles for managing storm water for the proposed development in line with best practice and the requirements of PKC.

This assessment is intended to demonstrate that, given the nature and quantum of development proposed, it will be feasible to drain the Site in line with planning requirements.

7.1 Key Principles of Surface Water Management

Current best practice document; The Sustainable Drainage System (SuDS) Manual (CIRIA Report C753F)[27], promotes sustainable water management through the use of SuDS. There are four main categories of SuDS which are referred to as the 'four pillars of SuDS design' as depicted in **Graphic 11**.

Graphic 11 : Four Pillars of SuDS (extract from CIRIA Report C753)



The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train.' The hierarchy of techniques is identified as:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g., minimise areas of hard standing).
- Source Control – control of runoff at or very near its source (such as the use of rainwater harvesting).
- Site Control – management of water from several sub-catchments.

[27] Report C753, The SuDS Manual; CIRIA (2015). Report C753F, December 2015.

- Regional Control – management of runoff from several sites, typically in a retention pond or wetland.

Graphic 12 : SuDS Management Train

It is generally accepted that the implementation of SuDS, as opposed to conventional drainage systems, provides a number of benefits by:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- reducing potable water demand through rainwater harvesting; and,
- improving amenity through the provision of public open spaces and wildlife habitat; and replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

7.2 Existing Surface Water Drainage Regime

The proposed BESS is located on land presently used for grazing purposes at Binn Farm. There are no existing drainage provisions at the proposed BESS.

7.3 Pre-Development Runoff Rates (Greenfield)

Greenfield runoff rates for the area equivalent to the proposed impermeable areas resulting from the development were estimated using industry-standard ReFH2 methodology[28], with the application of the latest FEH22 rainfall data and hydrological descriptors from the Flood

[28] Wallingford Hydro Solutions, ReFH2, last accessed September 2025

Estimation Handbook (FEH) Web Service[29]. At the time of writing the updated FEH 2025 catchment descriptors[30] were not available for use in ReFH2, and as such rates were calculated using the 2008 descriptors.

The impermeable area of the proposed BESS compound was determined by calculating the total compound area of 0.22 ha for a conservative approach to the greenfield runoff estimation.

It is understood that some areas within each development location will comprise gravelled surfacing, and areas outwith these locations will remain undeveloped greenfield land. These changes will be incorporated at the detailed design stage.

The greenfield runoff rates for the assumed impermeable areas of the Proposed Development resulting from the ReFH2 analysis are summarised below in **Table 2**. Full ReFH2 calculations and results are included in **Annex A**.

Table 2 : Greenfield Runoff Rates

Annual Exceedance Probability	Greenfield Runoff Rate	
	l/s*	l/s/ha
1:1	0.40	1.84
1:2	0.45	2.03
1:30	0.90	4.09
1:30 + 39%CC	1.29	5.91
1:200	1.38	6.28
1:200 + 39%CC	2.04	9.26

**Based on an impermeable area of 0.22ha.*

7.4 Proposed Discharge Arrangement

With reference to the SuDS Manual, the hierarchy of preferred disposal options for surface water runoff from development sites in decreasing order of sustainability is as follows:

- infiltration to ground;
- discharge to surface waters; or,
- discharge to sewer.

Table 3 summarises the suitability of disposal methods in the context of the site and the proposed development. Based on this, runoff from the site is proposed to drain to ground/an existing overland flow path.

[29] FEH Web Service, last accessed September 2025

[30] FEH Catchment Descriptors for 2025, accessed September 2025

Table 3 : Suitability of Surface Water Disposal Methods

Surface Water Disposal Method (in order of preference)	Suitability Description	Method Suitable (Y / N)
Infiltration to Ground	As discussed in **Section 1.5**, the soil and superficial geology at the Site are considered low permeability and therefore infiltration is not considered a viable drainage option. Additionally, firewater storage is required at the Site and it is therefore considered that an infiltration-only option would not be appropriate.	N
Surface Water Discharge	There are no major watercourses in the immediate vicinity of the proposed BESS. A minor tributary of the Binn Burn is located to the north-east of the proposed BESS location outwith the Site boundary. There are no existing connections from the Site to this watercourse. The proposed method of drainage for the BESS would be drainage to a detention basin with limited outflow to the existing overland flow path that drains to the tributary of the Binn Burn offsite to the north-east. It is possible that at detailed design stage a piped outfall to the tributary of the Binn Burn may be proposed. Any exceedance of the proposed detention basin would be expected to follow the natural/existing drainage regime to ultimately discharge to the existing minor watercourse.	Y
Sewer Discharge	There are no formal sewers serving the Site.	N

7.5 Conceptual Surface Water Drainage Strategy

The proposed drainage strategies detailed below will manage surface water runoff as close to the source as possible, seeking to mimic the existing runoff regimes and ensuring that there are no increases in peak discharge from the proposed impermeable areas on site. The analysis has been carried out using Causeway Flow v15.0 software.

The final routing and details of the surface water drainage strategy which could be applied at the Site are to be determined at detailed design stage. This would normally be undertaken during the post-planning stage or via an appropriately worded planning condition, in which individual hydraulic design parameters would be detailed as required. Notwithstanding, the following sections provide details of the intended system concept.

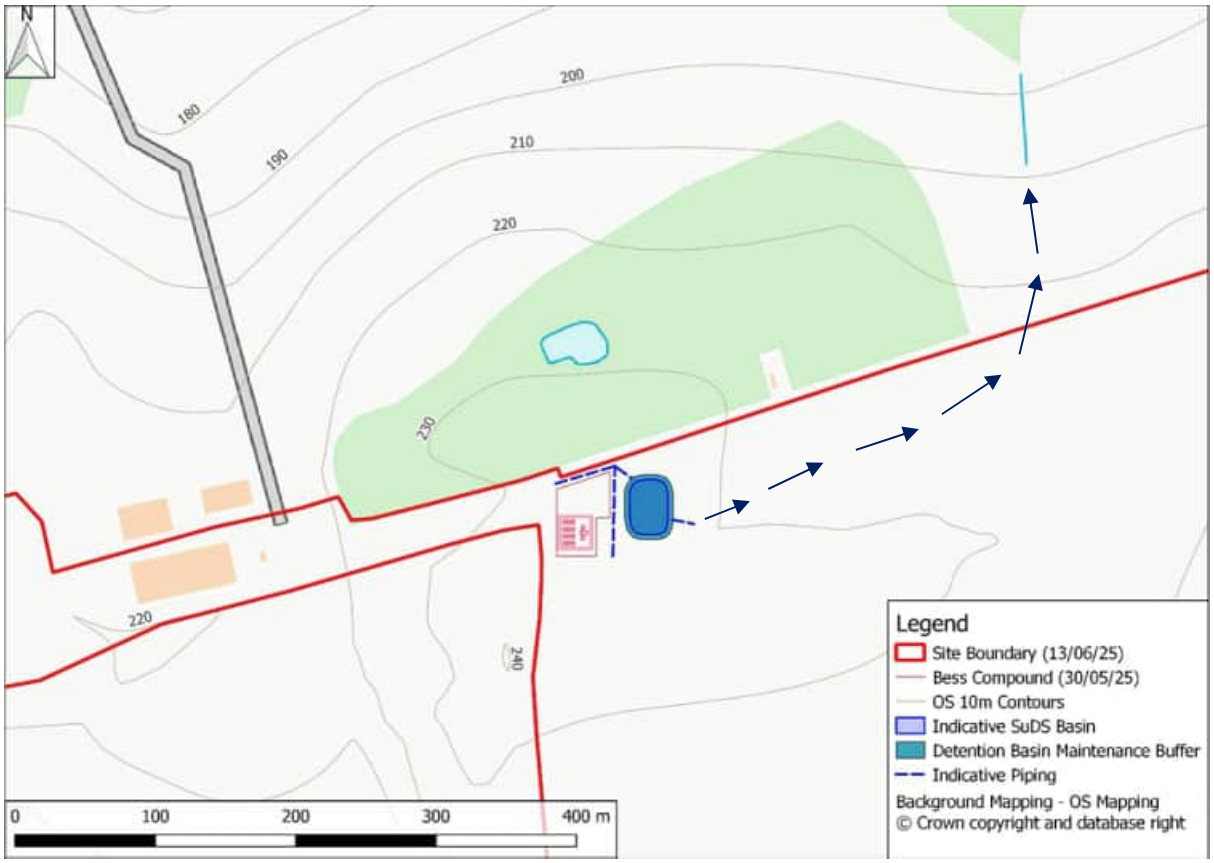
7.5.1 BESS

The proposed BESS is understood to have no existing surface water drainage network. For a conservative approach to the drainage provisions at this initial stage, it is assumed that the full 0.22 ha compound area is to be of impermeable surfacing.

The proposed surface water drainage strategy in this area will require the installation of interceptor drains/ditches to capture water and feed into a detention basin. The flows would

then be discharged at a limited rate to ground to flow overland to the minor watercourse to the north-east. The conceptual drainage strategy is shown in **Graphic 13**.

Graphic 13 : BESS Conceptual Drainage Strategy



It is noted that the detention basin at the BESS would be required to store firewater in the event of a fire, and as such would require lining and a penstock at the outfall to prevent contaminated fire water entering the minor watercourse system or wider environment. It would also be recommended that the interceptor drains/ditches directing flows to the basin are lined. Further details on the assessment of firewater are provided in **Section 7.12**.

7.6 SuDS Attenuation Storage

It is proposed that the required surface water attenuation is provided by a detention basin, which will be situated to the south of the compound, ensuring that surface water runoff can drain to the basin via gravity through interceptor drains. The proposed basin would be located outwith the BESS fencing but within the red line boundary and is proposed to be privately operated and maintained.

The parameters outlined in **Table 4** have been incorporated in the modelling of the proposed basin system, however, the exact dimensions will be determined at the detailed design stage.

Table 4 : Preliminary Drainage Model Parameters

Attribute	Detention Basin
Impermeable area	0.22 ha (+ assumed 0.14 ha basin area which includes an associated 3.5 m maintenance access buffer area in line with Sewers for Scotland v4)
Side slopes	1:3
Cover Level	235 m AOD (indicative level only, final level will be subject to more detailed topographical information of the Site)
Depth	1.5 m
Dimensions	550 m^2 at 0 m depth 827.7 m^2 at 1 m depth 987.7 m^2 at 1.5 m depth

The discharge rate from the detention basin to the minor watercourse is proposed to be restricted to a rate of 1.0l/s, greater than the 1:1 AEP greenfield runoff rate of 0.4l/s to prevent blockage risk. It is proposed that the discharge rate is restricted to 1.0l/s for all events up to and including the 0.5% AEP + CC event.

The volume of storage required for the 0.5% AEP + CC event with this discharge rate would be 440.3 m^3. The basin dimensions are oversized for this event, allowing for a total attenuation volume of 1149.9 m^3 in order to fully accommodate fire water in the event of a fire, as detailed in **Section 7.12**. Given that the basin will be lined and fitted with a penstock, the estimated area of the pond has been added to the impermeable area for sizing purposes.

Attenuation calculations demonstrating the performance of the proposed detention basin is included in **Annex B**.

7.7 SuDS Performance Assessment: Water Levels

It is proposed that attenuation will be provided by a detention basin for the proposed BESS. In line with NPF4 and PKC guidance, the proposed SuDS systems accommodate up to and including the 0.5% AEP event plus an allowance for climate change with no flooding.

Full results for the critical events are presented in **Annex B**, and the 3.33% AEP + CC and 0.5% AEP + CC events are summarised in **Table 5**. The final volume required for the detention basin is detailed in **Section 7.12**.

Table 5 : Summary of SuDS Performance – Attenuation Volume

SuDS Feature	AEP Event	Peak Water Depth (m)	Peak Water Volume (m^3)	Flood Volume (m^3)
Detention Basin (BESS)	3.33% AEP + 39%CC	0.47	288.9	0
	0.5% AEP + 39%CC	0.68	440.3	0

7.8 SuDS Performance Assessment: Water Quality

The simple index method, as outlined within the SuDS Manual, provides a way of quantifying the benefit to water quality of the SuDS Management Train. The pollution hazard from the land use and the mitigation from the SuDS component are each assigned an index. The total mitigation index must be greater than the pollution hazard index for adequate treatment to be delivered.

Total SuDS mitigation index ≥ pollution hazard index

(for each contaminant type) (for each containment type)

The total SuDS mitigation is the summation of the first components mitigation index and half the mitigation index of any subsequent component.

With reference to the SuDS Manual, post-development surface water runoff generated from each of the developments is considered to have a 'Low' Pollution Hazard Level respectively as presented in **Table 6**.

Table 6 : Pollution Hazard Potential for the Proposed Development

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Other Roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05
Low Traffic Surfaces with Infrequent Change	Low	0.5	0.4	0.4

The proposed surface water drainage system is required to provide sufficient treatment to mitigate the Pollution Hazard Indices indicated in the above table. The SuDS Mitigation Indices are therefore indicated in **Table 7**.

Table 7 : SuDS Mitigation Indices for Proposed Development

SuDS Component	Pollution Hazard Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Detention Basin	0.5	0.5	0.6
Swale	0.5	0.6	0.6

Table 8 compares the SuDS Mitigation Indices, provided by the proposed 'Source Control', 'Conveyance' and 'Site Control' measures against the Pollution Hazard Indices for each of the SuDS features.

Table 8 : SuDS Performance: Water Quality Indices Assessment – Detention Basin

Land Use	Pollution Hazard Level	Pollution Hazard and SuDS Mitigation Indices Comparison					
		Total Suspended Solids (TSS)		Metals		Hydrocarbons	
		Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index
Other Roofs (typically commercial/ industrial roofs)	Low	0.3	0.5	0.2	0.5	0.05	0.6
Low Traffic Surfaces with Infrequent Change	Low	0.5	0.5	0.4	0.5	0.4	0.6

As the SuDS Mitigation Index provided by the proposed SuDS measures are greater than or equal to the Pollution Hazard Index, the water quality assessment criteria are satisfied for all Land Use criteria.

7.9 SuDS Operational Maintenance Requirements

A full SuDS maintenance plan would be produced as part of the detailed drainage design post-development and the precise requirement would depend on manufacture specification of the final design.

An outline of the typical maintenance requirements of the proposed SuDS features is outlined below.

7.9.1 Detention Basin

A recommended operation and maintenance plan for the detention basin is summarised in **Table 9**.

Table 9 : Detention Basin Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage vegetation/remove nuisance plants	Monthly at start, then as required

Maintenance Schedule	Required Action	Minimum Frequency
	Inspect inlets, outlets, and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional maintenance	Reseed areas of poor vegetation growth	As required if bare soil is exposed within 10% or more of the basin treatment area
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay, and main basin when required	Every 5 years, or as required
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

7.10 Exceedance

In the low probability event of exceedance of the detention basin, flows would be expected to follow natural topographical gradients off-site, flowing in an easterly direction from the detention basin at the BESS to the minor watercourse offsite to the northeast.

Given that the proposed drainage strategy mimics the existing drainage pathways at the Site, the exceedance flow paths for the basin would be as outlined in the proposed drainage strategy in **Graphic 13**.

7.11 Foul Water Drainage Strategy

The proposed BESS development is to be unmanned during normal operation. There is therefore no requirement for a foul water drainage strategy for this Proposed Development.

7.12 Fire Water Management

Notwithstanding the SuDS mitigation index, provision will be made for firewater containment in the BESS. This is proposed to be provided by lining the proposed detention basin with a low permeability liner and provision of a penstock/shutoff valve on the outfall which can be used in the unlikely event of a fire to contain firewater in the basin, thus preventing discharge from the Site.

With reference to GPP18[9], it is understood that the capacity of the basin must be sufficient to store the following:

- 10-year return period, 8 days rainfall prior to the incident;
- 10-year return, 24 hour rainfall;
- An allowance for rain falling directly on to remote containment and areas of the Site draining into it, immediately after the incident;
- Fire-fighting and cooling water;
- Foam – a freeboard of not less than 100 mm; and
- Dynamic effects – allow 250 mm for surge of liquid and for wind-blown waves.

An outline estimation of the required volume of each of these GPP18 components and the total volume of the proposed basin are shown in **Table 10**. Full details of this will be provided during the detailed design stage of the Proposed Development.

The Proposed Development is to include two water tanks and an associated pump house for the storage of fire water. The tanks each have a capacity of 115,000 litres (combined capacity 230,000 litres). The proposed SuDS feature would therefore be required to store the full 230m^3 of water in the event of a fire.

In order to allow for rain falling directly on remote containment following the incident as well as on maintenance access areas following the incident, an additional area of 1400 m^2 has been added to the drainage area calculations. No outflow has been allowed for the 10% AEP 24-hour event, assuming activation of the penstock. It is noted that 230 m^3 of firewater is to be stored on site for use in the event of a fire.

Table 10 : GPP18 Required Volumes

Event	Volume (m^3)
10% AEP + CC, 8 days rainfall* (winter)	203.2
Fire-fighting and cooling water;	230.0
10% AEP + CC, 24-hour rainfall (winter) – no discharge due to penstock	266.5
Total	**699.7**
Total Basin Capacity (with freeboard)	**1149.9**

**Consecutive 10% AEP + CC 1-day rainfall event followed by 10% AEP + CC 7-day rainfall event (the maximum duration in Causeway Flow) modelled to account for the 8-day event.*

Modelling the total required volume in Causeway Flow indicates that there will be approximately 350 mm freeboard, sufficient for the required allowance for foam and dynamic effects.

An additional check was carried out on the 0.5% AEP event plus climate change followed by a fire-fighting incident. The resulting volume required is shown in **Table 11**.

Table 11 : 0.5% AEP event + CC and Subsequent Fire Incident Volumes

Event	Volume (m^3)
0.5% AEP + 42% (winter)	440.3
Fire-fighting and cooling water	230
Total Required Volume	**670.3**
Total Basin Capacity (with freeboard)	**1149.9**

8.0 Conclusions

8.1 Flood Risk

It is considered that the Proposed Development falls under exception a)i) of NPF4[1] Policy 22 as *"all forms of renewable, low-carbon and zero emission technologies for electricity generation and distribution and transmission electricity grid networks and primary sub stations".*

The flood risk screening indicates that the proposed BESS is not at flood risk for the NPF4 design event of 0.5% AEP + CC. Any direct rainfall on the BESS will be managed through the SuDS design.

It is understood that access/egress to the BESS is to be afforded by the existing tracks and that no alterations to these routes are required. Some flood risk to the access/egress is noted, though it is understood that the Site is to be unmanned and will remain operational in times of flood. As an additional precaution, Site staff should sign up for SEPA's Floodline warnings and check Met Office weather warnings and SEPA 3-day flood forecasts to ensure that the Site is not accessed in periods of heavy rainfall.

SEPA surface water flood mapping indicates some areas of flooding of depths of up to and in excess of 1 m in the area of the proposed solar panels. Review of the local topography in these areas indicates that flood depths of greater than 1 m are not expected. The standard minimum panel elevation of 1 m above ground level is considered sufficient from a flood risk perspective.

Given that the Proposed Development is not at flood risk and does not increase flood risk elsewhere, and can remain operational in times of flood, it is considered that the requirements of NPF4 and the Perth and Kinross Council Local Development Plan have been met.

8.2 Surface Water Drainage Strategy

It is proposed that surface water runoff from the impermeable areas associated with the proposed BESS is captured, attenuated, and drained via SuDS systems.

A detention basin is proposed for the BESS, discharging surface water at a restricted rate of 1.0l/s to an overland flow path to a minor tributary of the Binn Burn to the northeast. It is noted that at the detailed design stage, a piped solution may be proposed to discharge the basin to the tributary of the Binn Burn.

The detention basin would also be designed for the retention of firewater and would be fitted with a penstock. The total volume of the proposed detention basin is 1149.9 m^3 with a total required surface area of approximately 1400 m^2 including a 3.5 m maintenance buffer in line with Scottish Water guidance.

The proposed surface water drainage designs are indicative only and exact dimensions and levels will be determined at the detailed design stage.

Annex A Greenfield ReFH2 Outputs

Annex 1: Flood Risk Assessment and Drainage Impact Assessment

Binn Farm Solar & BESS

Trio Power Limited

SLR Project No.: 405.065788.00001

16 December 2025

UK Design Flood Estimation

Generated on 21 October 2025 15:14:09 by ahay
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 569B-A529

Site name: FEH_Point_Descriptors_317718_712393_v5_0_1

Easting: 317718

Northing: 712393

Country: Scotland

Catchment Area (km²): 0 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH22 (mm):	24.78	Total runoff (ML):	0.01
Total Rainfall (mm):	18.82	Total flow (ML):	0.03
Peak Rainfall (mm):	3.21	Peak flow (m³/s):	0.00

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	07:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.76	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	99.43	No
Cmax (mm)	438.95	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	4.18 [3.92]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	27.9 [12.87]	Yes
BR	2.62	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
Urban area (km^2)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.2814	0.0000	0.0638	0.0000	4.37E-05	4.37E-05
00:30:00	0.4112	0.0000	0.0936	0.0000	4.3E-05	4.33E-05
01:00:00	0.5995	0.0000	0.1371	0.0000	4.22E-05	4.36E-05
01:30:00	0.8712	0.0000	0.2008	0.0000	4.16E-05	4.5E-05
02:00:00	1.2607	0.0000	0.2936	0.0000	4.11E-05	4.82E-05
02:30:00	1.8123	0.0000	0.4284	0.0000	4.08E-05	5.38E-05
03:00:00	2.5697	0.0000	0.6203	0.0000	4.09E-05	6.32E-05
03:30:00	3.2117	0.0000	0.7964	0.0000	4.16E-05	7.79E-05
04:00:00	2.5697	0.0000	0.6541	0.0001	4.3E-05	0.0001
04:30:00	1.8123	0.0000	0.4704	0.0001	4.55E-05	0.00013
05:00:00	1.2607	0.0000	0.3316	0.0001	4.94E-05	0.000165
05:30:00	0.8712	0.0000	0.2313	0.0001	5.47E-05	0.000204
06:00:00	0.5995	0.0000	0.1601	0.0002	6.14E-05	0.000244
06:30:00	0.4112	0.0000	0.1103	0.0002	6.96E-05	0.000285
07:00:00	0.2814	0.0000	0.0757	0.0002	7.91E-05	0.000324
07:30:00	0.0000	0.0000	0.0000	0.0003	8.97E-05	0.000358
08:00:00	0.0000	0.0000	0.0000	0.0003	0.000101	0.000384
08:30:00	0.0000	0.0000	0.0000	0.0003	0.000112	0.000399
09:00:00	0.0000	0.0000	0.0000	0.0003	0.000124	0.000404
09:30:00	0.0000	0.0000	0.0000	0.0003	0.000134	0.000403
10:00:00	0.0000	0.0000	0.0000	0.0003	0.000144	0.000396
10:30:00	0.0000	0.0000	0.0000	0.0002	0.000153	0.000386
11:00:00	0.0000	0.0000	0.0000	0.0002	0.00016	0.000373
11:30:00	0.0000	0.0000	0.0000	0.0002	0.000167	0.000359
12:00:00	0.0000	0.0000	0.0000	0.0002	0.000172	0.000344
12:30:00	0.0000	0.0000	0.0000	0.0002	0.000177	0.000331
13:00:00	0.0000	0.0000	0.0000	0.0001	0.000181	0.000319
13:30:00	0.0000	0.0000	0.0000	0.0001	0.000183	0.000307
14:00:00	0.0000	0.0000	0.0000	0.0001	0.000186	0.000296
14:30:00	0.0000	0.0000	0.0000	0.0001	0.000187	0.000286
15:00:00	0.0000	0.0000	0.0000	0.0001	0.000188	0.000275
15:30:00	0.0000	0.0000	0.0000	0.0001	0.000189	0.000264
16:00:00	0.0000	0.0000	0.0000	0.0001	0.000188	0.000253
16:30:00	0.0000	0.0000	0.0000	0.0001	0.000188	0.000241

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000187	0.00023
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000185	0.000219
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000183	0.000208
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000181	0.000198
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000178	0.000189
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000176	0.000183
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000173	0.000177
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00017	0.000172
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000167	0.000168
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000164	0.000164
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000161	0.000161
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000158	0.000158
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000155	0.000155
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000153	0.000153
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00015	0.00015
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000147	0.000147
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000145	0.000145
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000142	0.000142
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00014	0.00014
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000137	0.000137
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000135	0.000135
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000132	0.000132
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00013	0.00013
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000128	0.000128
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000125	0.000125
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000123	0.000123
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000121	0.000121
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000119	0.000119
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000117	0.000117
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000115	0.000115
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000113	0.000113
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000111	0.000111
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000109	0.000109
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000107	0.000107
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000105	0.000105

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000103	0.000103
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000101	0.000101
35:30:00	0.0000	0.0000	0.0000	0.0000	9.93E-05	9.93E-05
36:00:00	0.0000	0.0000	0.0000	0.0000	9.76E-05	9.76E-05
36:30:00	0.0000	0.0000	0.0000	0.0000	9.58E-05	9.58E-05
37:00:00	0.0000	0.0000	0.0000	0.0000	9.41E-05	9.41E-05
37:30:00	0.0000	0.0000	0.0000	0.0000	9.25E-05	9.25E-05
38:00:00	0.0000	0.0000	0.0000	0.0000	9.08E-05	9.08E-05
38:30:00	0.0000	0.0000	0.0000	0.0000	8.92E-05	8.92E-05
39:00:00	0.0000	0.0000	0.0000	0.0000	8.76E-05	8.76E-05
39:30:00	0.0000	0.0000	0.0000	0.0000	8.61E-05	8.61E-05
40:00:00	0.0000	0.0000	0.0000	0.0000	8.45E-05	8.45E-05
40:30:00	0.0000	0.0000	0.0000	0.0000	8.3E-05	8.3E-05
41:00:00	0.0000	0.0000	0.0000	0.0000	8.16E-05	8.16E-05
41:30:00	0.0000	0.0000	0.0000	0.0000	8.01E-05	8.01E-05
42:00:00	0.0000	0.0000	0.0000	0.0000	7.87E-05	7.87E-05
42:30:00	0.0000	0.0000	0.0000	0.0000	7.73E-05	7.73E-05
43:00:00	0.0000	0.0000	0.0000	0.0000	7.59E-05	7.59E-05
43:30:00	0.0000	0.0000	0.0000	0.0000	7.46E-05	7.46E-05
44:00:00	0.0000	0.0000	0.0000	0.0000	7.32E-05	7.32E-05
44:30:00	0.0000	0.0000	0.0000	0.0000	7.19E-05	7.19E-05
45:00:00	0.0000	0.0000	0.0000	0.0000	7.07E-05	7.07E-05
45:30:00	0.0000	0.0000	0.0000	0.0000	6.94E-05	6.94E-05
46:00:00	0.0000	0.0000	0.0000	0.0000	6.82E-05	6.82E-05
46:30:00	0.0000	0.0000	0.0000	0.0000	6.7E-05	6.7E-05
47:00:00	0.0000	0.0000	0.0000	0.0000	6.58E-05	6.58E-05
47:30:00	0.0000	0.0000	0.0000	0.0000	6.46E-05	6.46E-05
48:00:00	0.0000	0.0000	0.0000	0.0000	6.35E-05	6.35E-05
48:30:00	0.0000	0.0000	0.0000	0.0000	6.23E-05	6.23E-05
49:00:00	0.0000	0.0000	0.0000	0.0000	6.12E-05	6.12E-05
49:30:00	0.0000	0.0000	0.0000	0.0000	6.01E-05	6.01E-05
50:00:00	0.0000	0.0000	0.0000	0.0000	5.91E-05	5.91E-05
50:30:00	0.0000	0.0000	0.0000	0.0000	5.8E-05	5.8E-05
51:00:00	0.0000	0.0000	0.0000	0.0000	5.7E-05	5.7E-05
51:30:00	0.0000	0.0000	0.0000	0.0000	5.6E-05	5.6E-05

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
52:00:00	0.0000	0.0000	0.0000	0.0000	5.5E-05	5.5E-05
52:30:00	0.0000	0.0000	0.0000	0.0000	5.4E-05	5.4E-05
53:00:00	0.0000	0.0000	0.0000	0.0000	5.3E-05	5.3E-05
53:30:00	0.0000	0.0000	0.0000	0.0000	5.21E-05	5.21E-05
54:00:00	0.0000	0.0000	0.0000	0.0000	5.12E-05	5.12E-05
54:30:00	0.0000	0.0000	0.0000	0.0000	5.03E-05	5.03E-05
55:00:00	0.0000	0.0000	0.0000	0.0000	4.94E-05	4.94E-05
55:30:00	0.0000	0.0000	0.0000	0.0000	4.85E-05	4.85E-05
56:00:00	0.0000	0.0000	0.0000	0.0000	4.76E-05	4.76E-05
56:30:00	0.0000	0.0000	0.0000	0.0000	4.68E-05	4.68E-05
57:00:00	0.0000	0.0000	0.0000	0.0000	4.6E-05	4.6E-05
57:30:00	0.0000	0.0000	0.0000	0.0000	4.51E-05	4.51E-05
58:00:00	0.0000	0.0000	0.0000	0.0000	4.43E-05	4.43E-05

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.61	No
BFIHOST19	0.51	No
PROPWET	0.45	No
SAAR (mm)	893	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 21 October 2025 15:14:31 by ahay
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 569B-A529

Site name: FEH_Point_Descriptors_317718_712393_v5_0_1

Easting: 317718

Northing: 712393

Country: Scotland

Catchment Area (km²): 0 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 30 year 1.39 CC

Summary of results

Rainfall - FEH22 (mm):	74.93	Total runoff (ML):	0.03
Total Rainfall (mm):	56.91	Total flow (ML):	0.09
Peak Rainfall (mm):	9.71	Peak flow (m³/s):	0.00

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	07:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.76	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No
Climate change factor	1.39	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	99.43	No
Cmax (mm)	438.95	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	4.18 [3.92]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	27.9 [12.87]	Yes
BR	2.17	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
Urban area (km^2)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.8508	0.0000	0.1936	0.0000	4.37E-05	4.37E-05
00:30:00	1.2433	0.0000	0.2858	0.0000	4.3E-05	4.39E-05
01:00:00	1.8125	0.0000	0.4230	0.0000	4.23E-05	4.63E-05
01:30:00	2.6340	0.0000	0.6280	0.0000	4.18E-05	5.22E-05
02:00:00	3.8117	0.0000	0.9368	0.0000	4.17E-05	6.33E-05
02:30:00	5.4796	0.0000	1.4047	0.0000	4.22E-05	8.22E-05
03:00:00	7.7696	0.0000	2.1090	0.0001	4.35E-05	0.000113
03:30:00	9.7106	0.0000	2.8292	0.0001	4.63E-05	0.000161
04:00:00	7.7696	0.0000	2.4184	0.0002	5.12E-05	0.000234
04:30:00	5.4796	0.0000	1.7883	0.0003	5.92E-05	0.000334
05:00:00	3.8117	0.0000	1.2843	0.0004	7.09E-05	0.000454
05:30:00	2.6340	0.0000	0.9069	0.0005	8.67E-05	0.000588
06:00:00	1.8125	0.0000	0.6332	0.0006	0.000107	0.00073
06:30:00	1.2433	0.0000	0.4387	0.0007	0.000131	0.000873
07:00:00	0.8508	0.0000	0.3022	0.0009	0.00016	0.00101
07:30:00	0.0000	0.0000	0.0000	0.0009	0.000191	0.00113
08:00:00	0.0000	0.0000	0.0000	0.0010	0.000226	0.00122
08:30:00	0.0000	0.0000	0.0000	0.0010	0.000261	0.00128
09:00:00	0.0000	0.0000	0.0000	0.0010	0.000295	0.0013
09:30:00	0.0000	0.0000	0.0000	0.0010	0.000328	0.00129
10:00:00	0.0000	0.0000	0.0000	0.0009	0.000358	0.00127
10:30:00	0.0000	0.0000	0.0000	0.0008	0.000386	0.00123
11:00:00	0.0000	0.0000	0.0000	0.0008	0.00041	0.00118
11:30:00	0.0000	0.0000	0.0000	0.0007	0.000431	0.00113
12:00:00	0.0000	0.0000	0.0000	0.0006	0.000449	0.00107
12:30:00	0.0000	0.0000	0.0000	0.0006	0.000464	0.00102
13:00:00	0.0000	0.0000	0.0000	0.0005	0.000476	0.000978
13:30:00	0.0000	0.0000	0.0000	0.0005	0.000486	0.000937
14:00:00	0.0000	0.0000	0.0000	0.0004	0.000494	0.000897
14:30:00	0.0000	0.0000	0.0000	0.0004	0.0005	0.000858
15:00:00	0.0000	0.0000	0.0000	0.0003	0.000504	0.00082
15:30:00	0.0000	0.0000	0.0000	0.0003	0.000507	0.000782
16:00:00	0.0000	0.0000	0.0000	0.0002	0.000507	0.000743
16:30:00	0.0000	0.0000	0.0000	0.0002	0.000507	0.000705

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:00:00	0.0000	0.0000	0.0000	0.0002	0.000505	0.000666
17:30:00	0.0000	0.0000	0.0000	0.0001	0.000501	0.000627
18:00:00	0.0000	0.0000	0.0000	0.0001	0.000497	0.00059
18:30:00	0.0000	0.0000	0.0000	0.0001	0.000491	0.000556
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000484	0.000527
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000477	0.000504
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000469	0.000485
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000461	0.00047
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000454	0.000458
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000446	0.000447
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000438	0.000438
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00043	0.00043
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000422	0.000422
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000415	0.000415
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000407	0.000407
24:30:00	0.0000	0.0000	0.0000	0.0000	0.0004	0.0004
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000393	0.000393
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000386	0.000386
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000379	0.000379
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000373	0.000373
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000366	0.000366
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000359	0.000359
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000353	0.000353
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000347	0.000347
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000341	0.000341
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000335	0.000335
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000329	0.000329
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000323	0.000323
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000317	0.000317
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000311	0.000311
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000306	0.000306
32:30:00	0.0000	0.0000	0.0000	0.0000	0.0003	0.0003
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000295	0.000295
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00029	0.00029
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000285	0.000285

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00028	0.00028
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000275	0.000275
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00027	0.00027
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000265	0.000265
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00026	0.00026
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000256	0.000256
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000251	0.000251
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000247	0.000247
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000242	0.000242
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000238	0.000238
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000234	0.000234
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00023	0.00023
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000226	0.000226
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000222	0.000222
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000218	0.000218
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000214	0.000214
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00021	0.00021
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000206	0.000206
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000203	0.000203
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000199	0.000199
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000195	0.000195
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000192	0.000192
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000189	0.000189
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000185	0.000185
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000182	0.000182
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000179	0.000179
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000175	0.000175
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000172	0.000172
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000169	0.000169
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000166	0.000166
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000163	0.000163
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00016	0.00016
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000158	0.000158
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000155	0.000155
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000152	0.000152

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000149	0.000149
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000147	0.000147
53:00:00	0.0000	0.0000	0.0000	0.0000	0.000144	0.000144
53:30:00	0.0000	0.0000	0.0000	0.0000	0.000142	0.000142
54:00:00	0.0000	0.0000	0.0000	0.0000	0.000139	0.000139
54:30:00	0.0000	0.0000	0.0000	0.0000	0.000137	0.000137
55:00:00	0.0000	0.0000	0.0000	0.0000	0.000134	0.000134
55:30:00	0.0000	0.0000	0.0000	0.0000	0.000132	0.000132
56:00:00	0.0000	0.0000	0.0000	0.0000	0.000129	0.000129
56:30:00	0.0000	0.0000	0.0000	0.0000	0.000127	0.000127
57:00:00	0.0000	0.0000	0.0000	0.0000	0.000125	0.000125
57:30:00	0.0000	0.0000	0.0000	0.0000	0.000123	0.000123
58:00:00	0.0000	0.0000	0.0000	0.0000	0.00012	0.00012
58:30:00	0.0000	0.0000	0.0000	0.0000	0.000118	0.000118
59:00:00	0.0000	0.0000	0.0000	0.0000	0.000116	0.000116
59:30:00	0.0000	0.0000	0.0000	0.0000	0.000114	0.000114
60:00:00	0.0000	0.0000	0.0000	0.0000	0.000112	0.000112
60:30:00	0.0000	0.0000	0.0000	0.0000	0.00011	0.00011
61:00:00	0.0000	0.0000	0.0000	0.0000	0.000108	0.000108
61:30:00	0.0000	0.0000	0.0000	0.0000	0.000106	0.000106
62:00:00	0.0000	0.0000	0.0000	0.0000	0.000104	0.000104
62:30:00	0.0000	0.0000	0.0000	0.0000	0.000103	0.000103
63:00:00	0.0000	0.0000	0.0000	0.0000	0.000101	0.000101
63:30:00	0.0000	0.0000	0.0000	0.0000	9.89E-05	9.89E-05
64:00:00	0.0000	0.0000	0.0000	0.0000	9.71E-05	9.71E-05
64:30:00	0.0000	0.0000	0.0000	0.0000	9.54E-05	9.54E-05
65:00:00	0.0000	0.0000	0.0000	0.0000	9.37E-05	9.37E-05
65:30:00	0.0000	0.0000	0.0000	0.0000	9.21E-05	9.21E-05
66:00:00	0.0000	0.0000	0.0000	0.0000	9.04E-05	9.04E-05
66:30:00	0.0000	0.0000	0.0000	0.0000	8.88E-05	8.88E-05
67:00:00	0.0000	0.0000	0.0000	0.0000	8.72E-05	8.72E-05
67:30:00	0.0000	0.0000	0.0000	0.0000	8.57E-05	8.57E-05
68:00:00	0.0000	0.0000	0.0000	0.0000	8.42E-05	8.42E-05
68:30:00	0.0000	0.0000	0.0000	0.0000	8.27E-05	8.27E-05
69:00:00	0.0000	0.0000	0.0000	0.0000	8.12E-05	8.12E-05

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
69:30:00	0.0000	0.0000	0.0000	0.0000	7.98E-05	7.98E-05
70:00:00	0.0000	0.0000	0.0000	0.0000	7.83E-05	7.83E-05
70:30:00	0.0000	0.0000	0.0000	0.0000	7.69E-05	7.69E-05
71:00:00	0.0000	0.0000	0.0000	0.0000	7.56E-05	7.56E-05
71:30:00	0.0000	0.0000	0.0000	0.0000	7.42E-05	7.42E-05
72:00:00	0.0000	0.0000	0.0000	0.0000	7.29E-05	7.29E-05
72:30:00	0.0000	0.0000	0.0000	0.0000	7.16E-05	7.16E-05
73:00:00	0.0000	0.0000	0.0000	0.0000	7.04E-05	7.04E-05
73:30:00	0.0000	0.0000	0.0000	0.0000	6.91E-05	6.91E-05
74:00:00	0.0000	0.0000	0.0000	0.0000	6.79E-05	6.79E-05
74:30:00	0.0000	0.0000	0.0000	0.0000	6.67E-05	6.67E-05
75:00:00	0.0000	0.0000	0.0000	0.0000	6.55E-05	6.55E-05
75:30:00	0.0000	0.0000	0.0000	0.0000	6.43E-05	6.43E-05
76:00:00	0.0000	0.0000	0.0000	0.0000	6.32E-05	6.32E-05
76:30:00	0.0000	0.0000	0.0000	0.0000	6.21E-05	6.21E-05
77:00:00	0.0000	0.0000	0.0000	0.0000	6.1E-05	6.1E-05
77:30:00	0.0000	0.0000	0.0000	0.0000	5.99E-05	5.99E-05
78:00:00	0.0000	0.0000	0.0000	0.0000	5.88E-05	5.88E-05
78:30:00	0.0000	0.0000	0.0000	0.0000	5.78E-05	5.78E-05
79:00:00	0.0000	0.0000	0.0000	0.0000	5.67E-05	5.67E-05
79:30:00	0.0000	0.0000	0.0000	0.0000	5.57E-05	5.57E-05
80:00:00	0.0000	0.0000	0.0000	0.0000	5.47E-05	5.47E-05
80:30:00	0.0000	0.0000	0.0000	0.0000	5.38E-05	5.38E-05
81:00:00	0.0000	0.0000	0.0000	0.0000	5.28E-05	5.28E-05
81:30:00	0.0000	0.0000	0.0000	0.0000	5.19E-05	5.19E-05
82:00:00	0.0000	0.0000	0.0000	0.0000	5.1E-05	5.1E-05
82:30:00	0.0000	0.0000	0.0000	0.0000	5E-05	5E-05
83:00:00	0.0000	0.0000	0.0000	0.0000	4.92E-05	4.92E-05
83:30:00	0.0000	0.0000	0.0000	0.0000	4.83E-05	4.83E-05
84:00:00	0.0000	0.0000	0.0000	0.0000	4.74E-05	4.74E-05
84:30:00	0.0000	0.0000	0.0000	0.0000	4.66E-05	4.66E-05
85:00:00	0.0000	0.0000	0.0000	0.0000	4.58E-05	4.58E-05
85:30:00	0.0000	0.0000	0.0000	0.0000	4.49E-05	4.49E-05
86:00:00	0.0000	0.0000	0.0000	0.0000	4.41E-05	4.41E-05

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.61	No
BFIHOST19	0.51	No
PROPWET	0.45	No
SAAR (mm)	893	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 21 October 2025 15:13:29 by ahay
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 569B-A529

Site name: FEH_Point_Descriptors_317718_712393_v5_0_1

Easting: 317718

Northing: 712393

Country: Scotland

Catchment Area (km²): 0 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 200 year 1.39 CC

Summary of results

Rainfall - FEH22 (mm):	109.80	Total runoff (ML):	0.05
Total Rainfall (mm):	83.41	Total flow (ML):	0.14
Peak Rainfall (mm):	14.23	Peak flow (m³/s):	0.00

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	07:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.76	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No
Climate change factor	1.39	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	99.43	No
Cmax (mm)	438.95	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	4.18 [3.92]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	27.9 [12.87]	Yes
BR	1.93	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m^3/s)	0	No
Exporting drained area (km^2)	0	No
Urban area (km^2)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.2468	0.0000	0.2842	0.0000	4.37E-05	4.37E-05
00:30:00	1.8220	0.0000	0.4217	0.0000	4.3E-05	4.43E-05
01:00:00	2.6561	0.0000	0.6283	0.0000	4.23E-05	4.82E-05
01:30:00	3.8601	0.0000	0.9417	0.0000	4.2E-05	5.73E-05
02:00:00	5.5860	0.0000	1.4229	0.0000	4.2E-05	7.4E-05
02:30:00	8.0302	0.0000	2.1701	0.0001	4.29E-05	0.000102
03:00:00	11.3862	0.0000	3.3288	0.0001	4.49E-05	0.000149
03:30:00	14.2306	0.0000	4.5756	0.0002	4.89E-05	0.000222
04:00:00	11.3862	0.0000	3.9933	0.0003	5.58E-05	0.000335
04:30:00	8.0302	0.0000	2.9939	0.0004	6.69E-05	0.000491
05:00:00	5.5860	0.0000	2.1693	0.0006	8.32E-05	0.00068
05:30:00	3.8601	0.0000	1.5406	0.0008	0.000106	0.000892
06:00:00	2.6561	0.0000	1.0798	0.0010	0.000134	0.00112
06:30:00	1.8220	0.0000	0.7500	0.0012	0.000169	0.00135
07:00:00	1.2468	0.0000	0.5176	0.0014	0.000209	0.00157
07:30:00	0.0000	0.0000	0.0000	0.0015	0.000255	0.00176
08:00:00	0.0000	0.0000	0.0000	0.0016	0.000304	0.00191
08:30:00	0.0000	0.0000	0.0000	0.0016	0.000355	0.002
09:00:00	0.0000	0.0000	0.0000	0.0016	0.000405	0.00204
09:30:00	0.0000	0.0000	0.0000	0.0016	0.000453	0.00203
10:00:00	0.0000	0.0000	0.0000	0.0015	0.000497	0.00198
10:30:00	0.0000	0.0000	0.0000	0.0014	0.000537	0.00192
11:00:00	0.0000	0.0000	0.0000	0.0013	0.000573	0.00184
11:30:00	0.0000	0.0000	0.0000	0.0011	0.000604	0.00175
12:00:00	0.0000	0.0000	0.0000	0.0010	0.000631	0.00165
12:30:00	0.0000	0.0000	0.0000	0.0009	0.000653	0.00157
13:00:00	0.0000	0.0000	0.0000	0.0008	0.000671	0.00149
13:30:00	0.0000	0.0000	0.0000	0.0007	0.000686	0.00142
14:00:00	0.0000	0.0000	0.0000	0.0007	0.000698	0.00136
14:30:00	0.0000	0.0000	0.0000	0.0006	0.000707	0.00129
15:00:00	0.0000	0.0000	0.0000	0.0005	0.000713	0.00123
15:30:00	0.0000	0.0000	0.0000	0.0005	0.000717	0.00117
16:00:00	0.0000	0.0000	0.0000	0.0004	0.000719	0.00111
16:30:00	0.0000	0.0000	0.0000	0.0003	0.000719	0.00105

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:00:00	0.0000	0.0000	0.0000	0.0003	0.000716	0.000983
17:30:00	0.0000	0.0000	0.0000	0.0002	0.000712	0.000921
18:00:00	0.0000	0.0000	0.0000	0.0002	0.000705	0.000862
18:30:00	0.0000	0.0000	0.0000	0.0001	0.000697	0.000807
19:00:00	0.0000	0.0000	0.0000	0.0001	0.000688	0.000761
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000678	0.000724
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000667	0.000694
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000656	0.000671
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000645	0.000652
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000633	0.000636
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000622	0.000623
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000611	0.000611
23:00:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00059	0.00059
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000579	0.000579
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000569	0.000569
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000559	0.000559
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000549	0.000549
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000539	0.000539
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00053	0.00053
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00052	0.00052
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000511	0.000511
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000502	0.000502
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000493	0.000493
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000484	0.000484
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000476	0.000476
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000467	0.000467
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000459	0.000459
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000451	0.000451
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000443	0.000443
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000435	0.000435
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000427	0.000427
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00042	0.00042
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000412	0.000412
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000405	0.000405

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000398	0.000398
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00039	0.00039
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000384	0.000384
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000377	0.000377
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00037	0.00037
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000363	0.000363
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000357	0.000357
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000351	0.000351
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000344	0.000344
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000338	0.000338
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000332	0.000332
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000326	0.000326
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000321	0.000321
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000315	0.000315
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000309	0.000309
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000304	0.000304
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000298	0.000298
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000293	0.000293
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000288	0.000288
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000283	0.000283
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000278	0.000278
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000273	0.000273
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000268	0.000268
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000263	0.000263
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000259	0.000259
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000254	0.000254
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000249	0.000249
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000245	0.000245
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000241	0.000241
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000236	0.000236
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000232	0.000232
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000228	0.000228
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000224	0.000224
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00022	0.00022
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000216	0.000216

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000212	0.000212
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000209	0.000209
53:00:00	0.0000	0.0000	0.0000	0.0000	0.000205	0.000205
53:30:00	0.0000	0.0000	0.0000	0.0000	0.000201	0.000201
54:00:00	0.0000	0.0000	0.0000	0.0000	0.000198	0.000198
54:30:00	0.0000	0.0000	0.0000	0.0000	0.000194	0.000194
55:00:00	0.0000	0.0000	0.0000	0.0000	0.000191	0.000191
55:30:00	0.0000	0.0000	0.0000	0.0000	0.000187	0.000187
56:00:00	0.0000	0.0000	0.0000	0.0000	0.000184	0.000184
56:30:00	0.0000	0.0000	0.0000	0.0000	0.000181	0.000181
57:00:00	0.0000	0.0000	0.0000	0.0000	0.000177	0.000177
57:30:00	0.0000	0.0000	0.0000	0.0000	0.000174	0.000174
58:00:00	0.0000	0.0000	0.0000	0.0000	0.000171	0.000171
58:30:00	0.0000	0.0000	0.0000	0.0000	0.000168	0.000168
59:00:00	0.0000	0.0000	0.0000	0.0000	0.000165	0.000165
59:30:00	0.0000	0.0000	0.0000	0.0000	0.000162	0.000162
60:00:00	0.0000	0.0000	0.0000	0.0000	0.000159	0.000159
60:30:00	0.0000	0.0000	0.0000	0.0000	0.000157	0.000157
61:00:00	0.0000	0.0000	0.0000	0.0000	0.000154	0.000154
61:30:00	0.0000	0.0000	0.0000	0.0000	0.000151	0.000151
62:00:00	0.0000	0.0000	0.0000	0.0000	0.000148	0.000148
62:30:00	0.0000	0.0000	0.0000	0.0000	0.000146	0.000146
63:00:00	0.0000	0.0000	0.0000	0.0000	0.000143	0.000143
63:30:00	0.0000	0.0000	0.0000	0.0000	0.000141	0.000141
64:00:00	0.0000	0.0000	0.0000	0.0000	0.000138	0.000138
64:30:00	0.0000	0.0000	0.0000	0.0000	0.000136	0.000136
65:00:00	0.0000	0.0000	0.0000	0.0000	0.000133	0.000133
65:30:00	0.0000	0.0000	0.0000	0.0000	0.000131	0.000131
66:00:00	0.0000	0.0000	0.0000	0.0000	0.000129	0.000129
66:30:00	0.0000	0.0000	0.0000	0.0000	0.000126	0.000126
67:00:00	0.0000	0.0000	0.0000	0.0000	0.000124	0.000124
67:30:00	0.0000	0.0000	0.0000	0.0000	0.000122	0.000122
68:00:00	0.0000	0.0000	0.0000	0.0000	0.00012	0.00012
68:30:00	0.0000	0.0000	0.0000	0.0000	0.000118	0.000118
69:00:00	0.0000	0.0000	0.0000	0.0000	0.000115	0.000115

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
69:30:00	0.0000	0.0000	0.0000	0.0000	0.000113	0.000113
70:00:00	0.0000	0.0000	0.0000	0.0000	0.000111	0.000111
70:30:00	0.0000	0.0000	0.0000	0.0000	0.000109	0.000109
71:00:00	0.0000	0.0000	0.0000	0.0000	0.000107	0.000107
71:30:00	0.0000	0.0000	0.0000	0.0000	0.000106	0.000106
72:00:00	0.0000	0.0000	0.0000	0.0000	0.000104	0.000104
72:30:00	0.0000	0.0000	0.0000	0.0000	0.000102	0.000102
73:00:00	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
73:30:00	0.0000	0.0000	0.0000	0.0000	9.82E-05	9.82E-05
74:00:00	0.0000	0.0000	0.0000	0.0000	9.65E-05	9.65E-05
74:30:00	0.0000	0.0000	0.0000	0.0000	9.48E-05	9.48E-05
75:00:00	0.0000	0.0000	0.0000	0.0000	9.31E-05	9.31E-05
75:30:00	0.0000	0.0000	0.0000	0.0000	9.14E-05	9.14E-05
76:00:00	0.0000	0.0000	0.0000	0.0000	8.98E-05	8.98E-05
76:30:00	0.0000	0.0000	0.0000	0.0000	8.82E-05	8.82E-05
77:00:00	0.0000	0.0000	0.0000	0.0000	8.67E-05	8.67E-05
77:30:00	0.0000	0.0000	0.0000	0.0000	8.51E-05	8.51E-05
78:00:00	0.0000	0.0000	0.0000	0.0000	8.36E-05	8.36E-05
78:30:00	0.0000	0.0000	0.0000	0.0000	8.21E-05	8.21E-05
79:00:00	0.0000	0.0000	0.0000	0.0000	8.07E-05	8.07E-05
79:30:00	0.0000	0.0000	0.0000	0.0000	7.92E-05	7.92E-05
80:00:00	0.0000	0.0000	0.0000	0.0000	7.78E-05	7.78E-05
80:30:00	0.0000	0.0000	0.0000	0.0000	7.64E-05	7.64E-05
81:00:00	0.0000	0.0000	0.0000	0.0000	7.51E-05	7.51E-05
81:30:00	0.0000	0.0000	0.0000	0.0000	7.38E-05	7.38E-05
82:00:00	0.0000	0.0000	0.0000	0.0000	7.24E-05	7.24E-05
82:30:00	0.0000	0.0000	0.0000	0.0000	7.12E-05	7.12E-05
83:00:00	0.0000	0.0000	0.0000	0.0000	6.99E-05	6.99E-05
83:30:00	0.0000	0.0000	0.0000	0.0000	6.86E-05	6.86E-05
84:00:00	0.0000	0.0000	0.0000	0.0000	6.74E-05	6.74E-05
84:30:00	0.0000	0.0000	0.0000	0.0000	6.62E-05	6.62E-05
85:00:00	0.0000	0.0000	0.0000	0.0000	6.51E-05	6.51E-05
85:30:00	0.0000	0.0000	0.0000	0.0000	6.39E-05	6.39E-05
86:00:00	0.0000	0.0000	0.0000	0.0000	6.28E-05	6.28E-05
86:30:00	0.0000	0.0000	0.0000	0.0000	6.17E-05	6.17E-05

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m^3/s)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
87:00:00	0.0000	0.0000	0.0000	0.0000	6.06E-05	6.06E-05
87:30:00	0.0000	0.0000	0.0000	0.0000	5.95E-05	5.95E-05
88:00:00	0.0000	0.0000	0.0000	0.0000	5.84E-05	5.84E-05
88:30:00	0.0000	0.0000	0.0000	0.0000	5.74E-05	5.74E-05
89:00:00	0.0000	0.0000	0.0000	0.0000	5.64E-05	5.64E-05
89:30:00	0.0000	0.0000	0.0000	0.0000	5.54E-05	5.54E-05
90:00:00	0.0000	0.0000	0.0000	0.0000	5.44E-05	5.44E-05
90:30:00	0.0000	0.0000	0.0000	0.0000	5.34E-05	5.34E-05
91:00:00	0.0000	0.0000	0.0000	0.0000	5.25E-05	5.25E-05
91:30:00	0.0000	0.0000	0.0000	0.0000	5.15E-05	5.15E-05
92:00:00	0.0000	0.0000	0.0000	0.0000	5.06E-05	5.06E-05
92:30:00	0.0000	0.0000	0.0000	0.0000	4.97E-05	4.97E-05
93:00:00	0.0000	0.0000	0.0000	0.0000	4.88E-05	4.88E-05
93:30:00	0.0000	0.0000	0.0000	0.0000	4.8E-05	4.8E-05
94:00:00	0.0000	0.0000	0.0000	0.0000	4.71E-05	4.71E-05
94:30:00	0.0000	0.0000	0.0000	0.0000	4.63E-05	4.63E-05
95:00:00	0.0000	0.0000	0.0000	0.0000	4.55E-05	4.55E-05
95:30:00	0.0000	0.0000	0.0000	0.0000	4.47E-05	4.47E-05

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.61	No
BFIHOST19	0.51	No
PROPWET	0.45	No
SAAR (mm)	893	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

Annex B Causeway Flow Results – Detention Basin

Annex 1: Flood Risk Assessment and Drainage Impact Assessment

Binn Farm Solar & BESS

Trio Power Limited

SLR Project No.: 405.065788.00001

16 December 2025

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	3.00	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)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	0.360	235.000	29.490	60.714	1.500

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	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

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 %)
1	0	0	0
2	0	0	0
10	0	0	0
10	39	0	0
30	0	0	0
30	39	0	0
200	0	0	0
200	39	0	0
1000	0	0	0
1000	25	0	0
1000	39	0	0
1000	50	0	0
1000	75	0	0
1000	100	0	80

Node Depth/Area 1 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	233.500	Product Number	CTL-SHE-0051-1000-0650-1000
Design Depth (m)	0.650	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	233.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	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	550.0	550.0	1.000	827.7	842.7	1.500	987.7	1011.4

Results for 1 year 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	Depth/Area 1	1050	233.617	0.117	3.1	66.5264	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Depth/Area 1	Hydro-Brake®	1.0	63.3

Results for 2 year 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	Depth/Area 1	1080	233.643	0.143	3.7	81.9844	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Depth/Area 1	Hydro-Brake®	1.0	67.6

Results for 10 year 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	Depth/Area 1	1680	233.729	0.229	4.2	134.1955	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Depth/Area 1	Hydro-Brake®	1.0	104.5

Results for 10 year +39% 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	Depth/Area 1	2340	233.846	0.346	4.8	208.5942	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2880 minute winter	Depth/Area 1	Hydro-Brake®	1.0	140.5

Results for 30 year 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	Depth/Area 1	1800	233.808	0.308	5.3	183.7822	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Depth/Area 1	Hydro-Brake®	1.0	107.4

Results for 30 year +39% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	Depth/Area 1	2760	233.966	0.466	6.0	288.9525	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2880 minute winter	Depth/Area 1	Hydro-Brake®	1.0	137.5

Results for 200 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Depth/Area 1	2100	233.974	0.474	7.5	293.8721	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Depth/Area 1	Hydro-Brake®	1.0	105.8

Results for 200 year +39% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	Depth/Area 1	2760	234.178	0.678	8.4	440.2773	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2880 minute winter	Depth/Area 1	Hydro-Brake®	1.0	155.3

Results for 1000 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Depth/Area 1	2100	234.095	0.595	9.2	379.5380	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2160 minute winter	Depth/Area 1	Hydro-Brake®	1.0	113.8

Results for 1000 year +25% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	Depth/Area 1	2820	234.251	0.751	9.3	495.0491	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
2880 minute winter	Depth/Area 1	Hydro-Brake®	1.1	160.9

Results for 1000 year +39% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	Depth/Area 1	4080	234.336	0.836	7.6	560.9228	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
4320 minute winter	Depth/Area 1	Hydro-Brake®	1.1	245.5

Results for 1000 year +50% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	Depth/Area 1	4140	234.407	0.907	8.2	617.7632	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
4320 minute winter	Depth/Area 1	Hydro-Brake®	1.2	253.2

Results for 1000 year +75% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
4320 minute winter	Depth/Area 1	4140	234.558	1.058	9.6	742.5602	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
4320 minute winter	Depth/Area 1	Hydro-Brake®	1.2	268.0

Results for 1000 year +100% CC +80% Q Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute winter	Depth/Area 1	5340	235.000	1.500	10.8	1149.9000	741.5484	FLOOD

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
10080 minute winter	Depth/Area 1	Hydro-Brake®	1.5	734.3

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	3.00	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)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	0.360	235.000	29.490	60.714	1.500

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x
Rainfall Events	Consecutive	Drain Down Time (mins)	240
Winter CV	0.840	Additional Storage (m³/ha)	20.0
Additional Area (A %)	0	Starting Level (m)	
Additional Flow (Q %)	0	Check Discharge Rate(s)	x
Analysis Speed	Normal	Check Discharge Volume	x

Time Offset (mins)	Duration (mins)	Return Period (years)	Climate Change (CC %)	Time Offset (mins)	Duration (mins)	Return Period (years)	Climate Change (CC %)
0	1440	10	39	1440	10080	10	39

Node Depth/Area 1 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	233.500	Product Number	CTL-SHE-0051-1000-0650-1000
Design Depth (m)	0.650	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	233.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	550.0	550.0	1.000	827.7	842.7	1.500	987.7	1011.4

Results for Consecutive Rainfall 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
1440-10080	Depth/Area 1	1380	233.838	0.338	7.6	203.2037	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440-10080	Depth/Area 1	Hydro-Brake®	1.0	723.4

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	3.00	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)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	0.360	235.000	29.328	60.714	1.500

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	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

Storm Durations

1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	39	0	0

Node Depth/Area 1 Offline Head/Flow Control

Flap Valve	x	Invert Level (m)	233.500	Design Flow (l/s)	1.0
Loop to Node		Design Depth (m)	0.400		

Head (m)	Flow (l/s)
1.000	0.000

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	233.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	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	550.0	550.0	1.000	827.7	842.7	1.500	987.7	1011.4

Results for 10 year +39% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Depth/Area 1	1470	233.933	0.433	7.7	266.4892	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Depth/Area 1	Head/Flow	0.0	0.0

Annex C SEPA Checklist

Annex 1: Flood Risk Assessment and Drainage Impact Assessment

Binn Farm Solar & BESS

Trio Power Limited

SLR Project No.: 405.065788.00001

16 December 2025

Flood Risk Assessment (FRA) Checklist

Scotland's 4th National Planning Framework has recently been published. This document is therefore being reviewed and updated to reflect the new policies. You can still find useful and relevant information here but be aware that some parts may be out of date and our responses to planning applications may not match the information set out here.

(SS-NFR-F-001 - Version 16 - Last updated 27/08/2019

This document must be attached within the front cover of any Flood Risk Assessments issued to Local Planning Authorities (LPA) in support of a development proposal which may be at risk of flooding. The document will take only a few minutes to complete and will assist SEPA in reviewing FRAs, when consulted by LPAs. This document should not be a substitute for a FRA.

Development Proposal Summary

Site Name:		Binn Farm Solar PV and BESS development				
Grid Reference:	Easting:	318106	Northing:	712221		
Local Authority:		Perth and Kinross Council				
Planning Reference number (if known):						
Nature of the development:		Infrastructure	If residential, state type:			
Size of the development site:		60 Ha				
Identified Flood Risk:	Source:	Pluvial	Source name:	Surface water runoff		

Land Use Planning

Is any of the site within the functional floodplain? (refer to SPP para 255)	No	If yes, what is the net loss of storage?		m^3		
Is the site identified within the local development plan?	No	Local Development Plan Name:		Year of Publication:		
		Allocation Number / Reference:				
If yes, what is the proposed use for the site as identified in the local plan?	Select from List	If Other please specify:				
Does the local development plan and/or any pre-application advice, identify any flood risk issues with or requirements for the site.	No	If so, please specify:				
What is the proposed land use vulnerability?	Essential Infrastructure	Do the proposals represent an increase in land use vulnerability?	No			

Supporting Information

Have clear maps / plans been provided within the FRA (including topographic and flood inundation plans)?	Yes		
Has sufficient supporting information, in line with our Technical Guidance, been provided? For example: site plans, photos, topographic information, structure information and other site specific information.	Yes		
Has a historic flood search been undertaken?	Yes	If flood records in vicinity of the site please provide details:	
Is a formal flood prevention scheme present?	No	If known, state the standard of protection offered:	
Current / historical site use:	Agricultural land for planting & grazing		
Is the site considered vacant or derelict?	No		

Development Requirements

Freeboard on design water level:		600 mm				
Is safe / dry access and egress available?		See report Section 5.0	Min access/egress level:	/	m AOD	
Design levels:	Ground level:	/ m AOD	Min FFL:	/	mAOD	

Mitigation

Can development be designed to avoid all areas at risk of flooding?	Yes	
Is mitigation proposed?	Yes	*For access/egress*
If yes, is compenstory storage necessary?	No	
Demonstration of compensatory storage on a "like for like" basis?	No	
Should water resistant materials and forms of construction be used?	No	

Flood Risk Assessment (FRA) Checklist

(SS-NFR-F-001 - Version 16 - Last updated 27/08/2019

Hydrology

Is there a requirement to consider fluvial flooding?	No			
Area of catchment:		km^2	Is a map of catchment area included in FRA?	Select from List
Estimation method(s) used (please select all that apply):	Pooled Analysis ☐ Single Site Analysis ☐ Enhanced Single Site ☐ ReFH2 ☐ FEH RRM ☐ Other ☐		If Pooled analysis have group details been included? If other (please specify methodology used):	Select from List
Estimate of 200 year design flood flow:		m^3/s		
Qmed estimate:		m^3/s	Method:	Select from List
Statistical Distribution Selected:	Select from List		Reasons for selection:	

Hydraulics

Hydraulic modelling method:	Select from List		Software used: If other please specify:	Select from List
Number of cross sections:				
Source of data (i.e. topographic survey, LiDAR etc):			Date obtained / surveyed:	
Modelled reach length:		m		
Any changes to default simulation parameters?			If yes please provide details:	
Model timestep:				
Model grid size:				
Any structures within the modelled length?	Select from List		Specify, if combination:	
Maximum observed velocity:		m/s		
Brief summary of sensitivity tests, and range:				
variation on flow (%)		%	Please specify climate change scenario considered:	
variation on channel roughness (%)		%		
blockage of structure (range of % blocked)		%		
boundary conditions:	**Upstream**		**Downstream**	
(1) type	Flow		Select from List	
	Specify if other		Specify if other:	
(2) does it influence water levels at the site?	Select from List		Select from List	
Has model been calibrated (gauge data / flood records)?	Select from List			
Is the hydraulic model available to SEPA?	Select from List			
Design flood levels:	200 year	m AOD	200 year plus climate change	m AOD
Cross section results provided?	Select from List			
Long section results provided?	Select from List			
Cross section ratings provided?	Select from List			
Tabular output provided (i.e. levels, velocities)?				
Mass balance error:		%		

Coastal

Is there a requirement to consider coastal / tidal flooding?	No			
Estimate of 200 year design flood level:		m AOD		
Estimation method(s) used:	Select from List		If other please specify methodology used:	
Allowance for climate change (m):		m		
Allowance for wave action etc (m):		m		
Overall design flood level:		m AOD		

Comments

Any additional comments:	Minor areas of surface water flood depths of over 1m for 0.5% AEP event + CC indicated on SEPA mapping for solar panels and access off main road. Flood risk areas have been reviewed and it has been found that ponding in excess of 400mm should not occur in these locations. Solar panels will be situated on plints with a minimum of 600mm freeboard from flood depths. There is no flood risk to the proposed BESS. Site to be generally unmanned and proposed to avoid access in times of flood, with flood forecasts to be observed by staff.

Approved by:	**Robert Walker**
Organisation:	**SLR Consulting Ltd**
Date:	**18/12/2025**

Annex D Compliance Certificate

Annex 1: Flood Risk Assessment and Drainage Impact Assessment

Binn Farm Solar & BESS

Trio Power Limited

SLR Project No.: 405.065788.00001

16 December 2025

Appendix B - Assessment Compliance Certification and Insurance

Assessment Compliance Certification

I certify that all reasonable skill, care and attention has been exercised in undertaking the attached Flood Risk Assessment/ Drainage Impact Assessment/Surface Water Drainage Design* *(delete as appropriate)*. The documentation has been prepared for the below noted development in accordance with the PKC Developers' Guidance Note on Flooding and Drainage.

Name of Development

Binn Farm Solar & BESS

Address of Development

BNG E 318188, N 712158

Name of Developer

Trio Power Limited

Planning Application Number

Name and Address of Organisation Preparing this Assessment

SLR Consulting Ltd, The Tun, 4 Jackson's Entry, Edinburgh

United Kingdom, EH8 8PJ

Signed

Name

Robert Walker

Position Held

Principal Flood Risk Specialist

Engineering Qualification[1]

C.WEM CIWEM

[1] *Chartered Engineer or equivalent from an appropriate Engineering Institution.*

Date

18/12/25

Insurance

Please attach a copy of your professional indemnity insurance policy to this document.

Annex 2: Private Water Supply Risk Assessment

Binn Farm Solar PV and BESS

Trio Power Limited

Prepared by:

SLR Consulting Limited

The Tun, 4 Jackson's Entry, Edinburgh, EH8 8PJ

SLR Project No.: 405.065788.00001

21 November 2025

Revision: 01

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	21 November 2025	KRR	MB	MB

Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Trio Power Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Table of Contents

Tables in Text

Plates

Figures

1.0 Introduction

SLR Consulting Ltd (SLR) has been appointed by Trio Power Limited to provide consulting services to support a proposed solar photovoltaic (PV) array and Battery Energy Storage System (BESS) development (the 'Proposed Development') at a site near Glenfarg in Perth and Kinross.

This report considers the potential effects of the Proposed Development on the quality and quantity of water at private water supply (PWS) sources within the study area which extends to a buffer of 500 m from the Site boundary. To complete the assessment, a conceptual site model is presented which uses a source-pathway-receptor linkage to assess the risk to each PWS source. Where necessary, mitigation required to safeguard a water source is proposed.

The location of the PWS sources is shown on **Figure 1** appended.

This report should be read in conjunction with the **Appendix G: Water Environment Environmental Appraisal Report** of the Supporting Environmental Information Report (SEIR). The SEIR contains a detailed description of the local hydrology and hydrogeology, flow mechanisms and hydraulic properties of the soils and geology, the embedded mitigation incorporated in the development design, and an assessment of impacts on groundwater and surface water flows and quality.

1.1 Survey Approach

Following consultation with Perth and Kinross Council (PKC), data was received for PWS users and sources within the study area. This data was then augmented with Ordnance Survey (OS) mapping and aerial photography.

Additional properties, and potential water users, were also identified following a programme of site-specific field investigation that involved visiting the properties within the study area, enquiring about their water use and source, and mapping water abstraction locations. A standard reporting questionnaire was used to ensure consistency of data collected.

The location of water sources (boreholes, springs, surface water abstractions) and holding tanks etc. were recorded using a handheld GPS. When residents were unavailable on the day that the survey was conducted, questionnaires were left at properties requesting details of their water source or PWS.

The field investigation was completed in August and November 2025 by the author of this report and the assessment has been overseen and reviewed by Martin Baines, Technical Director for Hydrology and Flood Risk.

1.2 Assessment Methodology and Report Structure

The assessment has been undertaken with reference to Scottish Environment Protection Agency (SEPA) guidance[1] which sets outs SEPA's expectations for the assessment of impact of developments on groundwater abstractions, for both public and private water supplies. This guidance applies to proposed infrastructure, both temporary and permanent, provided that any temporary or permanent dewatering abstractions are unlikely to exceed 10 m^3/day.

As required by SEPA's guidance, the assessment has been undertaken by suitably qualified and experienced specialists.

[1] SEPA (August 2024) Guidance on Assessing the Impacts of Development on Groundwater Abstractions

SEPA recommends adopting a phased approach to the assessment of risks to groundwater abstractions, with greater detail being required for higher risk sites or activities, and identify the steps given in **Table 1**.

Table 1: SEPA Methodology - Assessment Steps

Step	Description
1	Identifying any Existing Groundwater Abstractions This covers both public and private water supply groundwater abstractions, both within and outwith the site boundary. It is critical that it is the actual source of the abstraction, and not the property that it supplies, that is identified. The relevant buffer zones for groundwater abstractions for all proposed infrastructure, both temporary and permanent and provided expected dewatering rates do not exceed 10 m^3/day, are: a) 10 m for all activities; b) 100 m radius of all subsurface activities less than 1 m in depth; c) 250 m of all subsurface activities deeper than 1 m. Details of each private water supply source will require confirmation, including a site walkover survey. If there are no groundwater abstractions within the buffer zones, SEPA will not provide comment on this topic in our planning response. **If there are no groundwater abstractions within the buffer zones there is no need to assess further and progress to Step 2.**
2	Qualitative Impact Assessment A conceptual site model (CSM) should be provided as part of the Environmental Statement. This should include interpretation of the hydrogeological setting, including the groundwater flow regime. This may be supported, as appropriate, by intrusive ground investigation, groundwater monitoring, or groundwater modelling. Qualitative assessment of the potential impacts to any groundwater abstractions identified within the relevant buffer zones is required. This should consider the expected extent, magnitude, likelihood, and duration, frequency, and reversibility of any potential impacts. The impact assessment should consider the impacts to each groundwater abstraction individually, including any potential cumulative effects if the groundwater abstraction is near multiple parts of the proposed development. **If the potential impacts to groundwater abstractions are considered low or less then no further risk assessment (e.g. Step 3) is required.**
3	Detailed Quantitative Risk Assessment This would include characterisation of the ground conditions at both the relevant infrastructure location(s) and the groundwater abstraction(s), plus the pathway(s) in between if appropriate. This will require ground investigation, including groundwater level and quality monitoring and quantify the potential change(s) in groundwater levels or flow regime.

Using this approach and developing this to include surface water abstractions and to consider the distribution pipework from ground and surface water abstractions the criteria given in **Table 2** have been used to assess potential risk to each PWS source.

Table 2: Private Water Supply Risk Assessment Criteria

PWS Risk	Criteria
PWS source considered potentially at risk from the Proposed Development	• PWS source is located within 10 m of any element of the Proposed Development; • spring fed or groundwater source is located within 100 m of excavations less than 1 m deep (such as access tracks); • spring fed or groundwater source is located within 250 m of excavations greater than 1 m deep (such as borrow pits, turbine crane pads and other hardstanding areas); and / or • stream or surface water fed abstraction is located within the same surface water catchment and downstream of the Proposed Development.
PWS source is not considered at risk from the Proposed Development, but distribution pipework may be impacted or PWS source is unconfirmed	• PWS source is located at least 10 m away from any element of the Proposed Development; • spring fed or groundwater source is not located within 100 m of excavations less than 1 m deep (such as access tracks); • spring fed or groundwater source is not located within 250 m of excavations greater than 1 m deep (such as borrow pits, turbine crane pads and other hardstanding areas); • stream abstraction is not located within the same surface water catchment and / or upstream of the Proposed Development; • the distribution pipework between the PWS source and property may be crossed by the Proposed Development; and / or • PWS source unconfirmed and needs to be assessed prior to construction.
PWS source or pipework not considered to be at risk from the Proposed Development	• PWS source is located at least 10 m away from any element of the Proposed Development; • spring fed or groundwater source is not located within 100 m of excavations less than 1 m deep (such as access tracks); • spring fed or groundwater source is not located within 250 m of excavations greater than 1 m deep (such as borrow pits, turbine crane pads and other hardstanding areas); • stream abstraction is not located within the same surface water catchment and / or upstream of the Proposed Development; • the distribution pipework between the PWS source and property will not be crossed by the Proposed Development.
Property supplied by mains	Property has been confirmed to be supplied by mains rather than a private water supply and therefore no further assessment is required

The results of the PWS survey and assessment are presented in **Section 2** of this report in accordance with **Step 1** of the SEPA guidance.

2.0 Private Water Supply Risk Assessment (Step 1)

Table 2 presents information collected from the PWS field survey, returned questionnaires, data collected during the desk study and following consultation with PKC. If a source is assessed to be within the buffers specified in SEPA's guidance and have a hydraulic connection (e.g. there is a flow pathway) to the Proposed Development, a further qualitative risk assessment and necessary mitigation are given in **Section 3**.

The findings from **Table 3** are summarised as follows:

- two PWS sources have been identified as potentially at risk from the Proposed Development (and are assessed further in **Section 3**); and
- two PWS source are assessed as not at risk from the Proposed Development.

Table 3: Private Water Supply Risk Assessment

PWS ID (Figure 1)	Property Name	Data Source and Source Type	Location of PWS Source and Distance from the Proposed Development	Details	PWS Risk Assessment (see Table 2)
PWS01	Balvaird Farm	Site Survey Mains and Borehole	E 317235 / N 712349 Approximately 440 m from the proposed access track to the proposed BESS.	The farm manager confirmed that the properties along the Millden Road are supplied by mains. The farm also is partially supplied by a borehole which is located approximately 20 m from the old steading building. It is confirmed that the borehole only supplies livestock. No development is proposed within 250 m of the borehole. The development will not cross any distribution pipework from the PWS source to the adjacent fields. It is therefore considered that the PWS source and associated distribution pipework is not at risk from the Proposed Development.	PWS source and pipework not considered to be at risk. No further assessment, monitoring or mitigation required.
PWS02	Gamekeepers Cottage	Site Survey Spring	E 318271 / N 712594 Approximately 100 m north of solar panels.	Resident confirmed that the property is supplied by a spring fed source which is located approximately 210 m south-west of the property. Water is gravity fed from the spring to the property and adjacent farmland. PWS source is located within 250 m of the Proposed Development. It is therefore considered that the PWS	PWS source potentially at risk. Further assessment required (Step 2) – see **Section 3**.

PWS ID (Figure 1)	Property Name	Data Source and Source Type	Location of PWS Source and Distance from the Proposed Development	Details	PWS Risk Assessment (see Table 2)
				source is potentially at risk from the Proposed Development and further assessment is required.	
PWS03	Easter Catochil	Site Survey Borehole	E 318400 / N 712985 Approximately 420 m northeast of solar panels.	Residents confirmed that the property is supplied by an 80 m deep borehole which is located approximately 140 m south of the property. No development is proposed within 250 m of the borehole. The development will not cross any distribution pipework from the PWS source to the property. It is therefore considered that the PWS source and associated distribution pipework is not at risk from the Proposed Development.	PWS source and pipework not considered to be at risk. No further assessment, monitoring or mitigation required.
PWS04	Pittuncarty and West Cottage	Site Survey Spring	E 318210 / N 711880 Approximately 100 m south, east and west of solar panels.	Resident confirmed that the four properties and farm are supplied by a spring fed source which is located approximately 850 m north-west of the farm. Water is gravity fed from the spring to a holding tank before being pumped and gravity fed to the properties. PWS source is located within 250 m of the Proposed Development. It is therefore considered that the PWS source is potentially at risk from the Proposed Development and further assessment is required.	PWS source potentially at risk. Further assessment required (Step 2) – see **Section 3**.

3.0 Qualitative Impact Assessment (Step 2)

This section of the report provides assessment of PWS sources which has been identified as potentially at risk from the Proposed Development.

3.1 Committed Mitigation

Appendix G of the SEIR details the mitigation measures that would be deployed and used to safeguard the water environment and abstractions. Of relevance to this report and assessment are the following:

- 100 m buffer to PWS02 and PWS04 sources as part of the Proposed Development design and it is confirmed that no development or construction activities, except for the proposed security fencing, are proposed within 100 m of the PWS sources;
- the production of a final Construction and Environmental Management Plan (CEMP) which would be agreed with statutory consultees prior to commencement of any works; and
- the deployment of an Ecological or Environmental Clerk of Works (ECoW or EnvCoW) to oversee all works and with the authority to cease works should a risk to the water environment (e.g. change in water flow or quality) become apparent.

3.2 Assessment of PWS02 – Gamekeepers Cottage

Table 4: PWS02: Summary Details

Descriptors	Details
Date Visited	August 2025
Source Type	Spring
Location	E 318271 / N 712594 Approximately 100 m north of solar panels and approximately 560 m northeast of proposed BESS.
Photograph of Source	
Details	It has been confirmed that the property and surrounding farmland is supplied by a spring fed source which is located approximately 210 m southwest of the property. Water is gravity fed along the field boundary to the north of the supply before it is distributed around the

Descriptors	Details
	buildings and fields. The overflow from the source flows northwards towards the Binn Burn.

Ground elevations locally fall to the north-west towards the Binn Burn. Published geology plans show that the source is located on andesites of the Ochil Volcanic Formation. No superficial deposits are mapped at the PWS source location. The bedrock has been designated as a low productivity aquifer whereby small amounts of groundwater may be present within the upper weathered surface, secondary fractures and rare springs yielding groundwater quantities of up to 2 l/s. It is therefore considered that the groundwater flow is likely to follow local surface gradients.

The upstream catchment of the PWS source has been delineated using the 1 m and 5 m contour extracted from the OS Terrain 5 m elevation data and is shown on **Plate 1**.

The water catchment is shown to extend to the south and south-west. No development, apart from the security fencing, is proposed within the upstream catchment and within 100 m of the PWS source. The only development proposed within 250 m of the spring comprises of the solar PV arrays and the proposed perimeter fencing.

Plate 1: PWS02: Water Catchment Area

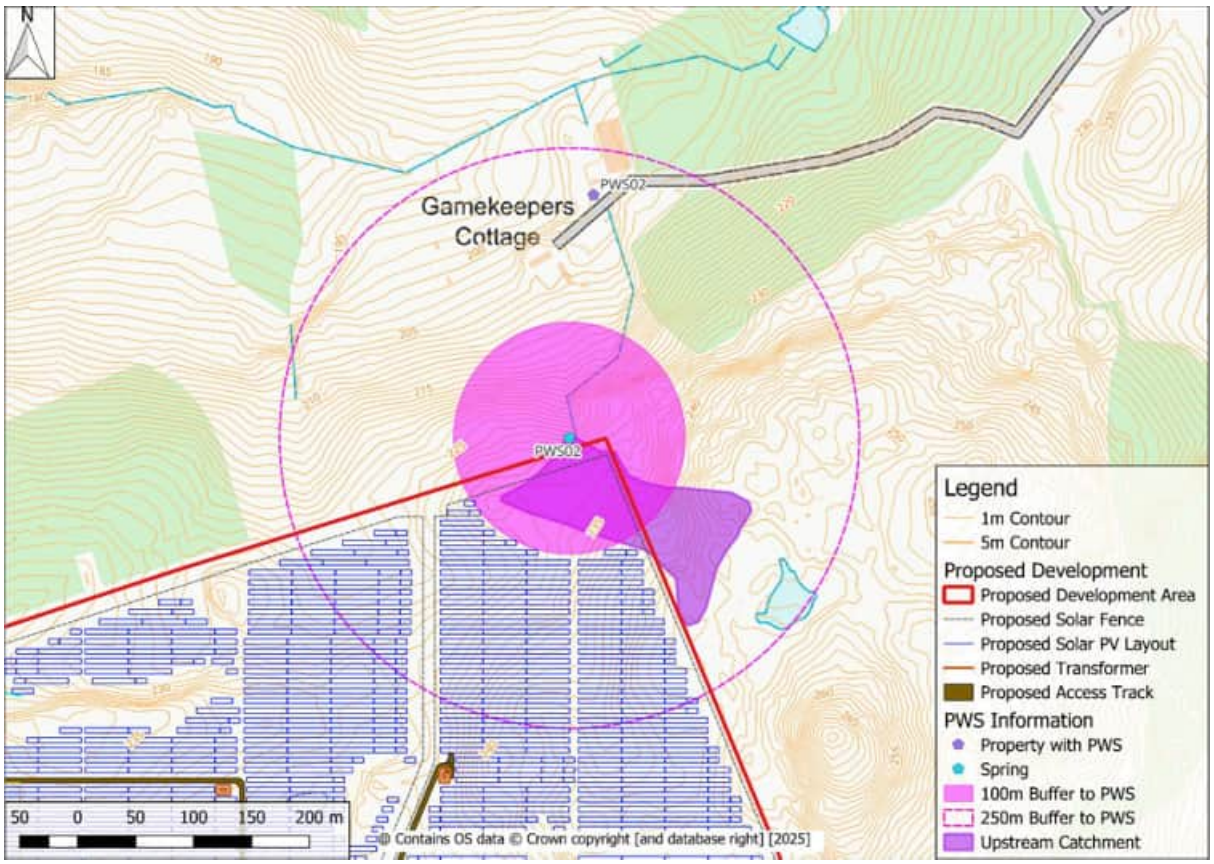


Table 5 presents a qualitative risk assessment of PWS02, as required by SEPA's guidance. No significant risk is identified to the PWS source and therefore there is no requirement to progress to a quantitative risk assessment as defined by Step 3 of SEPA's guidance.

Table 5: PWS02: Qualitative Risk Assessment

Descriptor	Assessment
Risk to Water Quality	Elements of the Proposed Development (proposed security fencing) are noted upstream of the PWS source. The shallow groundwater flow is vulnerable to pollution.
Risk to Water Quantity	The PWS source likely intercepts water from shallow weathered bedrock. No development, apart from the security fencing, is proposed within the upstream catchment and within 100 m of the PWS source. The only development proposed within 250 m of the spring comprises of the solar PV arrays and the proposed perimeter fencing. The solar modules will be mounted onto metal frames which will be anchored to the ground via steel piles which will be driven approximately 1 to 2 m below ground, as discussed in **Section 4** of the accompanying SEIR. No significant or prolonged dewatering is required to facilitate construction of the solar arrays. Standard security fencing would be erected between posts that would be driven into the ground at shallow depths. No dewatering is required to facilitate construction of the fencing. No short or long-term effect on water levels of flow direction is expected and therefore no detrimental effect on the yield to the PWS source is anticipated.
Recommendation	The PWS source should be clearly marked, and no works should be undertaken within 10 m of the PWS source. No works except for security fencing is proposed within the upstream catchment and within 100 m of the PWS source. Works within 250 m of the PWS should be supervised and measures deployed to prevent and minimise the generation of pollutants and suspended solids (these measures should form part of the final agreed CEMP). Confirmatory baseline, construction and post construction water level/flow and quality monitoring at the PWS source should be undertaken.
Additional Mitigation	None over and above that specified in **Appendix G** of the SEIR.
Overall Risk Assessment	The controls which would be adopted during construction and operation of the Proposed Development, which are in accordance with best practice and will be agreed in the final CEMP, will safeguard surface water and groundwater which sustains the PWS source.

3.3 Assessment of PWS04 – Pittuncarty and West Cottage

Table 6: PWS02: Summary Details

Descriptors	Details
Date Visited	November 2025
Source Type	Spring
Location	E 318210 / N 711880 Approximately 100 m south, east and west of solar panels and approximately 660 m south-east of proposed BESS.

Descriptors	Details
Photograph of Source	
Details	It has been confirmed that the properties and farm at Pittuncarty and West Cottage are supplied by a spring fed source which is located approximately 850 m north-west of the farm. Water is piped from the spring underground through the fields to the south-east of the source via two holding tanks (see Plate 2) before it is pumped and gravity fed to the properties. It is noted that all the infrastructure for the PWS, except for the holding tanks, are underground so the exact location of the PWS source could not be located during the site walkover.

Ground elevations locally fall to the south towards a tributary of the Barroway Burn. Published geology plans show that the source is located on andesites of the Ochil Volcanic Formation. No superficial deposits are mapped at the PWS source location. The bedrock has been designated as a low productivity aquifer whereby small amounts of groundwater may be present within the upper weathered surface, secondary fractures and rare springs yielding groundwater quantities of up to 2 l/s. It is therefore considered that the groundwater flow is likely to follow local surface gradients.

The upstream catchment of the PWS source has been delineated using the 1 m and 5 m contour extracted from the OS Terrain 5 m elevation data and is shown on **Plate 2**.

The water catchment is shown to extend to the north-east and east. Solar PV arrays are noted within the upstream catchment and within 250 m of the PWS source, however, no development apart from fencing is proposed within 100 m of the PWS source.

Plate 2: PWS02: Water Catchment Area

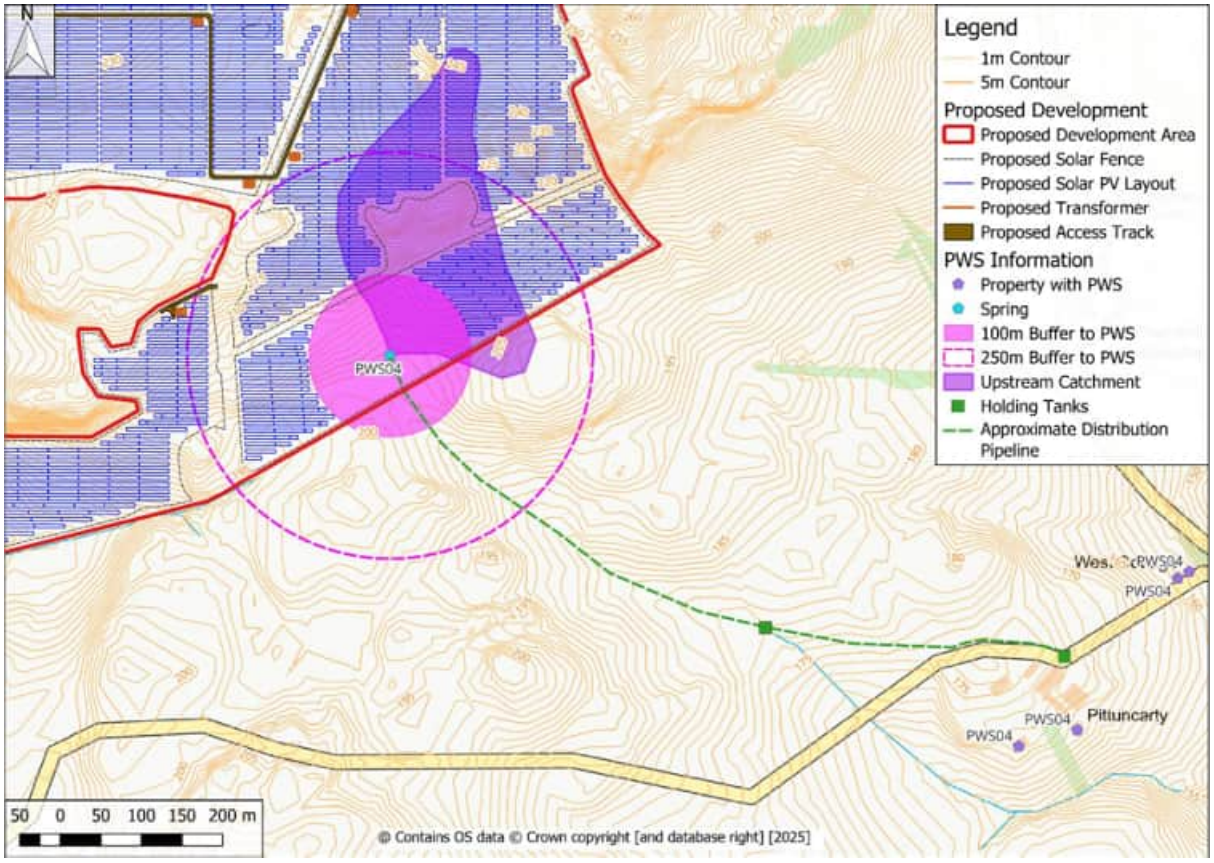


Table 7 presents a qualitative risk assessment of PWS04, as required by SEPA's guidance. No significant risk is identified to the PWS source and therefore no requirement to progress to a quantitative risk assessment as defined by Step 3 of SEPA's guidance.

Table 7: PWS02: Qualitative Risk Assessment

Descriptor	Assessment
Risk to Water Quality	Elements of the Proposed Development (proposed security fencing and proposed solar PV array panels) are noted upstream of the PWS source. The shallow groundwater flow is vulnerable to pollution.
Risk to Water Quantity	The PWS source likely intercepts water from shallow weathered bedrock. No development apart from fencing is proposed within 100 m of the PWS source and the only development located within 250 m is the proposed solar PV arrays and fencing. The solar modules will be mounted onto metal frames which will be anchored to the ground via steel piles which will be driven approximately 1 to 2 m below ground, as discussed in **Section 4** of the accompanying SEIR. No significant or prolonged dewatering is required to facilitate construction of the solar arrays. Standard security fencing would be erected between posts that would be driven into the ground at shallow depths. No dewatering is required to facilitate construction of the fencing No short or long-term effect on water levels of flow direction is expected and therefore no detrimental effect on the yield to the PWS source is anticipated.

Descriptor	Assessment
Recommendation	It is recommended that the PWS source and associated pipework within the Site boundary is confirmed before construction. The PWS source should be clearly marked, and no works should be undertaken within 10 m of the PWS source. No works except for the proposed security fencing is proposed within 100 m of the PWS. Works within 250 m of the PWS and within the surface water catchment should be supervised and measures deployed to prevent and minimise the generation of pollutants and suspended solids (these measures should form part of the final agreed CEMP). Confirmatory baseline, construction and post construction water level/flow and quality monitoring at the PWS source should be undertaken.
Additional Mitigation	None over and above that specified in **Appendix G** of the SEIR.
Overall Risk Assessment	The controls which would be adopted during construction and operation of the Proposed Development, which are in accordance with best practice and will be agreed in the final CEMP, will safeguard surface water and groundwater which sustains the PWS source.

4.0 Example Monitoring and Contingency Plan

Monitoring of the PWS02 and PWS04 source (as identified in **Section 3**) has been recommended to confirm that the embedded mitigation included in the site design and committed to in the SEIR are effective and that there is no impairment of the water environment and water sources.

Pre-development monitoring data can be used to establish baseline water levels and quality. This understanding of baseline conditions can be used to define trigger values to which routine monitoring data collected during construction can be compared against.

A separate water monitoring and reporting plan would be developed during the detailed project design phase. The monitoring programme would be secured by a pre-development planning condition to be agreed with statutory consultees. It is expected that the water monitoring plan would contain the following:

- in accordance with SEPA guidance[1], monthly baseline monitoring for a period of at least 12 months, fortnightly monitoring during construction phase where works are ongoing within 250m of the PWS sources and monthly monitoring for a period of at least 12 months of post construction monitoring;
- location of proposed monitoring locations (NGR and plan);
- proposals for baseline, construction and post construction monitoring and reporting;
- commitment to prepare and adhere to a pollution incident response plan;
- a commitment to maintain wholesome water supplies at all private water supply sources.

Table 8 shows an example protocol which could be used as a basis to agree a water monitoring protocol with relevant consultees.

Table 8: Example Monitoring Protocol*

Location	Frequency	Determinand Suite
• PWS02 • PWS04	• Monthly baseline monitoring for a period of at least 12 months • Fortnightly monitoring during construction phase where works are ongoing within 250 m of the PWS sources; and • Monthly monitoring for a period of at least 12 months of post construction monitoring	Field Sampling • pH • Electrical conductivity • Dissolved Oxygen • Redox • Temperature • Water Level and/or flow Extractive Samples • Chloride • Alkalinity • Sulphate • Sodium • Potassium • Calcium • Magnesium • Ammoniacal Nitrogen • Nitrate • Nitrite

Location	Frequency	Determinand Suite
		• Orthophosphate • Biological Oxygen Demand • Chemical Oxygen Demand • Iron (total and dissolved) • Manganese (total and dissolved) • Total suspended solids • Dissolved organic carbon • Colour • Turbidity • Taste • Order • Other parameters relevant to the activities being undertaken or the hydrogeological setting e.g. hydrocarbons, metals, etc.

* Monitoring locations, suite and frequency to be agreed with statutory consultees

4.1 Monitoring and Reporting Personnel

The monitoring and reporting would be undertaken by appropriately experienced and trained staff.

4.2 Monitoring Methodology

Water samples would be collected following guidance within SEPA, July 2003, Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water, v2 (specifically Section 9 thereof)[2].

Prevailing weather conditions, qualitative flow conditions as well as other visual indicators would be recorded in order to aid the sample reporting.

The water samples would be placed directly into appropriate sterile bottles, which would be labelled and dispatched to a UKAS accredited laboratory under chilled conditions and accompanied by the relevant chain of custody documentation.

4.3 Example Intervention Strategy

In the unlikely event that the routine monitoring data recorded potential pollution at a private water supply an investigation would be undertaken and intervention strategy would be implemented. The details of this would be agreed prior to any construction and secured by an appropriately worded planning condition.

4.3.1 Alerting Potentially Affected Properties

Contact details (landline and mobile telephone numbers / email addresses) for private water supply users would be maintained by site management at all times.

In the event that monitoring data collected at any private water supply exceeds the trigger levels defined by the baseline monitoring, and exceeds prescribed regulatory standards then

[2] sepa.org.uk/media/28992/guidance-on-monitoring-of-landfill-leachate-groundwater-and-surface-water.pdf, last accessed November 2025

property owners would be advised and repeat water sampling undertaken (if agreed with the property owners). Property owners would be advised within 24 hours of receipt of monitoring results. Repeat water sampling would be undertaken as soon as reasonably practicable and within 72 hours.

Details of any affected property would be reported to PKC within the timeframe as agreed with PKC when the monitoring programme was agreed and finalised.

4.4 Provision of Alternative Water Supplies

The Applicant commits to maintaining the yield and wholesomeness of water supplies.

The following measures may be deployed in the unlikely event a private water supply is impaired by the works:

- provision of bottled potable water in the event of a short or transient derogation of a water supply (bottled water would be retained on site ready for quick dispatch to any affected property); and
- provision of an alternative water source (e.g. spring, borehole, alternative surface water abstraction location) in the event of a permanent derogation of a water supply.

In the event of an alternative water source being implemented PKC would be advised as soon as is practical.

Figures

Annex 2: Private Water Supply Risk Assessment

Binn Farm Solar PV and BESS

Trio Power Limited
SLR Project No.: 405.065788.00001

21 November 2025

316000 317000 318000 319000

713000 712000

N

PWS03
PWS03
PWS02
PWS02
PWS01
PWS01
PWS04
PWS04
PWS04
PWS04
PWS04

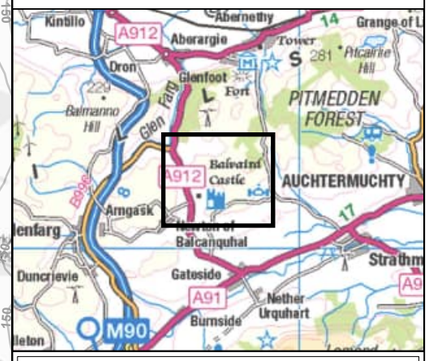
Binn Farm
Catochil Farm Cottage
Glen Wood
Glen Cottage
Easter Catochil
Bain Coach House
Binn Burn
Gamekeepers Cottage
New Fargie Cottage
Born Wood
MacGregor House
Mill Burn
Millburn House
Summerfield
Leden Urqhart Farm Cottage
West Cottage
Glentarkie Steading

LEGEND

- Proposed Development Area
- Proposed Solar Photovolatic Layout
- Proposed Private Substation
- Proposed Distribution Network Operator (DNO) Substation
- Proposed Construction Compound
- Proposed Battery Energy Storage System (BESS)
- Proposed Transformer Station
- Proposed New Access Track
- Proposed Battery Energy Storage System (BESS) Fence
- Proposed Solar Photovoltaic Layout Fence
- Communication Equipment and Replacement Part Storage
- Proposed Welfare
- Proposed Water Tank
- Proposed CCTV Point Location

Private Water Supply (PWS) Type

- Borehole
- Farm with PWS
- Property with PWS
- Spring



trio

SLR

BINN FARM SOLAR PV AND BESS

WATER ENVIRONMENT ENVIRONMENTAL APPRAISAL

PRIVATE WATER SUPPLY RISK ASSESSMENT

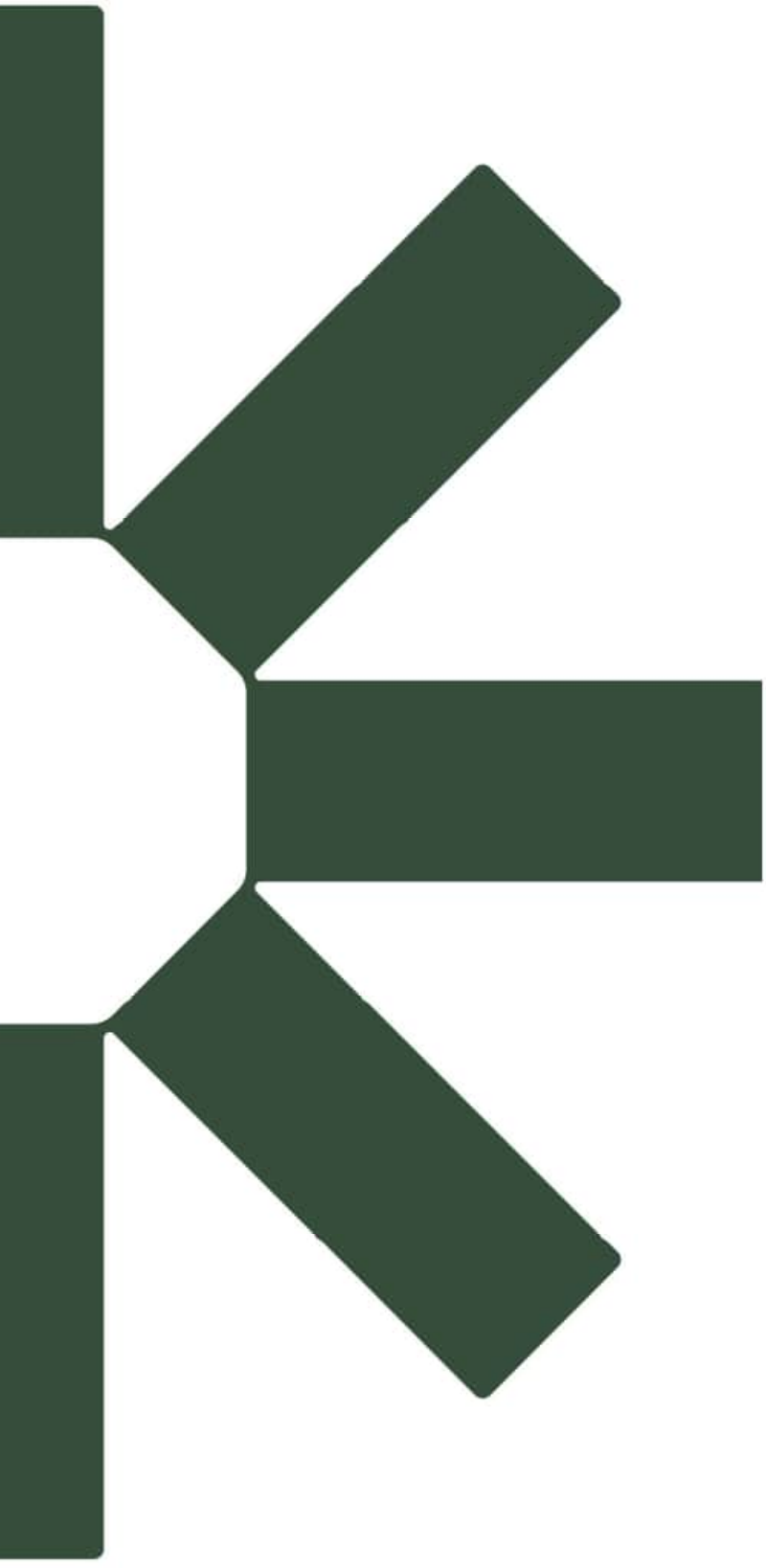
FIGURE 1

Scale 1:10,000 @ A3

Date DECEMBER 2025

0 0.5 1 Kilometres

405.065788.00001.0020.1 PWSRA



Making Sustainability Happen