PROPOSED WIND TURBINE DEVELOPMENT, BEARS DOWNS WIND FARM, TREVILLEDOR CROSS. NEWQUAY. CORNWALL. TR8 4HQ.

FLOOD RISK ASSESSMENT AND SuDS DRAINAGE STRATEGY

J-3131 -Rev.04

Engineering & Development Solutions

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For:	Clean Earth Energy Unit 2A Bess Park Road Trenant Industrial Estate Wadebridge Cornwall PL27 6HB	**Job No:** **Date:** **Edition:**	J-3131 July 2025 04

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APPENDICES

Appendix A Proposed Site Layout Including Conceptual Drainage Plan

Appendix B Calculations

1.0 INTRODUCTION

Clean Earth Energy are proposing to develop a site at Bears Down Wind Farm, Trevilledor Cross, Newquay, TR8 4HQ. It is proposed to replace the existing 16 wind turbines on site with 4 no. new turbines, widen the access track through the site and construct an overrun area at the junction with the C0055 public highway. The site lies to the east of the village of St. Eval and northeast of St. Mawgan. The site lies directly south and east of an unnamed access track that joins the B3274 and the A39, as seen on **Figure 1**, below. An aerial view of the site is included in **Figure 2**.

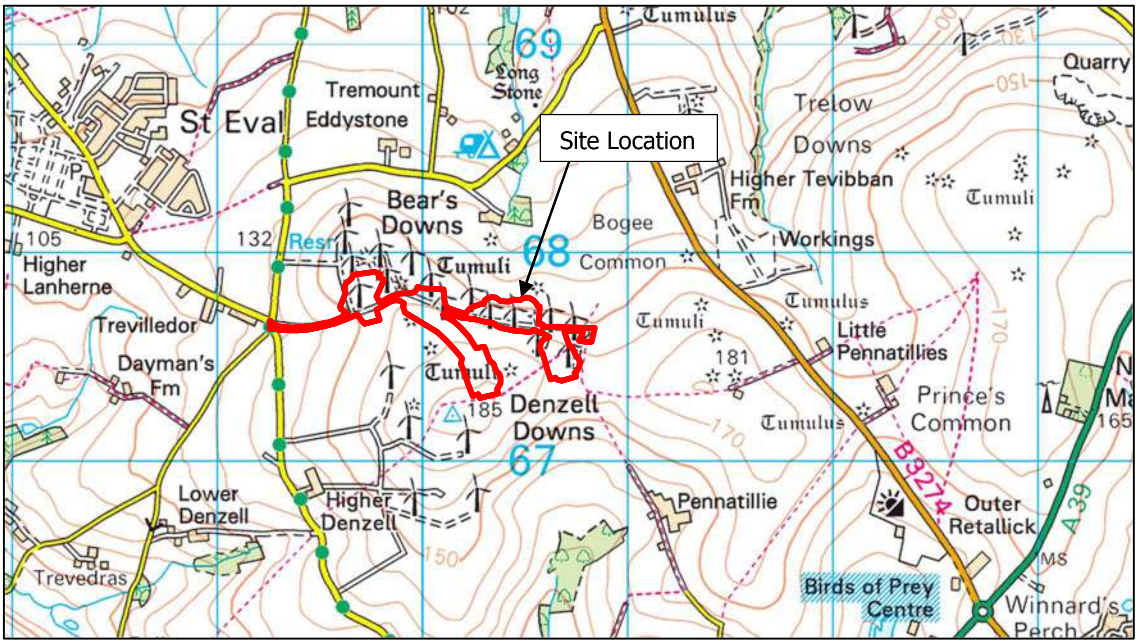


Figure 1 - Geographical Area and Location

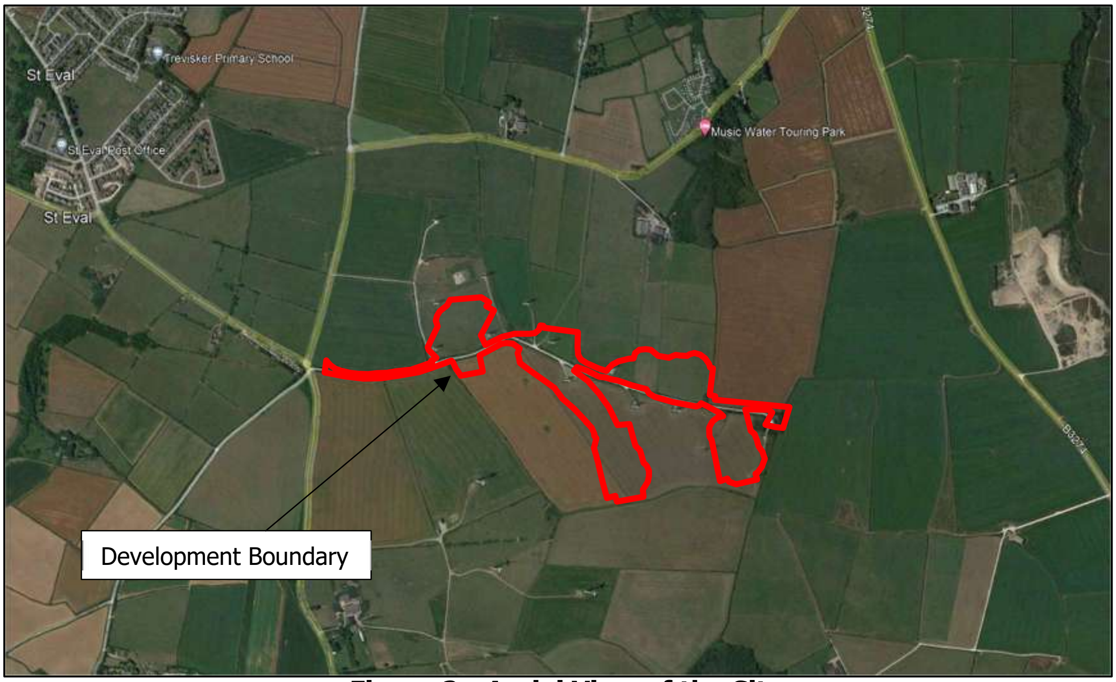


Figure 2 - Aerial View of the Site

Reference to the Environment Agency (EA) flood map for planning shows the site to lie within Flood Zone 1 (Low Risk, less than 1 in 1,000 annual probability of river and sea flooding). As the development proposal has an area over 1 ha, it is required to provide a Flood Risk Assessment (FRA) under the National Planning Policy Framework (NPPF) on Planning and Flood Risk.

As the site lies within Flood Zone 1, the primary aim of the FRA will be to ensure that the development does not increase flood risk elsewhere. This can be achieved by providing a suitable sustainable drainage scheme (SuDS) that manages surface water runoff from the development.

To address this requirement, Engineering and Development Solutions (EDS) have been commissioned to prepare an FRA including a surface water drainage strategy for the proposed development, in accordance with the best practice principles of SuDS, the National Planning Policy Framework (NPPF), Sustainable Drainage Systems (SuDS), Guidance for Cornwall and Planning Practice Guidance (PPG). This report details the findings of the study.

2.0 SITE LOCATION & DESCRIPTION

2.1 Site Location

The proposed development site is located approximately 900m east of the village of St. Eval and 3km northeast of St. Mawgan in the county of Cornwall. The wider geographical location is dominated by agricultural farmland; there is an existing wind farm located directly south of the site approximately 300m away. The approximate Ordnance Survey Grid Reference for the centre of the site is SW 90057 67757.

The access track to the site connects to all of the turbines on site; this track joins to an unnamed lane that leads into the village of St. Eval in the west and St. Columb Major to the south. This access route will be retained and widened by approximately 2 metres with a proposed additional access track in the north of the site. An overrun area is to be constructed at the junction to the main site access track with the C0055 public highway, this is to allow large vehicles to negotiate the junction into the site. Details of the proposal can be seen in **Annex A.**

In terms of existing topography, the site has a high point of 185m AOD and generally falls in a south to north direction. Land in the north falls towards the source of the Porthcothnan Stream, at a distance of approximately 200m north of the site boundary.

2.2 Existing Usage

The site currently accommodates 16 wind turbines, with associated infrastructure and private site access to the west. The remaining land is used as farmland.

2.3 Proposed Usage

The development proposal is for the installation of 4 no. new wind turbines to replace the current 16 existing turbines on site. The locations of the proposed turbines are included in **Table 1** below and **Figure 3** for ease of reference. These new turbines will be approximately 150m (tip height). The existing access track in the west will be retained. The proposed layout plan which includes LIDAR ground profile information is shown in **Appendix A**.

Turbine No.	Easting	Northing
2	190085	67724
3	190317	67396
4	190482	67727
5	190670	67470

Table 1 - Proposed Turbine Location

Figure 3 - Proposed Turbine Locations

3.0 HYDROLOGICAL AND HYDROGEOLOGICAL CONTEXT

3.1 Hydrology

The local hydrology of the area is largely influenced by the existing watercourses that surround the site. There are multiple sources of streams that start in close proximity to the site, including the following:

- Porthcothnan Stream- 200m north east of the site
- Unnamed Tributary to the Penrose Stream- 850m north of the site
- Unnamed tributary to the Gluvian Stream- 600m east of the access road

The general arrangement of the local hydrology is further described below within **Figure 4**.

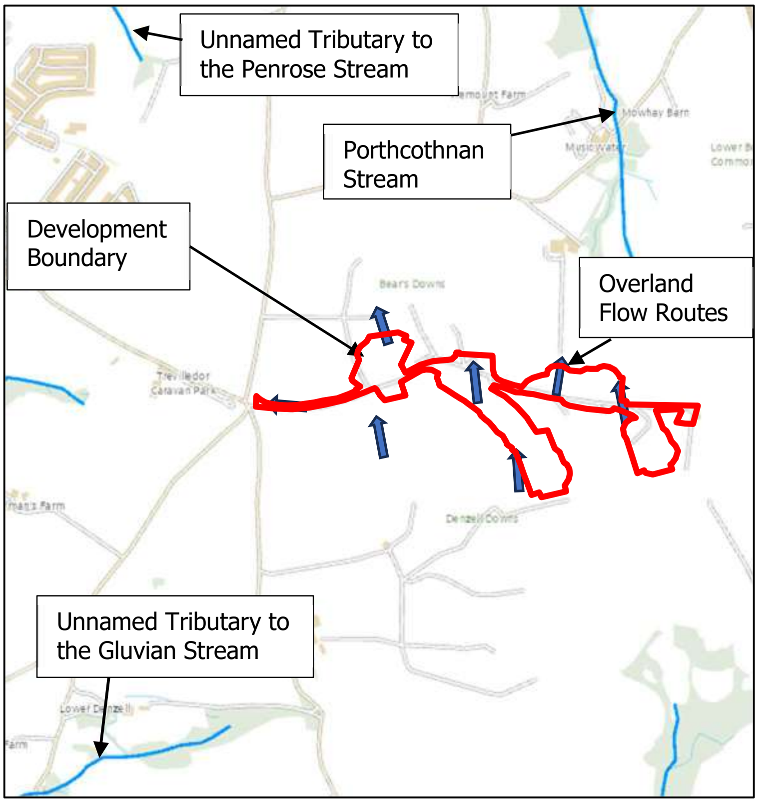


Figure 4 - Plan Showing Local Hydrology and Flow Routes

The topography and existing infrastructure on site, will result in surface water runoff flowing overland towards the natural receptors of the surrounding streams. As land falls predominantly to the north of the site, majority of overland flows will flow in this direction towards the Porthcothnan Stream. The Porthcothnan Stream flows in a general northeast direction away from the site before confluencing with the Penrose Stream and outfalls at the coast in Porthcothnan Bay.

A lesser component of the flow will be conveyed westerly out of the site, down the existing access track towards the unnamed tributary of the Gluvian Stream.

Due to the rural surroundings of the site, it is anticipated that most of the excess surface water runoff will infiltrate into the ground; flows that don't inflitrate into the ground will continue overland to the receptors as described above.

Reference to the Flood Estimation Handbook (FEH) website confirms that the site lays within the catchment of multiple streams, including the Porthcothnan Stream and an unnamed tributary to the Gluvian Stream. The catchment area for the Porthcothan Stream encompassess an area of 0.99km² and the catchment area at the downstream extent of the site for the tributary to the Gluvian Stream is approximatly 0.67km². This can be seen in **Figure 5** below.

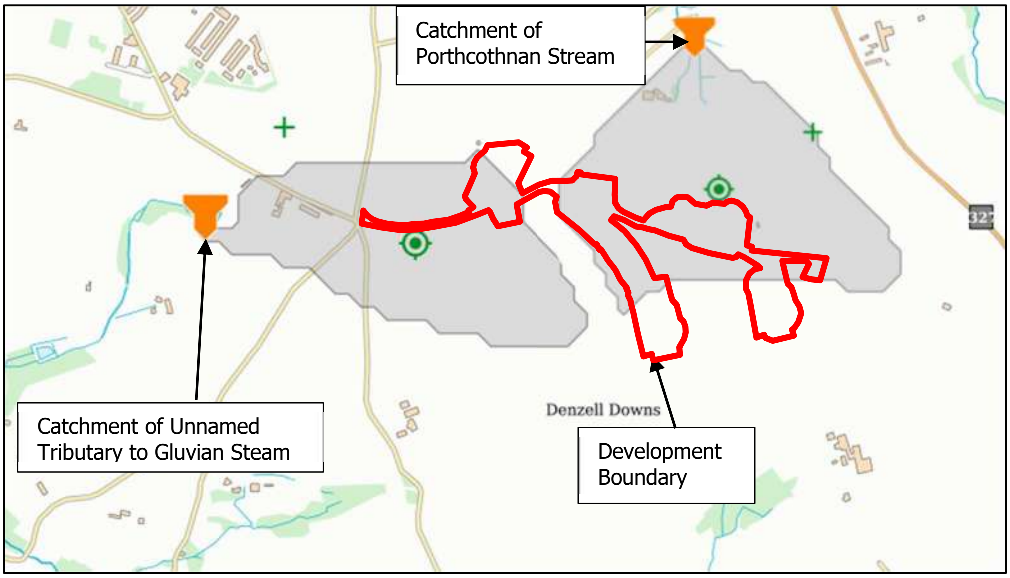


Figure 5 - Plan Showing Catchment at Downstream End of Site

3.2 Hydrogeology

Reference to information published by the British Geological Society (BGS) indicates that the site is underlain by the Staddon Formation which is predominantly made up of sandstone, siltstone and mudstone see **Figure 6**, below. The BGS Geology of Britain mapping describes the bedrock as follows: *'Sedimentary bedrock formed between 407.6 and 393.3 million years ago during the Devonian period.'* This unit of bedrock is made out of different sedimentary units. This includes medium to thick beds (1-4m) of fine to medium grained sandstones, the sequence then thickens and occurs in a coarsening up sequence that is interbedded with grey mudstones and siltstones with a gradational weathering profile near the surface. There are no superficial deposits present at the site.

Percolation testing was carried out on site in line with BRE 365/CIRIA 156 by Karn Geo Services on the 25/09/2023. This allowed for the ground conditions to be assessed; the full report and trial pit photos are included in **Appendix B**. The trial pit was taken to a depth of 3.1m which allowed a detailed inspection of the ground conditions of the site to be undertaken. It was concluded that the top 0.2m of soil on the site is topsoil, with the remaining 2.9m of the pit consisting of the Staddon formation. The material is recorded to comprise a brown clayey, sandy gravel of mudstone. The gravel found in the pit was fine to coarse angular to subrounded and becomes more competent with depth. Despite there only being one trial pit carried out on site, **Figure 6** highlights that the geology is consistent throughout the site. This suggests that the ground conditions taken from the trial pit would be similar throughout the entire development site. Further percolation testing should be carried out on site at detail design stage; however, it is deemed appropriate to conceptually design the infiltration system for the development based on the single trial pit due to the consistency in the geological mapping.

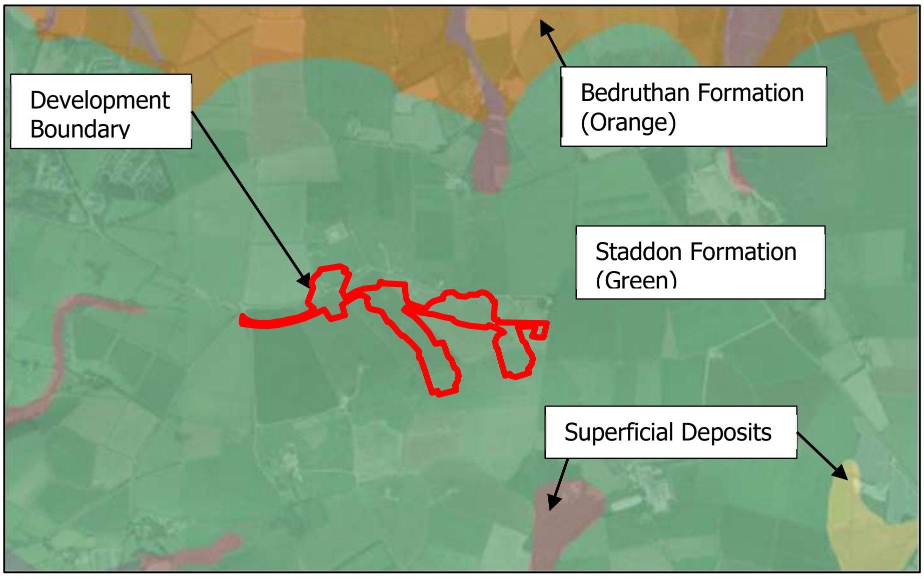


Figure 6 - Plan Showing the Bedrock in the Surrounding Area

The area is designated as a "Secondary A" Aquifer type, which is the general designation for most of Cornwall. This is described as permeable layers that can support local water supplies and may form an important source of base flow to rivers. With respect to groundwater vulnerability, the area is classified as 'High-Medium' as seen in **Figure 7**, below. This is a measure of the vulnerability of groundwater to a pollutant discharged at ground level based upon hydrological, geological, hydrogeological and soil properties within the area.

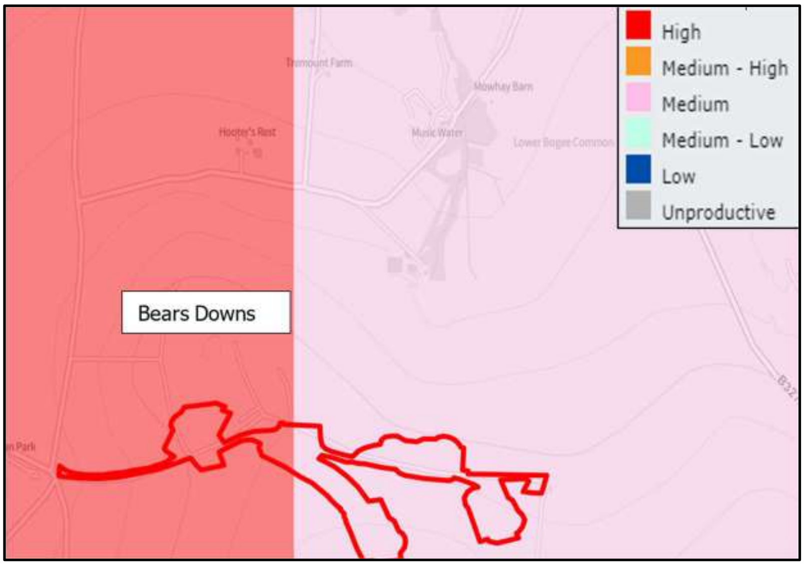


Figure 7 - Groundwater Vulnerability Map

A search has been undertaken with respect to borehole information available on the BGS database to determine groundwater depths in the vicinity of the site. **Figure 8** shows a map of the available boreholes in the surrounding area to the site. As shown, the nearest borehole is referenced SW86 NE4 located in St. Eval, west of the site.

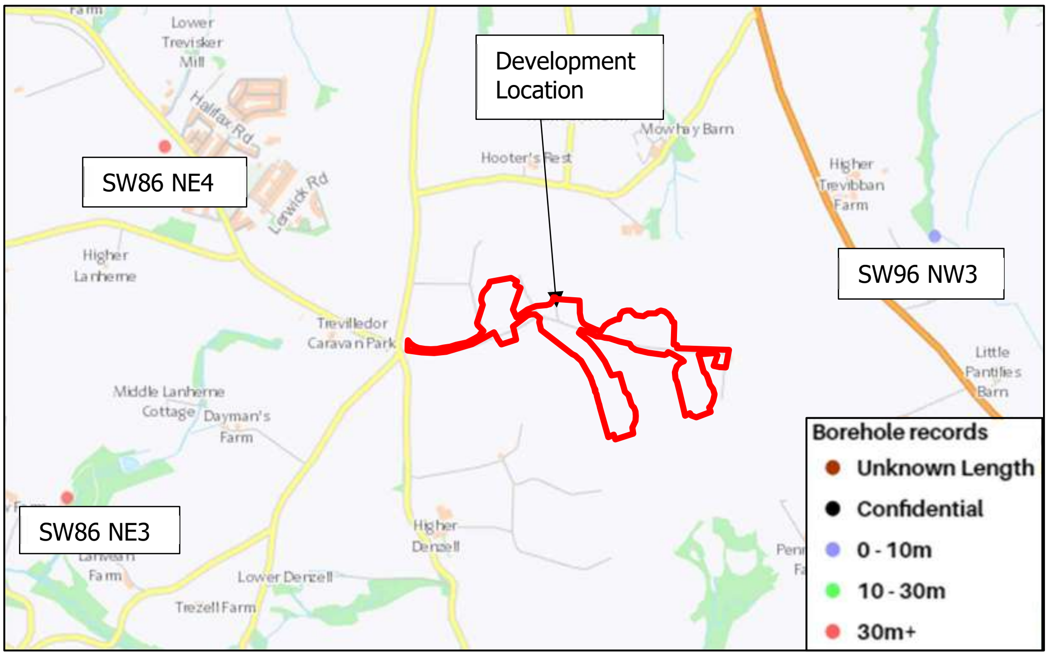


Figure 8 - Plan Showing Borehole Records for the Site

Borehole SW86 NE4, with reference to the available information on the BGS website, indicates that the borehole struck water at 19m below ground level (bgl) and had a resting water level of 13m below the surface. A borehole to the southwest of the site (SW96 NW3) near New Farm, St. Mawgan also struck groundwater. The depth of the borehole here was 49m and water was found at 24m bgl.

Borehole SW96 NW3 to the east of the site at Trelow Downs, was taken in close proximity to the source of the Mellingey Stream in a disused adit. This was a shallow borehole recorded to only 7.3m deep. Groundwater was found at 6m bgl.

Groundwater levels on site are likely to be impacted by the surrounding streams which are in close proximity to the site. These would act as sumps, to draw down on groundwater levels beneath the site. The three boreholes surrounding the site struck water at depths of between 24m, 13m and 6m; it is therefore anticipated that the groundwater levels on site will be somewhere between these levels. As such it is apparent that the groundwater on site should be well depressed beneath the surface. A trial pit excavated under BRE 365/CIRIA 156 to a depth of 3.1m discovered no groundwater on the site.

4.0 ASSESSMENT OF FLOOD RISKS

4.1 Fluvial and Tidal Flooding

The Environment Agency indicative flood map for planning (**Figure 9**, below) shows that the entire site is located in Flood Zone 1, less than a 1 in 1,000 annual probability of river and sea flooding and is therefore not at significant risk from either fluvial or tidal flooding.

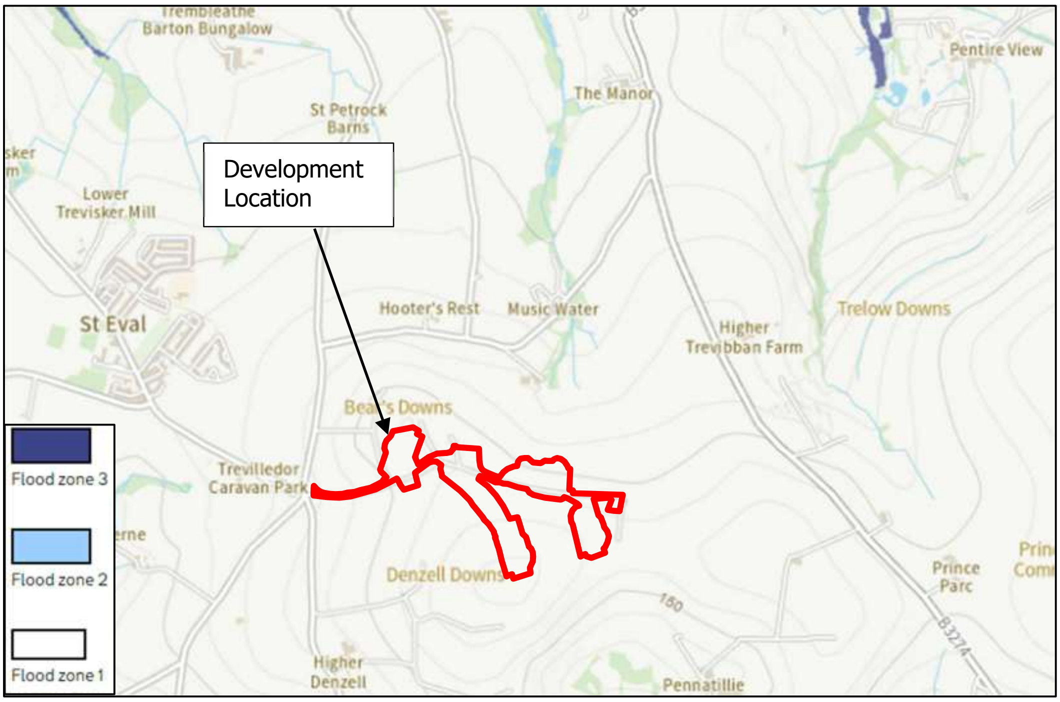


Figure 9 - Environment Agency Flood Map for Planning (Rivers & Sea) Extract

4.2 Groundwater Flooding

Groundwater flooding is linked to the ability of the ground to hold water. The Cornwall Level 1 Strategic Flood Risk Assessment (SFRA) notes the following about groundwater flooding in Cornwall:

"Groundwater flooding is linked to the ability of the ground to hold water. Due to its geology, Cornwall has only minor aquifers and generally does not experience much groundwater type flooding. The exception to this is found in areas that have extensive mine drainage systems, where blockages within drainage tunnels can lead to unexpected breakouts of groundwater at the surface."

Furthermore, inspection of the available information suggests that the groundwater table is depressed at a considerable depth beneath the site. The surrounding water courses to the site will act as sumps, drawing water away from the site. As such, construction for the proposed turbines is likely to be well above the phreatic surface and is unlikely to interact with groundwater flows. Therefore, the risk of groundwater flooding or impact from the proposed works on the groundwater regime is considered to be low and is not examined further in this report.

4.3 Overland Flow

The proposed turbines are located on relatively high ground, compared to the surrounding area. Because of this, the potential for surface water accumulating around the turbines is limited. In addition to this, the ground slopes in a south to north direction towards the source of the Porthcothnan Stream and the unnamed tributary to the Penrose Stream.

The EA map extract, seen in **Figure 10** below, provides further assessment of the risk of flooding from surface water to the site. It shows that the majority of the site is at a very low risk of flooding from surface water suggesting that there is a less than 0.1% chance of surface water flooding each year.

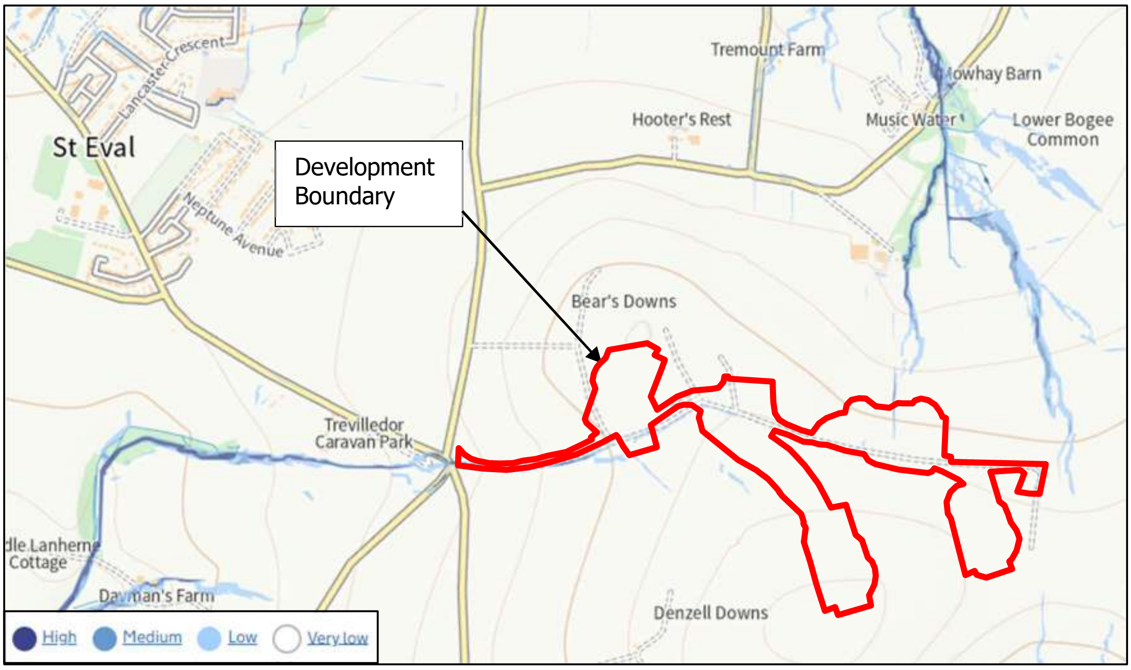


Figure 10 - EA Flood Risk from Surface Water Map Extract

There is an area on site that has a higher risk of flooding on the existing access track that connects to an unnamed lane, heading west towards St. Eval. This is an area of medium risk with a 3.3% risk of flooding each year. Despite this higher risk, it is considered that this does not pose a significant hazard to the proposed development as the overland flows generated here will flow along the access track as the track will act as a conveyance pathway towards the unnamed tributary to the Gluvian Stream. Therefore, flooding from surface water is not considered to represent a significant risk to the development.

4.4 Flooding from Sewers

There are no mains sewers in the area and the nearest upslope residential dwelling lies 1.3km to the west of the development. As such, the likelihood of flooding from sewers is negligible.

4.5 Flooding from Reservoirs, Canals, and Other Artificial Sources

Interrogation of the online EA flood risk mapping service does not indicate the site is at risk of flooding from reservoirs as there are no large artificial bodies of water in the surrounding area.

Therefore, flooding of the site from reservoirs and other artificial water bodies is not considered to be a significant risk.

4.6 Flooding as a Result of Development

The development of the site will alter the nature of the surface permeability across the site through the implementation of new hard standings, overrun area and the associated extension to the access track onto the site and to each individual turbine.

It is important that surface water runoff from the development is understood and managed by means of a sustainable surface water drainage system to prevent an increase in the risk of flooding to areas downstream of the site.

By designing the site's surface water drainage infrastructure in accordance with the advice reproduced in **Section 5**, the proposed development will not increase flood risk to third parties downslope. In consideration of the above, the proposed sustainable drainage system to be installed within the development is described in more detail in **Section 6** of this report.

5.0 DESIGN STANDARDS

Design of the site drainage infrastructure and Sustainable Drainage System (SuDS) is to be carried out in line with best practice, and to industry standard design procedures. Several publications, including design guidance and best practice guidance will be applied to different components of the final SuDS infrastructure. The sections below provide an overview of the design standards to be used on this project for various aspects of the SuDS infrastructure design.

5.1 The CIRIA SuDS Manual (C753)

This document is a comprehensive publication covering design, construction, operation, and maintenance of SuDS. The advice and best practice outlined in this document has been utilised in the design of the site SuDS features which have been detailed in this report.

5.2 Building Regulations Part H

Building Regulations Part H 'Drainage and Waste Disposal' covers the design and installation of surface water and foul water systems. All private drainage including pipes, manholes, down pipes, and other drainage infrastructure on the site should be designed and installed in accordance with this document.

5.3 The Wallingford Procedure

Developed by HR Wallingford, this publication covers the design of urban drainage systems. In addition, the document includes regional rainfall data for use in design for varying return period events. Basic sizing calculations for the proposed SuDS system and the estimation of the runoff volumes have been made using this method.

5.4 National Planning Policy Framework

The National Planning Policy Framework (NPPF) contains a policy relating to the appropriate assessment of flood risk within the UK. The associated technical guidance provides further details on the definitions, classifications and constraints used to apply national policy to new developments.

It contains details on flood zone definition, site specific FRAs, vulnerability classifications, appropriate development, climate change allowances, residual risk management, flood resilience, the sequential test, and the exception test.

5.5 Drainage Guidance for Cornwall

This document provides advice for Cornwall Council as the Local Planning Authority and those involved in developing the built environment on:

- The location of Critical Drainage Areas, where the flood risks from surface water runoff are likely to be most significant.
- Standards to be achieved by surface water drainage.
- The content of an FRA considering surface water drainage.
- Sustainable Drainage techniques (SuDS)
- Sources of further information

The Drainage Guidance for Cornwall (DGfC) document is currently under review though until an updated version is published, advice appropriate to the proposed development considered within this report is reproduced below for ease of reference.

The development site is not within a Critical Drainage Area though its area is close to 1 hectare, therefore using DGfC it is considered that the site may conservatively be classified as '*E4 – Developments greater than or equal to 1 hectare*' and the following guidance would apply:

"Outside Critical Drainage Areas – Greenfield Sites

E4 – Developments greater than or equal to 1 hectare

- *Following the Building Regulations Drainage hierarchy, surface water should: -*

  i. *Drain to a soakaway or infiltration system designed in accordance with the SUDS Manual - CIRIA C697, using a minimum of a 30-year return period storm.*

  Where a FRA demonstrates that infiltration is not possible: -

  ii. *A sustainable drainage system shall be provided ensuring flow attenuation, no adverse impact on water quality and where possible habitat creation.*

- *The total discharge from the site should aim to mimic greenfield rates. These shall be no more than the theoretical greenfield run-off rates from each of the corresponding 1-, 10-, 30- and 100-year storms. When these values are less than 5 litres/second, a rate of 5 litres/second can be used. Attenuation may not be necessary if the discharge is directly to coastal waters. In these cases, the impact on the receiving environment in terms of habitat, erosion and water quality should be assessed.*

- *The design must take into account the appropriate allowance for increased rainfall from climate change. This should be based on the lifetime of the development, the guidance in Annex B of PPS25 and the PPS25 Practice Guide."*

6.0 PROPOSED SUSTAINABLE DRAINAGE SYSTEM (SUDS)

The preferable drainage solution would be to drain all surface water runoff from the development using infiltration, in line with best practice guidance to deal with runoff as close to source as possible.

In order to determine whether infiltration would form a viable means of surface water disposal, site investigation work was carried out by Karn Geo-services in line with BRE 365/CIRIA 156 on the 25/09/2023.

Percolation tests were carried out in one location across the site; the results are summarised below and included in **Annex B**. The trial pit showed a fast rate of infiltration that is suitable for soakaway design as seen in **Table 2** below.

Test	Soil Infiltration Rate (m/s)	Soil Infiltration Rate (m/hr)
1	3.04×10^{-3}	10.94
2	2.41×10^{-3}	8.67
3	2.58×10^{-3}	9.28

Table - 2 Soil Infiltration Rates

Location of the trial pit is included in Karn Geotechnic report attached in **Appendix B** and highlighted on drawing **J-3131-3002A** located in **Appendix A**. The worst-case value has been taken to size the infiltration system; based on **Table 2** above, this value has been taken as 8.67 m/hr.

6.1 Drainage Design

The introduction of the hardstanding areas, overrun area and widened access track around the new turbines will introduce impermeable areas. This infrastructure is proposed to be installed as imported hardcore capped with Type 1 material. This will result in a partially permeable road, overrun area and hardstanding areas. As such, these areas will be assumed to be 50% permeable.

<u>Access Road</u>

The Access track that runs through the centre of the site provides access to the existing turbines. The existing access track is typically 3.5m to 4.0m wide and constructed in compacted stone granular material (sub-base).

The central spine of the existing access track will be retained within the proposed scheme and new sidetracks will be added emanating off the central track to provide local access to the new turbine locations. The existing central track will be widened by approximately 2m in similar materials to the existing track to facilitate the new development.

The track is to be widened using compacted subbase material (Type 1 subbase to 803 to the (Specification for Highway Works) to match the existing construction. This material is reasonably permeable in the loose state but becomes semi permeable when compacted as the fine material binds together on the top surface. For the purposes of the drainage analysis, this material is assumed to be 50% permeable.

It is proposed to construct gravel-filled trenches along the lower edges of the widened access track to infiltrate water into the surrounding ground. This has been designed on the basis and using a typical finished access track which has been widened to 5.5m, the track has the potential to develop a runoff of 0.1l/s per metre length of track. Calculations in Micro-Drainage show that a gravel filled trench of 0.3m width would fill to a depth of about 0.28m in an extreme event (1 in 100 year plus 50% climate change). As such, a 0.3m wide by 0.5m deep infiltration trench is proposed.

A 1m wide grass filter strip should be provided between the edge of the track and the filter drain if practicable. Check dams should be provided along the length of the drain at approximately 15m centres to prevent water flowing direct to the lower end of the drain.

The proposed infiltration trench should be installed along the lower edge of all lengths of the track subject to widening.

A typical section through the proposed track and trench is shown below in **Figure 11**

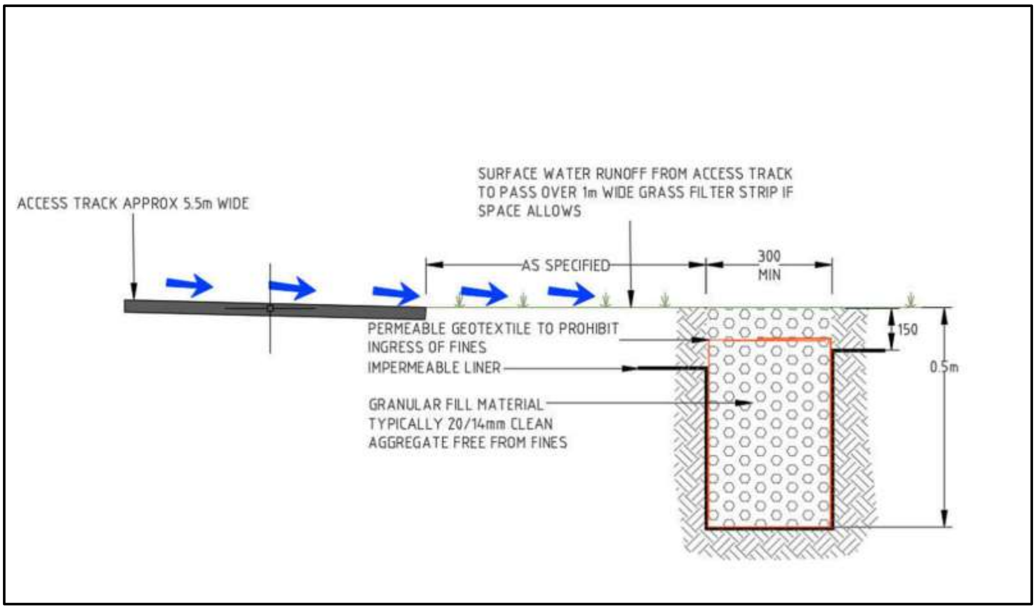


Figure 11 – Proposed Section Through Track Subject to Widening

Overrun Area

As part of the development, it is proposed to install a temporary overrun area at the junction of the main site access track with the C0055 public highway: this is to allow large vehicles to negotiate the junction into the site. The overrun area will be constructed in compacted subbase material similar to the trackway.

A plan layout showing the overrun area is provided below in **Figure 12.** The total area of the overrun area plus bellmouth is approximately 740m^2 or an effective impermeable area of 370m^2 based on 50% impermeability. Ground levels are such that the area is likely to have a fall towards a low point at the channel line with the public road.

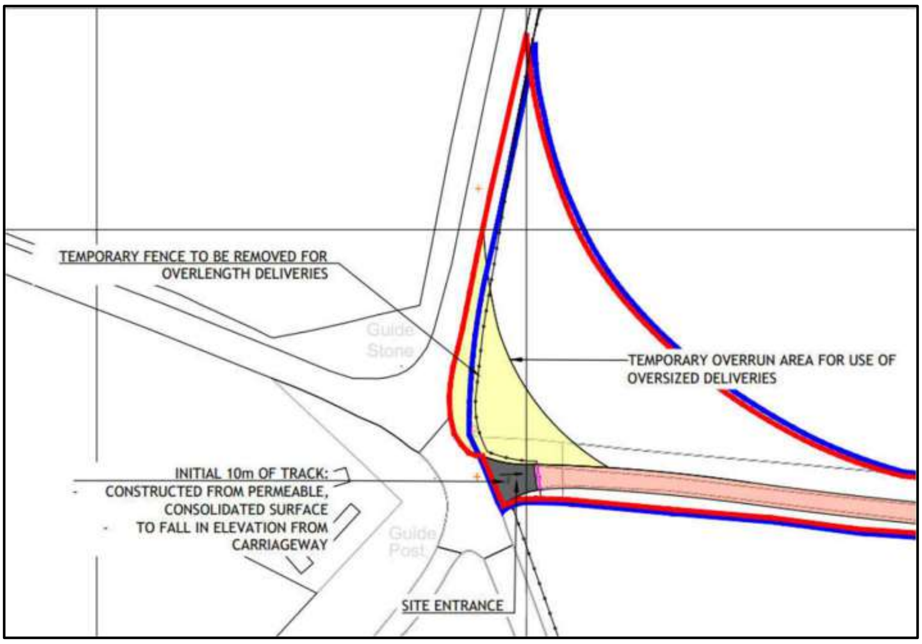


Figure 12 – Plan showing Proposed Overrun Works

In order to deal with potential runoff from the overrun area, it is proposed to install a set of three gullies at the local low point, with the gulley grids set in localized dished concrete aprons and the ground in the overrun area graded towards the gullies. Flow collected at the gullies would be drained to a separate soakaway installed at the rear of the overrun area away from the principal wheel track lines.

Calculations in Micro-Drainage show that a soakaway constructed from modular infiltration units of size 4m long by 2m wide by 0.8m deep would be sufficient to manage flows from an extreme rainfall event (1 in 100-year plus climate change); associated calculations are attached in **Annex A.** Drainage proposals for the overrun area are shown in **Figure 13 below.**

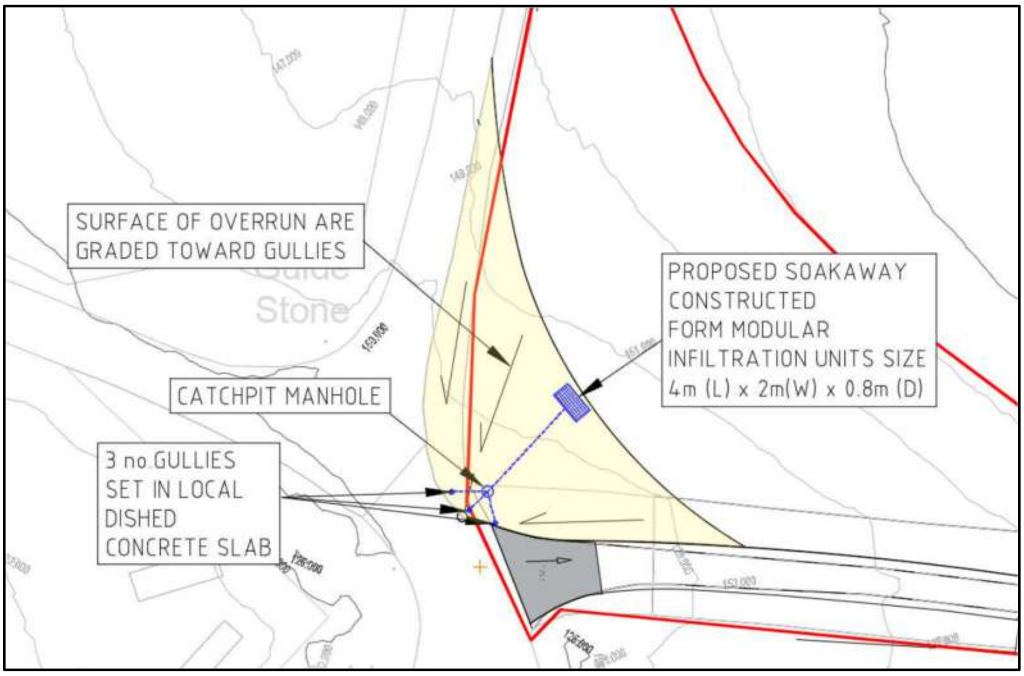


Figure 13 Plan showing Proposed Drainage Works in Overrun Area

Turbines Hardstanding Areas

It is proposed to drain the impermeable areas for the turbines into a series of shallow swales laid along the lower perimeter of the hardstanding areas for the turbines: these will convey flows to individual soakaways. A total of 4 soakaways have been designed for the hard standing areas for proposed turbines.

The foundation base to the turbines will be buried and will allow infiltration into the finished surfacing over the base. The footprint of the base is within the coverage of the hardstanding area, so it will be treated as being 50% permeable by default.

The following items have been taken into account when considering impermeable areas and the sizing of soakaways:

- Turbine 2 = 2500m² x 50% = 1,250m²
- Turbine 3 = 2500m² x 50% = 1,250m²
- Turbine 4 = 3300m² x 50% = 1,650m²
- Turbine 5 = 3000m² x 50% = 1,500m²
- Access track between Turbine 2 and 3 = 1500m² x 50% = 750m²
- Electricity substation = 40m²

- Total Equivalent Impermeable Area = 6,440m² (0.644 ha)

Building Regulations Part H places several restrictions on the siting on soakaways which should be complied with. This includes that soakaways should not be sited within 5m of any building or road. They should also be a sufficient distance away from other soakaways or drainage fields so that the overall soakage capacity of the ground is not exceeded or effectiveness of the units impaired. At this stage of the development, connections to the soakaway are indicative only.

The proposed soakaways have been sized using MicroDrainage software with a 50% allowance for Climate Change and an increased Factor of Safety to 10 due to the single percolation test pit. The soakaways are based on Aquacell modular infiltration units with a 95% void ratio. The dimension of each soakaway is shown below in **Table 3** below and in drawing **J-3131-3002A** in **Appendix A**.

Soakaway	Dimensions (W x L x D)
B-Turbine 2 and access road between T2 and 3	7.5m x 8m x 1.2m
C- Turbine 3	6m x 8m x 0.8m
D- Turbine 4	6m x 8m x 1.2m
E- Turbine 5	5.5m x 8m x 1.2m
F- Substation	1.5m x 1m x 0.8m

Table - 3 Proposed Soakaway Dimensions

6.2 Exceedance Events

In the unlikely event of a storm in excess of the 1 in 100-year return period rainfall event occurring (including climate change allowance), or if the proposed drainage systems were to become blocked, water may flood the system. In this case it is considered that the overflowing water would run over ground in a south to north direction. Overland flows are also shown to flow across the site in an east to west direction towards the access point to the site as per the predevelopment scenario. Exceedance flow direction arrows are shown on the drawings.

Due to the storage provided in the proposed drainage systems, and design standard used (1 in 100-year storm with an additional 50% allowance for the effects of climate change), any exceedance flows would be lower than would flow off the site in the pre-development scenario for a similar storm event. It is apparent that overland exceedance routes are unaffected by the proposed development.

6.3 Maintenance

The proposed surface water drainage systems will remain private and will not be offered for adoption. Management and maintenance responsibility for the infrastructure will be the responsibility of the site owner/operator.

Maintenance activities for the systems will broadly comprise regular maintenance, occasional tasks, and remedial work where necessary, as per the guidance in the CIRIA SuDS Manual C753 which is summarised in **Table 4, 5 and 6 below**. Inspection of the surface water drainage systems can generally be undertaken during routine site visits e.g., for grass cutting, leaf collection and/or litter collection.

SOAKAWAYS		
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will required reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year then annually
	Check soakaway to ensure emptying is occurring	Annually

Table 4 – Soakaway, Typical Maintenance Activity Schedule

SWALES		
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height 100-150mm	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design profile unless there is a design flaw	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and disposed of oils or petrol residues using safe standard practices	As required

Figure 5 – Swales, Typical Maintenance Activity Schedule

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

Figure 6 –Infiltration Trench, Typical Maintenance Activity Schedule

6.4 Residual Risks After Development

Rainfall over and above the design event could cause the sustainable drainage system to flood, however, any exceedance flows would be dealt with as outlined above.

The sustainable surface water drainage systems proposed in this report have been designed for the volume of surface runoff resulting from the proposed development, thus any unauthorised future connections into the proposed networks could potentially overload the system. Any future development on the site, beyond the current proposal, should be suitably planned and considered.

6.5 Construction Stage Drainage

In order to limit the potential for silt discoloured water to run off site during construction stage, the silt fencing should be constructed at the front end of the works. The designed infiltration systems should be the last stage of the construction process, to prevent silt build up or blockages inside the drainage systems.

During construction phase, the impermeable area on site will increase due to the creation of temporary car parking and office units being placed on site. In order to mitigate the surface water runoff before completion, a line of silt fencing should also be installed downslope of the works area during the construction phase. Additionally, moveable straw bales should be provided at the lower end of the access track to allow interception and filtration of any runoff bypassing the SUDS system along the access.

7.0 SUMMARY AND CONCLUSIONS

This study has investigated mechanisms of flooding and the potential for Sustainable Drainage (SuDS) to be installed as part of the development of 4no. replacement wind turbines at Bears Down Wind Farm, Trevilledor Cross, Newquay, TR8 4HQ.

Environment Agency (EA) indicative flood mapping shows that the development site is located entirely within Flood Zone 1; at little or no risk from tidal or fluvial flooding and is therefore for all types of development. The development proposal is for an area greater than 1 hectare in size, therefore further consideration of surface water drainage has been undertaken.

Additional investigation of the existing hydrology and hydrogeology has been undertaken at the request of Clean Earth Energy for completeness.

The study has investigated alternative mechanisms for flooding at the site and has concluded that the site is not at risk of flooding and will not cause an increase in flood risk elsewhere once the proposed sustainable drainage system is operational.

Infiltration testing undertaken on site has demonstrated that the site is suitable for the use of an infiltration-based surface water SuDS. The drainage proposal is described in more detail in this report and as shown in **Appendix A** with associated calculations located in **Annex B**.

Proposals have been provided to mitigate against the escape of silty runoff water during the construction stage.

Provided the recommendations outlined in this report are adopted in the development proposal then there is the capacity to manage the surface water runoff from the development onsite. The proposed drainage infrastructure has been designed in accordance with guidance outlined in the NPPF, PPG, and Drainage Guidance for Cornwall and therefore the development is entirely appropriate on this site from a flood risk perspective.

APPENDIX A PROPOSED LAYOUT INCLUDING CONCEPTUAL SuDS PLAN

KEY

- SITE BOUNDARY
- CONSTRUCTION PHASE SILT FENCE
- TEMPORARY AREAS
- IMPERMEABLE AREA
- PROPOSED PRIVATE SW SEWER
- PROPOSED CONVEYANCE SWALE
- PROPOSED INFILTRATION TRENCH
- PROPOSED SOAKAWAY COMPRISED OF MODULAR INFILTRATION UNITS WITH 95% VOID RATIO
- FLOOD ROUTING
- CONVEYANCE ARROW
- PROPOSED CATCHPIT WITH LEAF AND DEBRIS FILTER

SURFACE WATER

THE SURFACE WATER DRAINAGE SYSTEM HAS BEEN DESIGNED TO ACCEPT RUNOFF FROM THE PROPOSED HARD STANDING AREAS, WIND TURBINE BASE AND ACCESS PATHS. THE ACCESS PATHS, AND HARD STANDING AREAS ARE TAKEN TO BE SEMI-PERMEABLE (50% PERMEABLE)

CONVEYANCE SWALES WILL DRAIN RUNOFF FROM THE SITE INTO INDIVIDUAL SOAKAWAYS TO ALLOW SETTLEMENT OF SILT LADEN RUNOFF. INFILTRATION TRENCHES WILL BE CONSTRUCTED ON THE LOW POINTS OF THE WIDENED ACCESS TRACK TO INFILTRATE SURFACE WATER INTO THE SURROUNDING GROUND. THE INFILTRATION-BASED SYSTEMS HAVE BEEN DESIGNED TO ACCEPT FLOWS FROM EVENTS UP TO AND INCLUDING THE 1 IN 100-YEAR STORM EVENT WITH AN ALLOWANCE FOR CLIMATE CHANGE. THE SOAKAWAY CALCULATIONS HAVE BEEN BASED ON MODULAR INFILTRATION UNITS WITH A 95% VOID RATIO. THE FACTOR OF SAFETY HAS ALSO BEEN INCREASED TO 10 FOR SOAKAWAY DESIGN..

AT THIS STAGE, ALL INFRASTRUCTURE LOCATIONS ARE INDICATIVE ONLY.

MICRODRAINAGE SOFTWARE HAS BEEN USED TO SIZE THE STORAGE REQUIRED TO DRAIN THE IMPERMEABLE AREAS FROM THE SITE. BASED ON FEH RAINFALL WITH THE WORST CASE DESIGN STORM (100-YEAR) WITH RAINFALL INTENSITIES INCREASED BY 50% TO ALLOW FOR THE EFFECTS OF CLIMATE CHANGE AS REQUIRED BY THE LOCAL DRAINAGE GUIDANCE FOR THIS AREA.

PERCOLATION TESTS WERE CARRIED OUT ON SITE ON THE 25/09/23 BY KARN GEOSERVICES AND ONLY ONE TRIAL PIT WAS EXCAVATED.

THE SITE HAS A TOTAL IMPERMEABLE AREA OF APPROXIMATELY 7900m^2 PART OF THIS IMPERMEABLE AREA IS ALREADY IN EXISTENCE, ONLY THE ADDITIONAL AREAS HAVE BEEN CONSIDERED FOR A NEW DRAINAGE LAYOUT. EXISTING DRAINAGE DESIGN ON SITE WILL CONTINUE TO CONTROL SURFACE WATER RUNOFF FROM THE EXISTING AREAS.

INFILTRATION SYSTEMS

DESIGNED AREAS HAVE BEEN DESIGNED TO THE FOLLOWING DIMENSIONS (W x L x D)

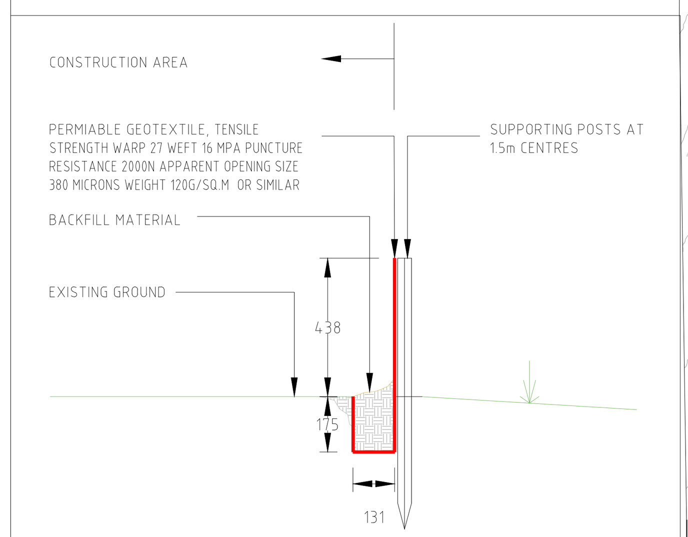
SA B (TURBINE 2 AND ACCESS ROAD BETWEEN T2 &3): 7.5m x 8m x 1.2m
SA C (TURBINE 3) 6m x 8m x 0.8m
SA D (TURBINE 4) 6m x 8m x 1.2m
SA E (TURBINE 5) 5.5m x 8m x 1.2m
SA F (SUBSTATION) 1.5m x 1m x 0.8m

CONSTRUCTION PHASE DRAINAGE

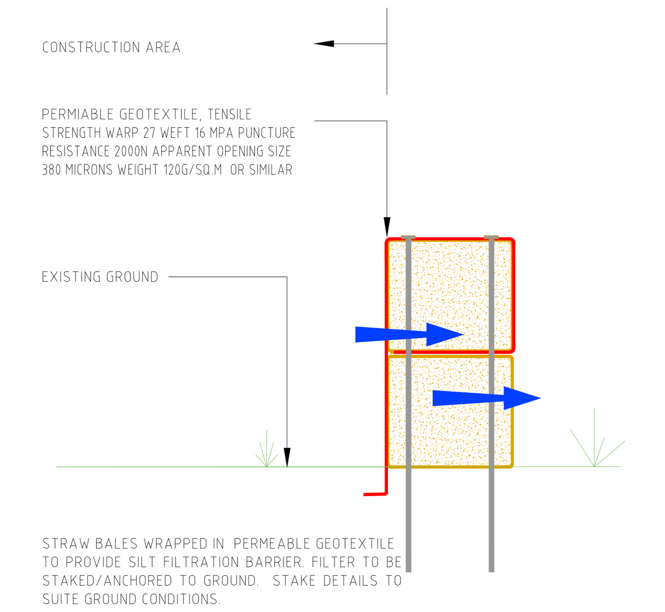
A FILTER STRIP OF A MINIMUM OF 1m SHOULD BE PROVIDED BETWEEN THE EDGE OF ANY CONSTRUCTION AREAS TO PROVIDE INITIAL INFILTRATION OF CONSTRUCTION RUNOFF. SILT FENCES SHOULD BE INSTALLED PARALLEL TO CONTOURS WHERE POSSIBLE TO PREVENT SILT LADEN RUNOFF DISCHARGING DIRECTLY INTO THE PROPOSED SYSTEMS.

SEQUENCE OF CONSTRUCTION

ALL DRAINAGE SHOULD BE CONSTRUCTED PRIOR TO ANY OTHER SITE ENABLING WORKS

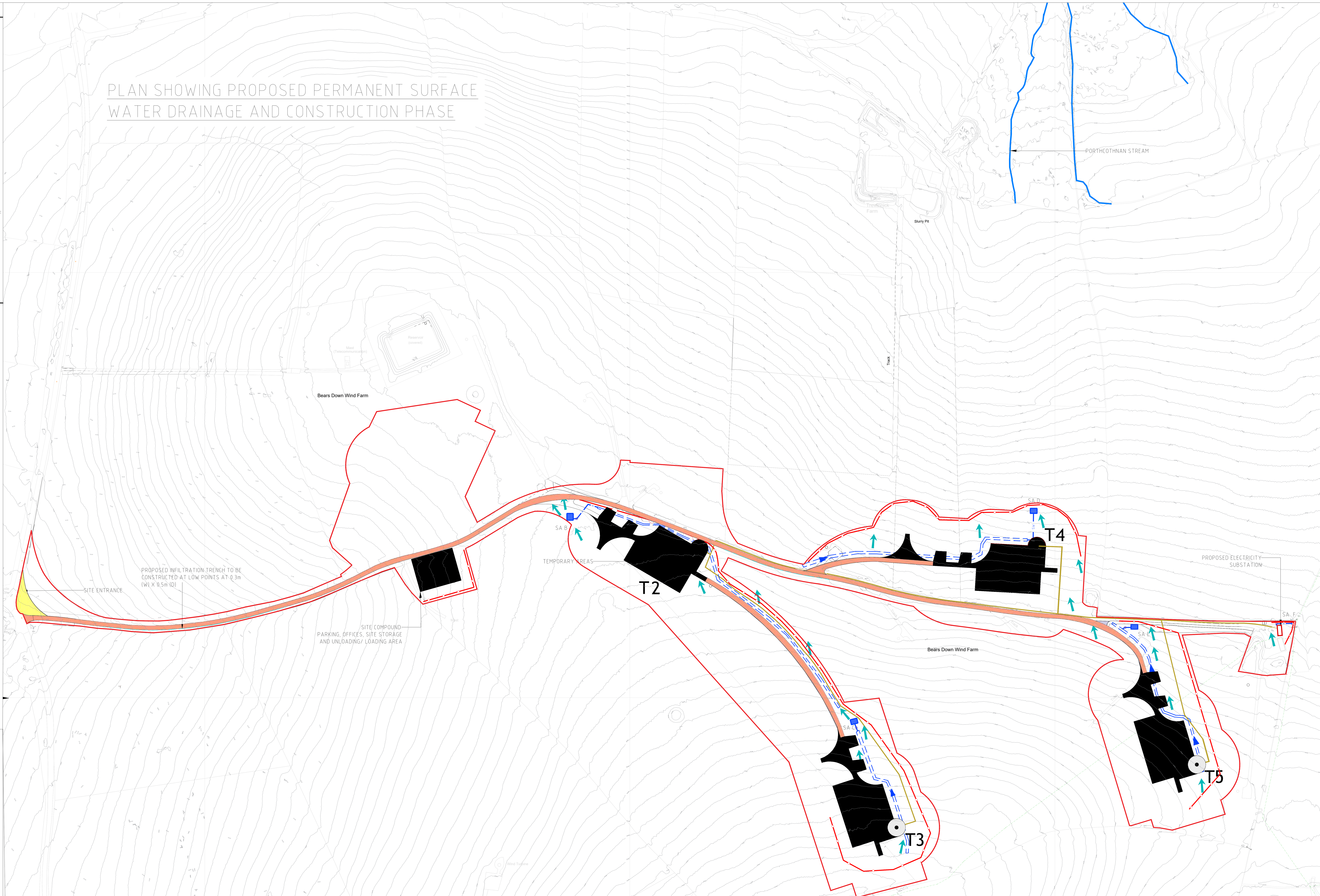


CONSTRUCTION PHASE SILT FENCE
NTS

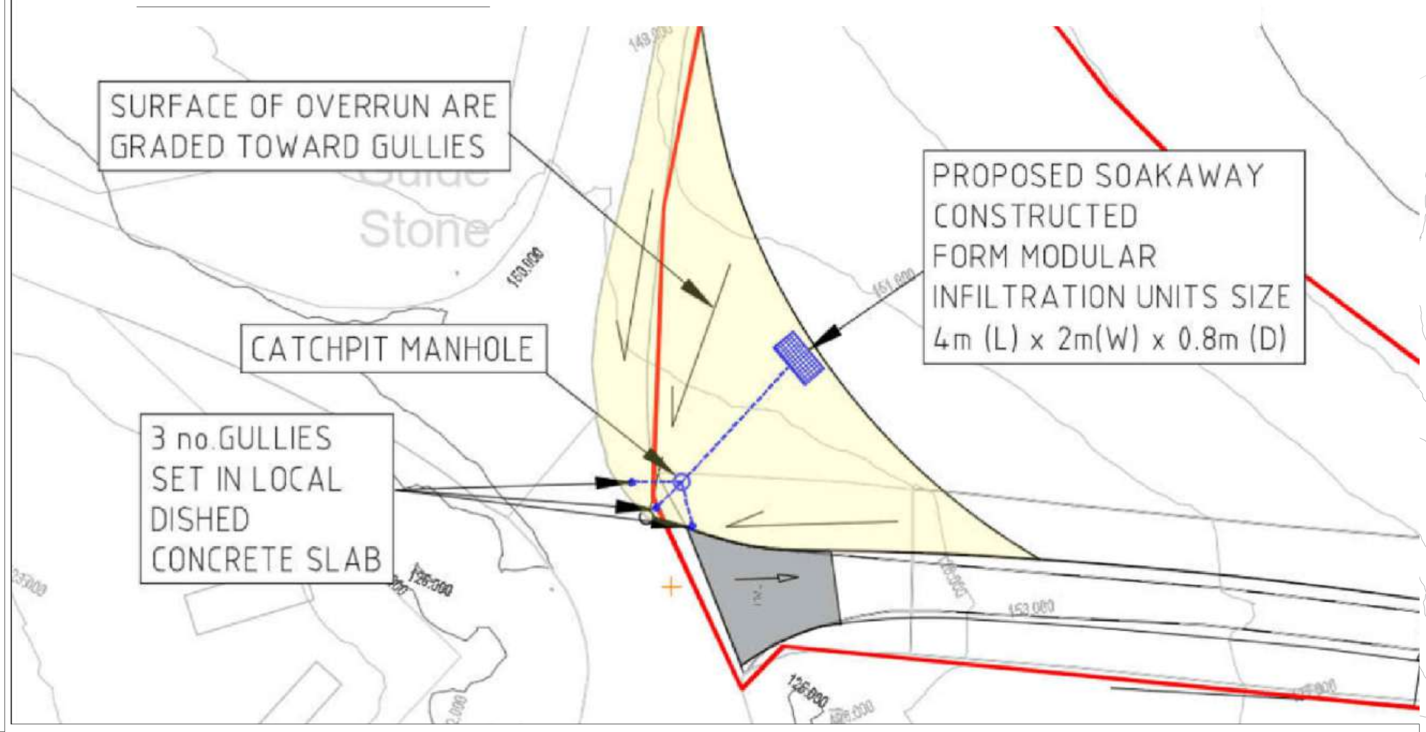


CONSTRUCTION PHASE SILT FENCE
('NO DIG' AREA - IF REQUIRED)
NTS

PLAN SHOWING PROPOSED PERMANENT SURFACE WATER DRAINAGE AND CONSTRUCTION PHASE



PLAN SHOWING PROPOSED DRAINAGE WORKS IN OVERRUN AREA



NOTES

1. This drawing is copyright. Refer to details above.
2. This drawing is only to be used for the purposes described in the status box below.
   Work to figured dimensions only, do not scale for construction purposes.
3. This drawing is to be read in conjunction with all other drawings, details and specifications pertaining to the work described. It should only be used for the purpose marked in the status box below, and shall not be used for construction unless clearly marked CONSTRUCTION.
4. Materials and workmanship shall comply to the appropriate British Standards and Codes of Practice unless otherwise stated.
5. The activities required to construct the work, shown on drawings clearly marked CONSTRUCTION, may be subject to the provisions of the Construction (Design & Management) Regulations 2015. The Contractor and Client must ensure that they are adequately conversant with these regulations and that the appropriate procedures required under the regulations are observed at all times.
6. The contractor is responsible for locating services prior to excavation. Any services shown on the drawing should be considered 'indicative' only. Where no services are shown on the drawing it does not necessarily mean there are no services present, only that a services search has not been undertaken. Where in doubt refer to HSE booklet "avoiding danger from underground services"
7. Design Risk Assessment

   A risk assessment relating to potential hazards associated with the works described within this drawing, in so far as they have been designed by EDS Ltd, has been undertaken. Risks identified have been eliminated by design wherever practicable. The status with regard to residual risks is as follows:

   The work is at an early planning stage and is not sufficiently advanced to allow a meaningful assessment of risks to be undertaken at this time.

Designer - EDS Drawing revision - A
Date - 17/07/25

DATE	DRWN	CHKD	REV	NOTES
17/07/25	LT	TPS	A	PRELIMINARY ISSUE

PROJECT MANAGER -	JAN CLARK
PROJECT ENGINEER -	LEILA THOMPSON
DRAWN DATE -	JULY 2025
SCALE & SHEET SIZE -	1:2500 @ A1

PRELIMINARY

EDS
Engineering & Development Solutions
- Flood Risk Assessment
- SuDS and Surface Water
- Foul and Sewage Treatment
- Highway Design
- Civil Engineering
- Statutory Approvals

EDS, Unit E4, Threemilestone Industrial Estate, Threemilestone, Truro, Cornwall TR4 9LD (01872) 306311 (Mob) 07973816457
Email: jan@eadsolutions.co.uk
www.eadsolutions.co.uk

CLIENT
CLEAN EARTH ENERGY

PROJECT
PROPOSED REPLACEMENT WIND TURBINES AT BEARS DOWNS, NEWQUAY, TR8 4HQ

DRAWING TITLE
PLAN SHOWING PROPOSED PERMANENT SURFACE WATER DRAINAGE AND CONSTRUCTION PHASE

PROJECT No.	DRAWING No.	REV
J-3131	3002	A

APPENDIX B CALCULATIONS

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Plymouth
Storm duration	D = **10** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.300**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **30** %
Factor Z1 (Wallingford procedure)	Z1 = **0.49**
Rainfall for 10min storm with 5 year return period	$M5\_10min_i = Z1 \times M5\_60min \times (1 + p_{climate})$ = **11.5** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.93**
Rainfall for 10min storm with 100 year return period	$M100\_10min = Z2 \times M5\_10min_i$ = **22.2** mm
Design rainfall intensity	$I_{max} = M100\_10min / D$ = **133.0** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **6** m^2
Percentage of area that is impermeable	p = **50** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **0.1** l/s

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 5 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.597	0.597	12.2	4.5	O K
30 min Summer	98.621	0.621	12.4	4.7	O K
60 min Summer	98.530	0.530	11.5	4.0	O K
120 min Summer	98.287	0.287	9.2	2.2	O K
180 min Summer	98.153	0.153	7.9	1.2	O K
240 min Summer	98.074	0.074	7.1	0.6	O K
360 min Summer	98.042	0.042	5.8	0.3	O K
480 min Summer	98.034	0.034	4.7	0.3	O K
600 min Summer	98.029	0.029	4.0	0.2	O K
720 min Summer	98.025	0.025	3.5	0.2	O K
960 min Summer	98.021	0.021	2.9	0.2	O K
1440 min Summer	98.015	0.015	2.1	0.1	O K
2160 min Summer	98.011	0.011	1.6	0.1	O K
2880 min Summer	98.009	0.009	1.2	0.1	O K
4320 min Summer	98.007	0.007	0.9	0.1	O K
5760 min Summer	98.006	0.006	0.8	0.0	O K
7200 min Summer	98.005	0.005	0.7	0.0	O K
8640 min Summer	98.004	0.004	0.5	0.0	O K
10080 min Summer	98.004	0.004	0.5	0.0	O K
15 min Winter	98.673	0.673	12.9	5.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	12
30 min Summer	107.084	0.0	20
60 min Summer	70.705	0.0	36
120 min Summer	42.286	0.0	68
180 min Summer	31.523	0.0	96
240 min Summer	25.633	0.0	126
360 min Summer	19.132	0.0	182
480 min Summer	15.531	0.0	242
600 min Summer	13.188	0.0	300
720 min Summer	11.523	0.0	360
960 min Summer	9.274	0.0	482
1440 min Summer	6.793	0.0	726
2160 min Summer	4.931	0.0	1072
2880 min Summer	3.916	0.0	1460
4320 min Summer	2.816	0.0	2156
5760 min Summer	2.236	0.0	2856
7200 min Summer	1.880	0.0	3608
8640 min Summer	1.639	0.0	4456
10080 min Summer	1.465	0.0	4976
15 min Winter	155.298	0.0	13

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	98.653	0.653	12.7	5.0	O K
60 min Winter	98.488	0.488	11.1	3.7	O K
120 min Winter	98.181	0.181	8.2	1.4	O K
180 min Winter	98.050	0.050	6.9	0.4	O K
240 min Winter	98.040	0.040	5.6	0.3	O K
360 min Winter	98.030	0.030	4.2	0.2	O K
480 min Winter	98.025	0.025	3.4	0.2	O K
600 min Winter	98.021	0.021	2.9	0.2	O K
720 min Winter	98.018	0.018	2.5	0.1	O K
960 min Winter	98.015	0.015	2.0	0.1	O K
1440 min Winter	98.011	0.011	1.5	0.1	O K
2160 min Winter	98.008	0.008	1.1	0.1	O K
2880 min Winter	98.007	0.007	0.9	0.1	O K
4320 min Winter	98.005	0.005	0.7	0.0	O K
5760 min Winter	98.004	0.004	0.5	0.0	O K
7200 min Winter	98.003	0.003	0.4	0.0	O K
8640 min Winter	98.003	0.003	0.4	0.0	O K
10080 min Winter	98.003	0.003	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	21
60 min Winter	70.705	0.0	38
120 min Winter	42.286	0.0	68
180 min Winter	31.523	0.0	92
240 min Winter	25.633	0.0	124
360 min Winter	19.132	0.0	182
480 min Winter	15.531	0.0	246
600 min Winter	13.188	0.0	304
720 min Winter	11.523	0.0	356
960 min Winter	9.274	0.0	488
1440 min Winter	6.793	0.0	708
2160 min Winter	4.931	0.0	1116
2880 min Winter	3.916	0.0	1420
4320 min Winter	2.816	0.0	2124
5760 min Winter	2.236	0.0	2720
7200 min Winter	1.880	0.0	3440
8640 min Winter	1.639	0.0	4736
10080 min Winter	1.465	0.0	5552

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.037

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.037

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 3.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	**Area (m^2)**	**Inf. Area (m^2)**	**Depth (m)**	**Area (m^2)**	**Inf. Area (m^2)**
0.000	8.0	8.0	0.900	0.0	17.6
0.800	8.0	17.6			

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 9 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.473	0.473	0.9	0.7	O K
30 min Summer	98.522	0.522	1.0	0.7	O K
60 min Summer	98.503	0.503	1.0	0.7	O K
120 min Summer	98.371	0.371	0.8	0.5	O K
180 min Summer	98.284	0.284	0.7	0.4	O K
240 min Summer	98.221	0.221	0.6	0.3	O K
360 min Summer	98.135	0.135	0.5	0.2	O K
480 min Summer	98.082	0.082	0.5	0.1	O K
600 min Summer	98.052	0.052	0.4	0.1	O K
720 min Summer	98.045	0.045	0.4	0.1	O K
960 min Summer	98.036	0.036	0.3	0.1	O K
1440 min Summer	98.026	0.026	0.2	0.0	O K
2160 min Summer	98.019	0.019	0.2	0.0	O K
2880 min Summer	98.015	0.015	0.1	0.0	O K
4320 min Summer	98.011	0.011	0.1	0.0	O K
5760 min Summer	98.009	0.009	0.1	0.0	O K
7200 min Summer	98.008	0.008	0.1	0.0	O K
8640 min Summer	98.007	0.007	0.1	0.0	O K
10080 min Summer	98.006	0.006	0.0	0.0	O K
15 min Winter	98.533	0.533	1.0	0.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	13
30 min Summer	107.084	0.0	21
60 min Summer	70.705	0.0	38
120 min Summer	42.286	0.0	70
180 min Summer	31.523	0.0	100
240 min Summer	25.633	0.0	132
360 min Summer	19.132	0.0	190
480 min Summer	15.531	0.0	250
600 min Summer	13.188	0.0	306
720 min Summer	11.523	0.0	366
960 min Summer	9.274	0.0	490
1440 min Summer	6.793	0.0	734
2160 min Summer	4.931	0.0	1100
2880 min Summer	3.916	0.0	1456
4320 min Summer	2.816	0.0	2132
5760 min Summer	2.236	0.0	2880
7200 min Summer	1.880	0.0	3648
8640 min Summer	1.639	0.0	4384
10080 min Summer	1.465	0.0	5120
15 min Winter	155.298	0.0	14

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	98.574	0.574	1.1	0.8	O K
60 min Winter	98.516	0.516	1.0	0.7	O K
120 min Winter	98.334	0.334	0.8	0.5	O K
180 min Winter	98.225	0.225	0.6	0.3	O K
240 min Winter	98.152	0.152	0.5	0.2	O K
360 min Winter	98.063	0.063	0.4	0.1	O K
480 min Winter	98.043	0.043	0.4	0.1	O K
600 min Winter	98.037	0.037	0.3	0.1	O K
720 min Winter	98.032	0.032	0.3	0.0	O K
960 min Winter	98.026	0.026	0.2	0.0	O K
1440 min Winter	98.019	0.019	0.2	0.0	O K
2160 min Winter	98.014	0.014	0.1	0.0	O K
2880 min Winter	98.011	0.011	0.1	0.0	O K
4320 min Winter	98.008	0.008	0.1	0.0	O K
5760 min Winter	98.007	0.007	0.1	0.0	O K
7200 min Winter	98.006	0.006	0.0	0.0	O K
8640 min Winter	98.005	0.005	0.0	0.0	O K
10080 min Winter	98.004	0.004	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	23
60 min Winter	70.705	0.0	40
120 min Winter	42.286	0.0	72
180 min Winter	31.523	0.0	104
240 min Winter	25.633	0.0	134
360 min Winter	19.132	0.0	190
480 min Winter	15.531	0.0	246
600 min Winter	13.188	0.0	304
720 min Winter	11.523	0.0	366
960 min Winter	9.274	0.0	490
1440 min Winter	6.793	0.0	740
2160 min Winter	4.931	0.0	1080
2880 min Winter	3.916	0.0	1484
4320 min Winter	2.816	0.0	2232
5760 min Winter	2.236	0.0	2872
7200 min Winter	1.880	0.0	3600
8640 min Winter	1.639	0.0	4400
10080 min Winter	1.465	0.0	5064

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	Area (m^2)	Inf. Area (m^2)	Depth (m)	Area (m^2)	Inf. Area (m^2)
0.000	1.5	1.5	0.900	0.0	5.5
0.800	1.5	5.5			

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.275	0.275	2.2	0.1	O K
30 min Summer	99.256	0.256	2.0	0.0	O K
60 min Summer	99.211	0.211	1.5	0.0	O K
120 min Summer	99.154	0.154	1.0	0.0	O K
180 min Summer	99.126	0.126	0.8	0.0	O K
240 min Summer	99.108	0.108	0.6	0.0	O K
360 min Summer	99.086	0.086	0.5	0.0	O K
480 min Summer	99.072	0.072	0.4	0.0	O K
600 min Summer	99.063	0.063	0.3	0.0	O K
720 min Summer	99.056	0.056	0.3	0.0	O K
960 min Summer	99.048	0.048	0.2	0.0	O K
1440 min Summer	99.041	0.041	0.2	0.0	O K
2160 min Summer	99.035	0.035	0.1	0.0	O K
2880 min Summer	99.031	0.031	0.1	0.0	O K
4320 min Summer	99.027	0.027	0.1	0.0	O K
5760 min Summer	99.024	0.024	0.1	0.0	O K
7200 min Summer	99.021	0.021	0.0	0.0	O K
8640 min Summer	99.020	0.020	0.0	0.0	O K
10080 min Summer	99.019	0.019	0.0	0.0	O K
15 min Winter	99.275	0.275	2.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	10
30 min Summer	107.084	0.0	18
60 min Summer	70.705	0.0	32
120 min Summer	42.286	0.0	62
180 min Summer	31.523	0.0	92
240 min Summer	25.633	0.0	122
360 min Summer	19.132	0.0	180
480 min Summer	15.531	0.0	242
600 min Summer	13.188	0.0	302
720 min Summer	11.523	0.0	366
960 min Summer	9.274	0.0	478
1440 min Summer	6.793	0.0	710
2160 min Summer	4.931	0.0	1068
2880 min Summer	3.916	0.0	1448
4320 min Summer	2.816	0.0	2200
5760 min Summer	2.236	0.0	2864
7200 min Summer	1.880	0.0	3552
8640 min Summer	1.639	0.0	4288
10080 min Summer	1.465	0.0	5056
15 min Winter	155.298	0.0	10

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
30 min Winter	99.234	0.234	1.8	0.0	O K
60 min Winter	99.180	0.180	1.2	0.0	O K
120 min Winter	99.123	0.123	0.7	0.0	O K
180 min Winter	99.098	0.098	0.6	0.0	O K
240 min Winter	99.083	0.083	0.5	0.0	O K
360 min Winter	99.065	0.065	0.3	0.0	O K
480 min Winter	99.054	0.054	0.3	0.0	O K
600 min Winter	99.049	0.049	0.2	0.0	O K
720 min Winter	99.046	0.046	0.2	0.0	O K
960 min Winter	99.041	0.041	0.2	0.0	O K
1440 min Winter	99.035	0.035	0.1	0.0	O K
2160 min Winter	99.030	0.030	0.1	0.0	O K
2880 min Winter	99.026	0.026	0.1	0.0	O K
4320 min Winter	99.023	0.023	0.1	0.0	O K
5760 min Winter	99.021	0.021	0.0	0.0	O K
7200 min Winter	99.018	0.018	0.0	0.0	O K
8640 min Winter	99.018	0.018	0.0	0.0	O K
10080 min Winter	99.016	0.016	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Time-Peak (mins)
30 min Winter	107.084	0.0	18
60 min Winter	70.705	0.0	32
120 min Winter	42.286	0.0	62
180 min Winter	31.523	0.0	92
240 min Winter	25.633	0.0	124
360 min Winter	19.132	0.0	184
480 min Winter	15.531	0.0	240
600 min Winter	13.188	0.0	298
720 min Winter	11.523	0.0	362
960 min Winter	9.274	0.0	470
1440 min Winter	6.793	0.0	722
2160 min Winter	4.931	0.0	1032
2880 min Winter	3.916	0.0	1464
4320 min Winter	2.816	0.0	2220
5760 min Winter	2.236	0.0	2840
7200 min Winter	1.880	0.0	3808
8640 min Winter	1.639	0.0	4616
10080 min Winter	1.465	0.0	5216

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.003

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.003

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Trench Structure

Infiltration Coefficient Base (m/hr)	8.67000	Trench Width (m)	0.3
Infiltration Coefficient Side (m/hr)	8.67000	Trench Length (m)	10.0
Safety Factor	3.0	Slope (1:X)	17.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	99.000	Cap Infiltration Depth (m)	0.000

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 29 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.758	0.758	20.1	43.2	O K
30 min Summer	98.902	0.902	21.2	51.4	O K
60 min Summer	98.967	0.967	21.7	55.1	O K
120 min Summer	98.846	0.846	20.8	48.2	O K
180 min Summer	98.737	0.737	20.0	42.0	O K
240 min Summer	98.638	0.638	19.2	36.3	O K
360 min Summer	98.465	0.465	17.9	26.5	O K
480 min Summer	98.328	0.328	16.9	18.7	O K
600 min Summer	98.222	0.222	16.1	12.6	O K
720 min Summer	98.142	0.142	15.5	8.1	O K
960 min Summer	98.054	0.054	14.9	3.1	O K
1440 min Summer	98.038	0.038	11.2	2.1	O K
2160 min Summer	98.027	0.027	8.1	1.6	O K
2880 min Summer	98.022	0.022	6.4	1.2	O K
4320 min Summer	98.016	0.016	4.7	0.9	O K
5760 min Summer	98.013	0.013	3.8	0.7	O K
7200 min Summer	98.011	0.011	3.2	0.6	O K
8640 min Summer	98.009	0.009	2.7	0.5	O K
10080 min Summer	98.008	0.008	2.4	0.5	O K
15 min Winter	98.873	0.873	21.0	49.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	16
30 min Summer	107.084	0.0	26
60 min Summer	70.705	0.0	44
120 min Summer	42.286	0.0	78
180 min Summer	31.523	0.0	110
240 min Summer	25.633	0.0	144
360 min Summer	19.132	0.0	206
480 min Summer	15.531	0.0	266
600 min Summer	13.188	0.0	326
720 min Summer	11.523	0.0	382
960 min Summer	9.274	0.0	490
1440 min Summer	6.793	0.0	734
2160 min Summer	4.931	0.0	1092
2880 min Summer	3.916	0.0	1448
4320 min Summer	2.816	0.0	2196
5760 min Summer	2.236	0.0	2880
7200 min Summer	1.880	0.0	3608
8640 min Summer	1.639	0.0	4336
10080 min Summer	1.465	0.0	5032
15 min Winter	155.298	0.0	16

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.048	1.048	22.3	59.7	O K
60 min Winter	99.113	1.113	22.8	63.4	O K
120 min Winter	98.922	0.922	21.3	52.5	O K
180 min Winter	98.751	0.751	20.1	42.8	O K
240 min Winter	98.600	0.600	18.9	34.2	O K
360 min Winter	98.356	0.356	17.1	20.3	O K
480 min Winter	98.179	0.179	15.8	10.2	O K
600 min Winter	98.066	0.066	14.9	3.8	O K
720 min Winter	98.046	0.046	13.6	2.6	O K
960 min Winter	98.037	0.037	11.0	2.1	O K
1440 min Winter	98.027	0.027	8.1	1.5	O K
2160 min Winter	98.020	0.020	5.9	1.1	O K
2880 min Winter	98.016	0.016	4.7	0.9	O K
4320 min Winter	98.011	0.011	3.3	0.6	O K
5760 min Winter	98.009	0.009	2.7	0.5	O K
7200 min Winter	98.008	0.008	2.3	0.4	O K
8640 min Winter	98.007	0.007	2.0	0.4	O K
10080 min Winter	98.006	0.006	1.9	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	28
60 min Winter	70.705	0.0	46
120 min Winter	42.286	0.0	84
180 min Winter	31.523	0.0	118
240 min Winter	25.633	0.0	152
360 min Winter	19.132	0.0	214
480 min Winter	15.531	0.0	272
600 min Winter	13.188	0.0	320
720 min Winter	11.523	0.0	368
960 min Winter	9.274	0.0	488
1440 min Winter	6.793	0.0	734
2160 min Winter	4.931	0.0	1092
2880 min Winter	3.916	0.0	1460
4320 min Winter	2.816	0.0	2156
5760 min Winter	2.236	0.0	2816
7200 min Winter	1.880	0.0	3632
8640 min Winter	1.639	0.0	4320
10080 min Winter	1.465	0.0	4944

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.200

Time (mins) From:	To:	Area (ha)
0	4	0.200

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	1.300	0.0	97.2
1.200	60.0	97.2			

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 21 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.556	0.556	15.3	25.3	O K
30 min Summer	98.649	0.649	15.9	29.6	O K
60 min Summer	98.681	0.681	16.2	31.0	O K
120 min Summer	98.563	0.563	15.4	25.7	O K
180 min Summer	98.462	0.462	14.7	21.1	O K
240 min Summer	98.374	0.374	14.1	17.0	O K
360 min Summer	98.234	0.234	13.1	10.7	O K
480 min Summer	98.137	0.137	12.5	6.2	O K
600 min Summer	98.076	0.076	12.1	3.5	O K
720 min Summer	98.049	0.049	11.7	2.2	O K
960 min Summer	98.040	0.040	9.5	1.8	O K
1440 min Summer	98.029	0.029	7.0	1.3	O K
2160 min Summer	98.021	0.021	5.1	1.0	O K
2880 min Summer	98.017	0.017	4.1	0.8	O K
4320 min Summer	98.012	0.012	2.9	0.6	O K
5760 min Summer	98.010	0.010	2.3	0.5	O K
7200 min Summer	98.008	0.008	2.0	0.4	O K
8640 min Summer	98.007	0.007	1.7	0.3	O K
10080 min Summer	98.007	0.007	1.6	0.3	O K
15 min Winter	98.641	0.641	15.9	29.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	15
30 min Summer	107.084	0.0	24
60 min Summer	70.705	0.0	42
120 min Summer	42.286	0.0	76
180 min Summer	31.523	0.0	108
240 min Summer	25.633	0.0	140
360 min Summer	19.132	0.0	200
480 min Summer	15.531	0.0	258
600 min Summer	13.188	0.0	312
720 min Summer	11.523	0.0	366
960 min Summer	9.274	0.0	488
1440 min Summer	6.793	0.0	724
2160 min Summer	4.931	0.0	1084
2880 min Summer	3.916	0.0	1432
4320 min Summer	2.816	0.0	2132
5760 min Summer	2.236	0.0	2928
7200 min Summer	1.880	0.0	3592
8640 min Summer	1.639	0.0	4336
10080 min Summer	1.465	0.0	4960
15 min Winter	155.298	0.0	16

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	98.752	0.752	16.6	34.3	O K
60 min Winter	98.771	0.771	16.8	35.2	O K
120 min Winter	98.586	0.586	15.5	26.7	O K
180 min Winter	98.432	0.432	14.5	19.7	O K
240 min Winter	98.305	0.305	13.6	13.9	O K
360 min Winter	98.121	0.121	12.4	5.5	O K
480 min Winter	98.048	0.048	11.5	2.2	O K
600 min Winter	98.041	0.041	9.7	1.9	O K
720 min Winter	98.036	0.036	8.5	1.6	O K
960 min Winter	98.029	0.029	6.8	1.3	O K
1440 min Winter	98.021	0.021	5.1	1.0	O K
2160 min Winter	98.015	0.015	3.6	0.7	O K
2880 min Winter	98.012	0.012	2.9	0.6	O K
4320 min Winter	98.009	0.009	2.1	0.4	O K
5760 min Winter	98.007	0.007	1.7	0.3	O K
7200 min Winter	98.006	0.006	1.5	0.3	O K
8640 min Winter	98.005	0.005	1.2	0.2	O K
10080 min Winter	98.005	0.005	1.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	26
60 min Winter	70.705	0.0	46
120 min Winter	42.286	0.0	82
180 min Winter	31.523	0.0	114
240 min Winter	25.633	0.0	146
360 min Winter	19.132	0.0	202
480 min Winter	15.531	0.0	244
600 min Winter	13.188	0.0	306
720 min Winter	11.523	0.0	360
960 min Winter	9.274	0.0	474
1440 min Winter	6.793	0.0	714
2160 min Winter	4.931	0.0	1100
2880 min Winter	3.916	0.0	1468
4320 min Winter	2.816	0.0	2176
5760 min Winter	2.236	0.0	2872
7200 min Winter	1.880	0.0	3568
8640 min Winter	1.639	0.0	4480
10080 min Winter	1.465	0.0	5024

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.125

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.125

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	Area (m^2)	Inf. Area (m^2)	Depth (m)	Area (m^2)	Inf. Area (m^2)
0.000	48.0	48.0	0.900	0.0	70.4
0.800	48.0	70.4			

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 28 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.781	0.781	16.8	35.6	O K
30 min Summer	98.929	0.929	17.8	42.4	O K
60 min Summer	98.995	0.995	18.3	45.4	O K
120 min Summer	98.872	0.872	17.4	39.7	O K
180 min Summer	98.762	0.762	16.7	34.7	O K
240 min Summer	98.661	0.661	16.0	30.1	O K
360 min Summer	98.487	0.487	14.8	22.2	O K
480 min Summer	98.349	0.349	13.9	15.9	O K
600 min Summer	98.242	0.242	13.2	11.0	O K
720 min Summer	98.159	0.159	12.6	7.2	O K
960 min Summer	98.062	0.062	12.0	2.8	O K
1440 min Summer	98.039	0.039	9.2	1.8	O K
2160 min Summer	98.028	0.028	6.7	1.3	O K
2880 min Summer	98.022	0.022	5.3	1.0	O K
4320 min Summer	98.016	0.016	3.9	0.7	O K
5760 min Summer	98.013	0.013	3.0	0.6	O K
7200 min Summer	98.011	0.011	2.6	0.5	O K
8640 min Summer	98.010	0.010	2.3	0.4	O K
10080 min Summer	98.009	0.009	2.1	0.4	O K
15 min Winter	98.899	0.899	17.6	41.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	16
30 min Summer	107.084	0.0	26
60 min Summer	70.705	0.0	44
120 min Summer	42.286	0.0	78
180 min Summer	31.523	0.0	110
240 min Summer	25.633	0.0	144
360 min Summer	19.132	0.0	206
480 min Summer	15.531	0.0	266
600 min Summer	13.188	0.0	326
720 min Summer	11.523	0.0	382
960 min Summer	9.274	0.0	492
1440 min Summer	6.793	0.0	722
2160 min Summer	4.931	0.0	1096
2880 min Summer	3.916	0.0	1448
4320 min Summer	2.816	0.0	2136
5760 min Summer	2.236	0.0	2928
7200 min Summer	1.880	0.0	3568
8640 min Summer	1.639	0.0	4352
10080 min Summer	1.465	0.0	5080
15 min Winter	155.298	0.0	16

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.078	1.078	18.8	49.1	O K
60 min Winter	99.144	1.144	19.3	52.2	O K
120 min Winter	98.947	0.947	17.9	43.2	O K
180 min Winter	98.775	0.775	16.8	35.3	O K
240 min Winter	98.624	0.624	15.8	28.4	O K
360 min Winter	98.380	0.380	14.1	17.3	O K
480 min Winter	98.201	0.201	12.9	9.2	O K
600 min Winter	98.081	0.081	12.1	3.7	O K
720 min Winter	98.047	0.047	11.2	2.1	O K
960 min Winter	98.038	0.038	9.1	1.7	O K
1440 min Winter	98.028	0.028	6.6	1.3	O K
2160 min Winter	98.020	0.020	4.8	0.9	O K
2880 min Winter	98.016	0.016	3.9	0.7	O K
4320 min Winter	98.012	0.012	2.8	0.5	O K
5760 min Winter	98.009	0.009	2.2	0.4	O K
7200 min Winter	98.008	0.008	1.8	0.4	O K
8640 min Winter	98.007	0.007	1.6	0.3	O K
10080 min Winter	98.006	0.006	1.5	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	27
60 min Winter	70.705	0.0	46
120 min Winter	42.286	0.0	84
180 min Winter	31.523	0.0	118
240 min Winter	25.633	0.0	152
360 min Winter	19.132	0.0	214
480 min Winter	15.531	0.0	274
600 min Winter	13.188	0.0	324
720 min Winter	11.523	0.0	362
960 min Winter	9.274	0.0	488
1440 min Winter	6.793	0.0	734
2160 min Winter	4.931	0.0	1076
2880 min Winter	3.916	0.0	1464
4320 min Winter	2.816	0.0	2180
5760 min Winter	2.236	0.0	2872
7200 min Winter	1.880	0.0	3616
8640 min Winter	1.639	0.0	4328
10080 min Winter	1.465	0.0	4784

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.165

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.165

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	48.0	48.0	1.300	0.0	81.6
1.200	48.0	81.6			

Summary of Results for 100 year Return Period (+50%)

Half Drain Time : 27 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	98.771	0.771	15.6	32.2	O K
30 min Summer	98.916	0.916	16.6	38.3	O K
60 min Summer	98.979	0.979	17.0	40.9	O K
120 min Summer	98.854	0.854	16.2	35.7	O K
180 min Summer	98.745	0.745	15.4	31.1	O K
240 min Summer	98.644	0.644	14.8	26.9	O K
360 min Summer	98.472	0.472	13.7	19.7	O K
480 min Summer	98.337	0.337	12.8	14.1	O K
600 min Summer	98.231	0.231	12.1	9.7	O K
720 min Summer	98.151	0.151	11.6	6.3	O K
960 min Summer	98.059	0.059	11.0	2.5	O K
1440 min Summer	98.038	0.038	8.4	1.6	O K
2160 min Summer	98.028	0.028	6.1	1.2	O K
2880 min Summer	98.022	0.022	4.9	0.9	O K
4320 min Summer	98.016	0.016	3.5	0.7	O K
5760 min Summer	98.013	0.013	2.8	0.5	O K
7200 min Summer	98.011	0.011	2.3	0.5	O K
8640 min Summer	98.009	0.009	2.0	0.4	O K
10080 min Summer	98.009	0.009	1.9	0.4	O K
15 min Winter	98.887	0.887	16.4	37.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	155.298	0.0	16
30 min Summer	107.084	0.0	25
60 min Summer	70.705	0.0	42
120 min Summer	42.286	0.0	78
180 min Summer	31.523	0.0	110
240 min Summer	25.633	0.0	144
360 min Summer	19.132	0.0	206
480 min Summer	15.531	0.0	266
600 min Summer	13.188	0.0	324
720 min Summer	11.523	0.0	382
960 min Summer	9.274	0.0	492
1440 min Summer	6.793	0.0	734
2160 min Summer	4.931	0.0	1100
2880 min Summer	3.916	0.0	1432
4320 min Summer	2.816	0.0	2168
5760 min Summer	2.236	0.0	2896
7200 min Summer	1.880	0.0	3632
8640 min Summer	1.639	0.0	4320
10080 min Summer	1.465	0.0	5008
15 min Winter	155.298	0.0	16

Summary of Results for 100 year Return Period (+50%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.061	1.061	17.5	44.4	O K
60 min Winter	99.124	1.124	17.9	47.0	O K
120 min Winter	98.925	0.925	16.6	38.7	O K
180 min Winter	98.753	0.753	15.5	31.5	O K
240 min Winter	98.604	0.604	14.5	25.2	O K
360 min Winter	98.364	0.364	13.0	15.2	O K
480 min Winter	98.190	0.190	11.8	7.9	O K
600 min Winter	98.075	0.075	11.1	3.1	O K
720 min Winter	98.047	0.047	10.2	2.0	O K
960 min Winter	98.038	0.038	8.2	1.6	O K
1440 min Winter	98.028	0.028	6.1	1.2	O K
2160 min Winter	98.020	0.020	4.4	0.8	O K
2880 min Winter	98.016	0.016	3.5	0.7	O K
4320 min Winter	98.012	0.012	2.6	0.5	O K
5760 min Winter	98.009	0.009	2.0	0.4	O K
7200 min Winter	98.008	0.008	1.7	0.3	O K
8640 min Winter	98.007	0.007	1.5	0.3	O K
10080 min Winter	98.006	0.006	1.4	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	107.084	0.0	27
60 min Winter	70.705	0.0	46
120 min Winter	42.286	0.0	82
180 min Winter	31.523	0.0	118
240 min Winter	25.633	0.0	152
360 min Winter	19.132	0.0	214
480 min Winter	15.531	0.0	272
600 min Winter	13.188	0.0	322
720 min Winter	11.523	0.0	360
960 min Winter	9.274	0.0	484
1440 min Winter	6.793	0.0	730
2160 min Winter	4.931	0.0	1088
2880 min Winter	3.916	0.0	1420
4320 min Winter	2.816	0.0	2244
5760 min Winter	2.236	0.0	2896
7200 min Winter	1.880	0.0	3656
8640 min Winter	1.639	0.0	4264
10080 min Winter	1.465	0.0	5000

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 189875 67794 SW 89875 67794
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+50

Time Area Diagram

Total Area (ha) 0.150

Time From:	(mins) To:	Area (ha)
0	4	0.150

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 8.67000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 8.67000

Depth (m)	Area (m^2)	Inf. Area (m^2)	Depth (m)	Area (m^2)	Inf. Area (m^2)
0.000	44.0	44.0	1.300	0.0	76.4
1.200	44.0	76.4			

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