PROPOSED DEMOLITION OF AN EXISTING HOUSE/ OUTBUILDINGS AND THE CONSTRUCTION OF A REPLACEMNET DWELLING/ OUTBUILDING WITH ASSOCIATED EXTERNAL WORKS AT MERRIFIELD, TRUNGLE, PAUL, PENZANCE, TR19 6UF.

FLOOD RISK ASSESSMENT

J-3307-Rev.01

Engineering & Development Solutions

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FLOOD RISK ASSESSMENT

Report No.	Issue Detail	Originator	Date	Checked by	Date
J-3307	01	SM	19/01/2024	AW	19/01/2024

For: Ms. L. Wagstaff
Merrifield
Trungle
Paul
Penzance
Cornwall
TR19 6UF

Job No: J-3307
Date: January 2024
Edition: 01

CONTENTS

APPENDICES

1.0 INTRODUCTION

Ms. L. Wagstaff is proposing the demolition of an existing house/ outbuildings with the construction of a replacement house/ outbuildings and associated external works at the following address: Merrifield, Trungle, Paul, Penzance, TR19 6UF.

The site is shown to be situated partly in Flood Zone 3. Part of the unnamed access track leading onto Fore Sreet is located within this flood zone, according to the Flood Maps for Planning published by GOV.UK and the Environment Agency's Interactive Flood Map. As the site location is shown to be within/close to an area at high risk to flooding, Cornwall Council require the planning application for the development to be accompanied by a Flood Risk Assessment (FRA).

To this end, Ms. L. Wagstaff has commissioned Engineering and Development Solutions Ltd. (EDS) to undertake a Flood Risk Assessment for the development. This report presents the findings of the FRA. It is prepared in line with the National Planning Policy (NPPF), the Planning Practice Guidance (PPG) and Drainage Guidance for Cornwall (DGfC) and as such may be used to support development. The primary aim of the FRA will be to investigate the extent of the floodplain on the site and access for a range of return period events and flood scenarios. This should allow any vulnerable development to be located in areas which are not at risk of flooding.

The site is located in Trungle, Paul, near Penzance, as seen in **Figures 1** and **Figure 2** below. The site can be accessed via an unamed track that leads east onto Fore Street.

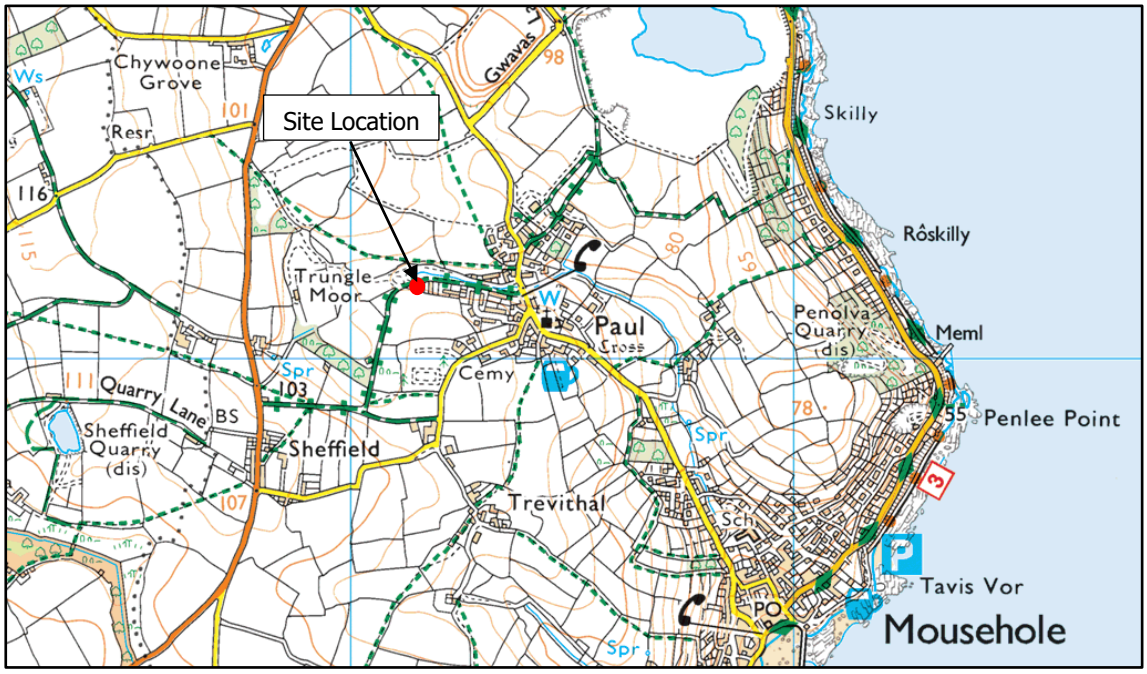


Figure 1 - Site Location and Wider Geographic Area

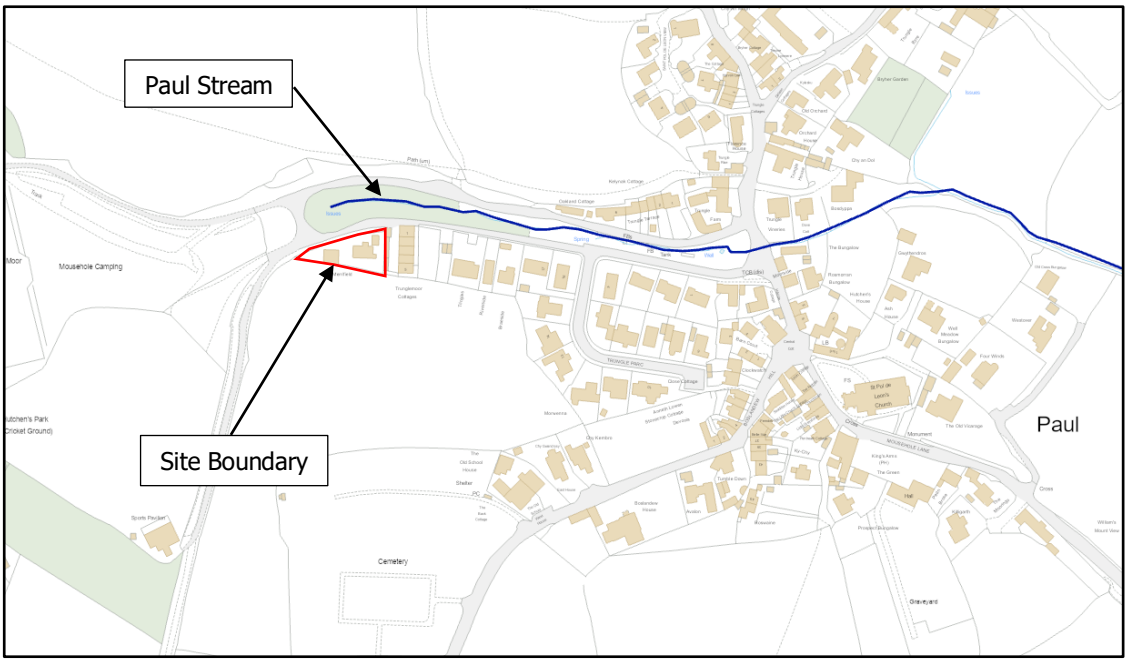


Figure 2 - Site Location

- **Site Description**

The proposed development is located at the following approximate ordnance survey grid reference: SW 46139 27164. The unnamed access track leads east into the village of Paul and onto Fore Street, this road continues south along Mousehole Lane towards the village of Mousehole or north to the B3315 and into the village of Newlyn.

Directly east of the proposed development site is predominantly residential properties, with the west of the site dominated by Mousehole Camping grounds, Paul Cricket Club and Mousehole AFC approximately 45m west of the site. To the north and south of the site, the land is mainly agricultural farmland.

Approximately 15m north of the sites entrance, is the Paul Stream. This water course continues downstream where the stream confluences with the Tumble Tyn Stream before out falling at the coast in Mousehole Harbour.

A topographic survey of the site and the access road has been undertaken, this can be seen in **Appendix A.** With reference to this survey and proposed layout designs for the location, the land generally falls in a south to north direction, towards the Paul Stream. The proposed dwelling will have a Finished Floor Level (FFL) of 84.50m AOD and the outbuilding will have an FFL of 85.00m AOD. The sites entrance will also be retained, with the entrance set at a minimum elevation of 84.47m AOD.

- **Existing Usage**

The site is currently a residential dwelling with several outbuildings located along an unnamed access track leading into the village centre.

- **Proposed Usage**

The development proposal is to demolish the existing buildings on site and reconstruct the residential property and the outbuilding. Existing access to be retained, as seen on development proposal located in **Appendix A**.

2.0 FLOOD MECHANISMS

Analysis of the Environment Agency indicative flood map shows that a small part of the site is shown to be located in Flood Zone 3, according to the Flood Maps for Planning published by GOV.UK, see **Figure 3** below. As such, an FRA is required to inform the development.

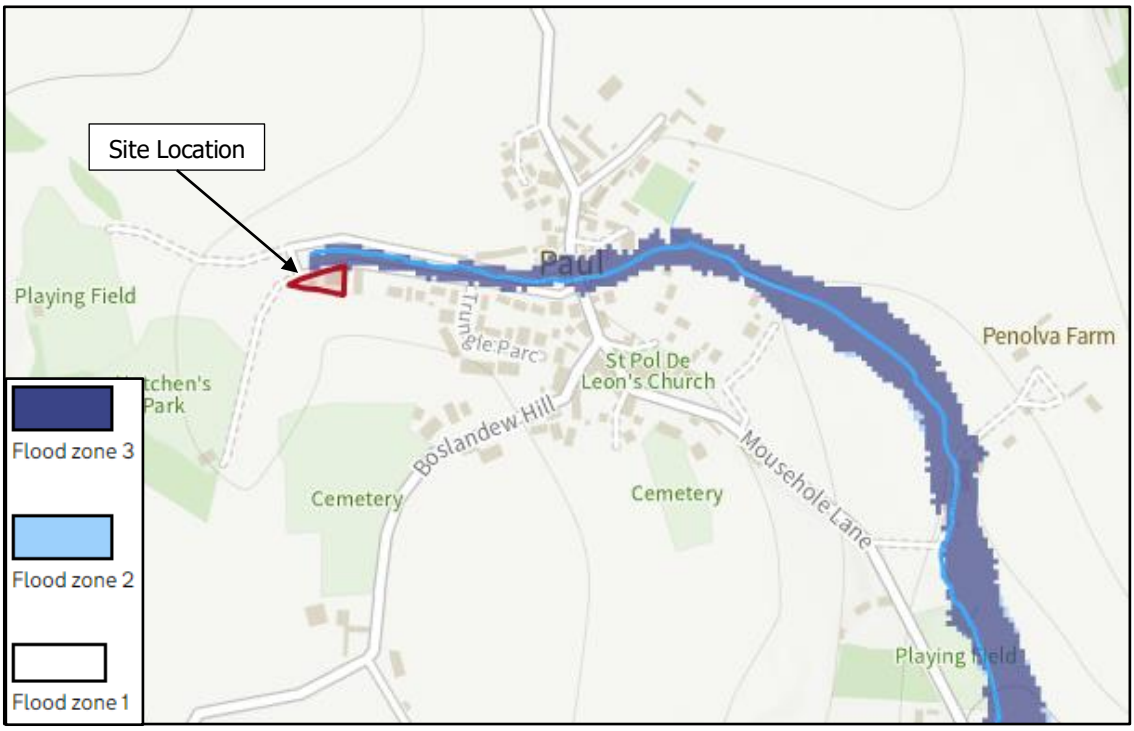


Figure 3 - Extract From GOV.UK Flood Map for Planing, Showing Flood Zones

Several possible flooding mechanisms have been considered at the site and are discussed below.

- **Groundwater Flooding**

Groundwater flooding is linked to the presence of aquifers and the ability of the underlying geological strata to bear water. Flooding occurs when water levels in the ground rise above surface elevations. The Cornwall Council Strategic Flood Risk Assessment (SFRA) highlights the geology of Cornwall only as minor aquifers and generally does not experience much groundwater flooding.

In addition, the nearby watercourses would act as sumps for local groundwater, suppressing the local phreatic level to the approximate level of the water elevation in the watercourse. In the unlikely event that groundwater did issue to the surface, the general ground profile slopes in a direction towards the watercourse. As such groundwater would be able to flow away off site towards the watercourse at a shallow depth. As such, the risk of groundwater flooding at the site is assessed to be low and is not considered further in this report.

- **Tidal Flooding**

The FFL of the existing building is well above any areas of tidal influence, located at a minimum elevation of 83.94m AOD. Given the nature of the site and the surrounding topography, tidal flooding is not considered further within this report.

- **Overland Sheet Flow**

The Cornwall Council Strategic Flood Risk Assessment (SFRA) map extract below, **Figure 4** highlights that the site is at low risk of surface water flooding, with the main site entrance at a higher risk of flooding than the buildings on site. However, the site is still at low risk of flooding, based on the 1 in 1000-year event.

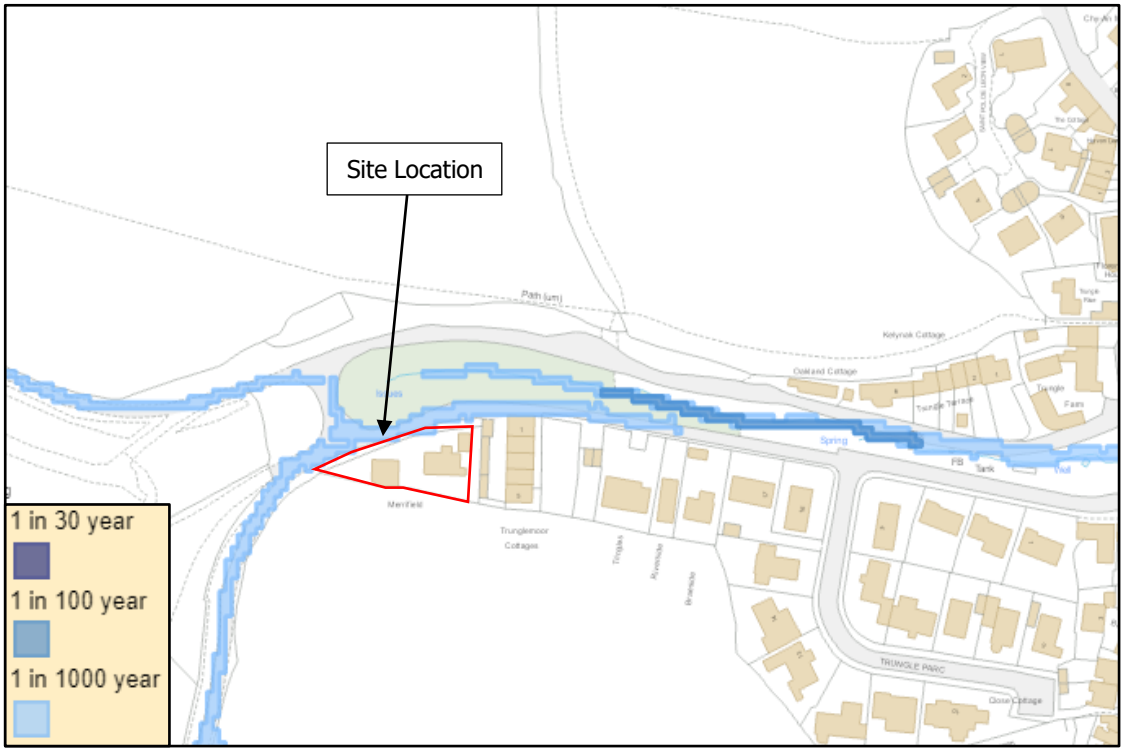


Figure 4 – Cornwall Council SFRA Map Extract from Surface Water Flooding

Th SFRA map above suggests that flows generated upstream of the site are collected along the unnamed track for the Mousehole Cricket club and Mousehole Campsite. The above figure also indicates that within the development boundary, the site is at very low risk of surface water flooding. There is limited potential for significant overland flows to develop from the fields upstream of the site, as rainfall would infiltrate into the ground or be intercepted by field boundaries. Additionally, the flow route portrayed in the figure above, follows a similar route to the fluvial situation presented in **Figure 3** above.

Despite this, the fluvial flooding situation is still more onerous than the surface water, therefore consideration of flood risks represented by the fluvial case should largely cover the flood risk arising from surface water sources. This is considered further in the fluvial risk section below and in greater detail in **Section 3.0** and **4.0**. Mitigation measures are presented in **Section 5.0** of this report to address potential surface water flooding.

- **Flooding from Reservoirs, Canals, and other Artificial Sources**

With reference to 1:25000 Ordnance Survey mapping and EA mapping, there appear to be no impounded waterbodies within the vicinity of the site. Therefore, flooding from these sources can be discounted. The only waterbodies in close proximity to the site is the Paul Stream that runs adjacent to the site.

- **Fluvial (River) Flooding**

The Environment Agency's indicative flood mapping (**Figure 3**) shows that the very north eastern corner of the site is located in Flood Zone 3. As such, fluvial flooding has been investigated in further detail in **Sections 3.0 & 4.0** of this report. Additionally, an EA Product 4 Information Request has also been obtained for this study and can be seen in greater detail in **Appendix C**.

The information from the EA provides modelled flood levels for a series of nodes along the Paul Stream. The node positions in the vicinity of the site can be seen in **Figure 5** below.

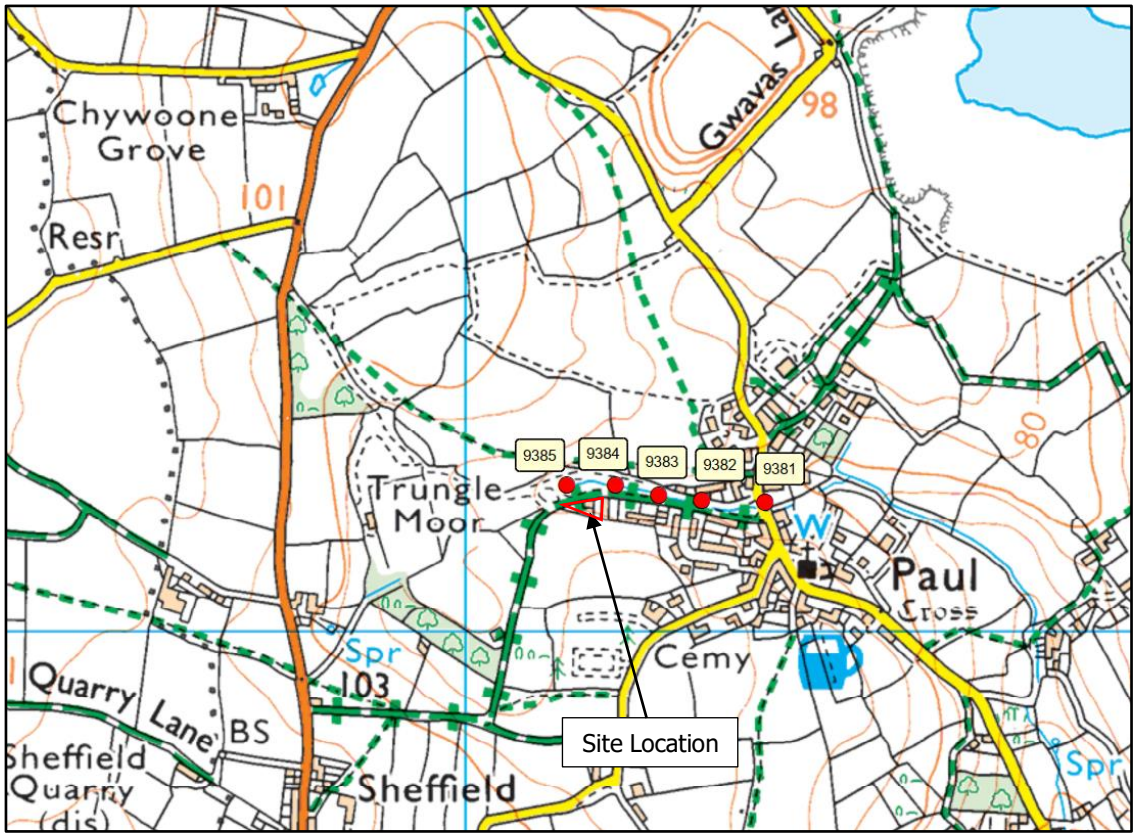


Figure 5 – Plan showing EA Model Node Points

The flood information above gives model levels for a series of nodes along the watercourse. The site is located between two separate node points, **Table 1** below highlights the node points which are located closest to the site.

Flood Event	Node Ref	
	9385	**9384**
1 in 100 Year	84.50m AOD	84.07m AOD
1 in 1000 Year	84.51m AOD	83.57m AOD

Table 1 – Summary of Modelled Flood Levels (m AOD)

No data has been provided by the EA for the 1 in 100-year flood level with an allowance for climate change, therefore the 1 in 1000-year fluvial level has been taken as an equivalent.

The site is located between these two node points, as such flood levels have been interpolated below, the two nodes are approximately 46.87m apart. The interpolated modelled flood levels are seen in **Table 2** below:

Flood Event	Interpolated Level
1 in 100 Year	84.07m AOD
1 in 1000 Year	83.57m AOD

Table 2 – Interpolated Flood Levels Based on EA Data

The interpolated flood levels have been based entirely on the EA data provided as part of the Product 4 Information obtained for this study, this can be seen in further detail in **Appendix C**. The table above indicates that the 1 in 100-year event is higher than the 1 in 1000-year event. This is due to an error in the original data provided from the EA as part of the Information request. As such, the higher value has been used as a conservative approach to assess flood levels.

The development proposal is to demolish and construct a new residential dwelling and outbuilding, with the FFL of the new dwelling set at an elevation of 84.50m AOD and the outbuilding proposed at 85.00m AOD.

Based on the above levels, the proposed development is above the flood levels for the in 1 in 100-year event. During this event, the flood is predicted to be 84.07m AOD, resulting in a 0.43m freeboard between the proposed dwelling and the flood level. Additionally, the outbuilding will have a freeboard of 0.93m.

As the Jflow data provided by the EA has found to be uncertain, a basic HEC-RAS fluvial flood model has been undertaken to support the data provided by the EA in **Appendix C**. This is investigated in more detail in **Section 3.0** of this report.

- **Flooding as a Result of Development**

The development of the site will alter the nature of the surface permeability of the site. The development of the area will create impermeable areas through the implementation of paved areas where there are currently greenfield permeable areas. Therefore, the rate at which water runs of these areas could increase. Provided a suitable surface water drainage system installed as part of the development, then there is the capacity to manage surface water originating from the development and thus flood risk to third parties would not increase.

- **Historic Flooding**

The EA Product 4 Information Request located in **Appendix C** did not mention any periods of historic flooding at the site, only in the wider geographic area. Additionally, analysis of the DEFRA Historic Flood Map showed that there were no recorded periods of flooding at the site location, as seen in **Figure 6** below.

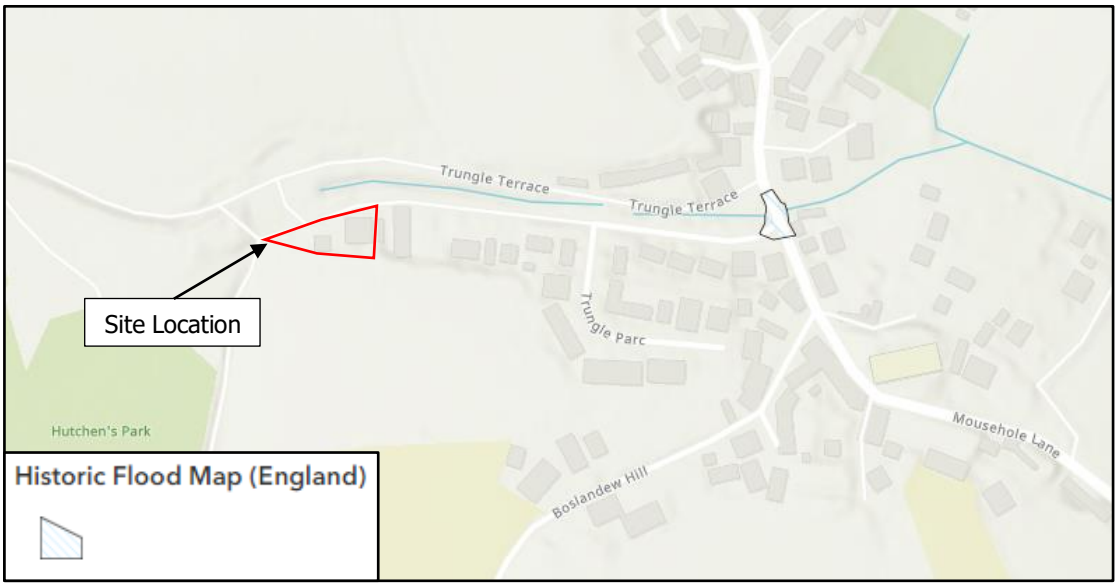


Figure 6 – GOV.UK Historical Flood Map

3.0 FLOOD FLOW ESTIMATION

Analysis of the Environment Agency's Indicative Flood Map (**Figure 3**) highlights that part of the site's location appears to be located in Flood Zone 3, indicating a high probability of fluvial flooding (1 in 100 or greater annual probability of river flooding). JFlow data has been provided from the EA as part of a Product 4 Information Request, a specific flood model of the site is more accurate than relying on JFlow data to assess the flood risk of a potential development. As such, fluvial flooding is investigated in more detail below.

- **Catchment**

The catchment at this site encompasses an area of 0.5km² according to the Flood Estimation Handbook (FEH) catchment descriptors. An extract of the catchment area is shown below in **Figure 7**. The majority of the catchment is open farmland.

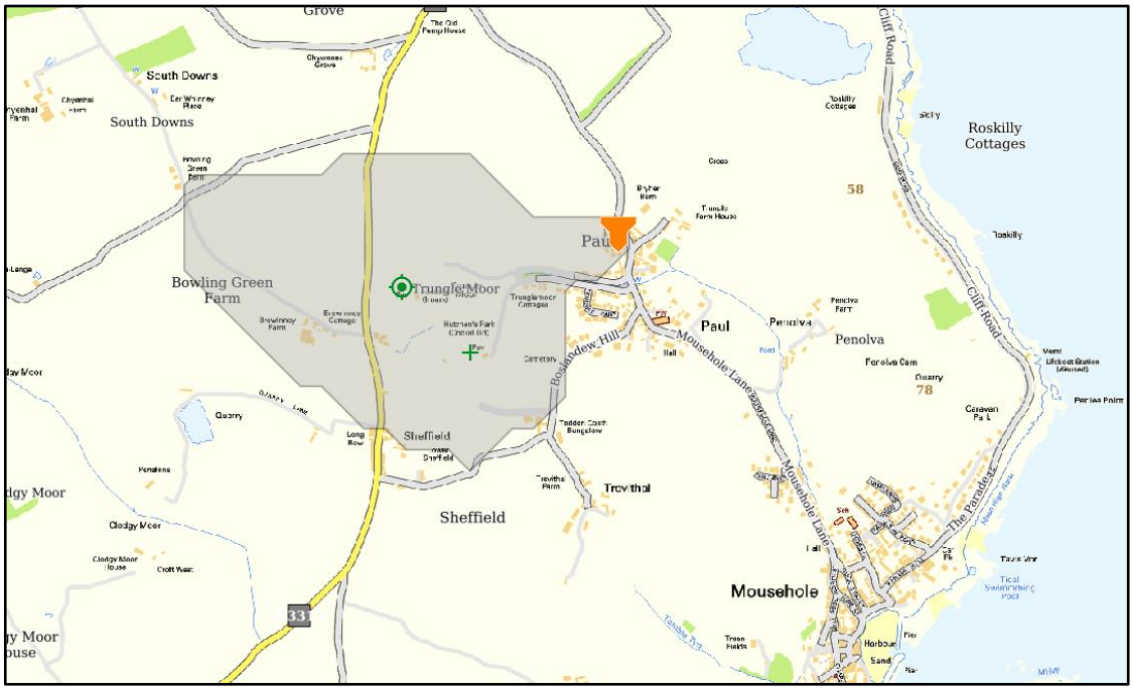


Figure 7 - Catchment Boundary

- **Methodology**

An overview of the methods used to assess the extent and depth of potential fluvial flooding at the site is outlined below:

1. Estimation of peak flows for the Paul Stream for the 30-year, 100-year, 100-year including climate change allowances, and 1000-year return periods.

2. Build a HEC-RAS model of the site and surrounding area using topographic survey and LIDAR data.

3. Run HEC-RAS model for each of the return period scenarios.

4. Compare model outputs against site information and discuss implications.

Flood flow estimates have been derived for a variety of return period events. The catchment descriptors for the site were obtained from the FEH (Flood Estimation Handbook) web service.

Two methods have been used to estimate peak flows within the stream at the subject site. These are the Revitalised Rainfall-Runoff Model Version 2 (ReFH2) and the FEH Statistical Method implemented in WINFAP 5 software. The suitability of using each method has then been assessed prior to use in the flood model.

Revitalised Rainfall Runoff Method

The Revitalised Rainfall-Runoff Model Version 2 (ReFH2) has been used to determine flood flows using the software created by the Centre for Ecology & Hydrology (CEH) and catchment descriptors only. The ReFH2 method is the most up-to-date method and is currently one of the industry standards recognised by the EA.

A time step of 15 minutes and duration of 2 hours and 15 minutes has been used for calculating the design rainfall for the river as recommended in the ReFH2 software. **Table 1** below shows the calculated ReFH2 flows for various return period events. Full details of the flow calculations are included in **Appendix B**.

FEH Statistical

In applying the Statistical Method, a pooling group was generated for the catchment at the site, as the watercourse is ungauged. A cumulative record of more than 500 years was selected for hydraulically similar gauged catchments. The record of pooling groups is included in **Appendix B**.

The Generalised Logistic distribution was selected to form the growth curve for the site; furthermore, FEH indicates that it usually provides the best fit to extreme floods.

As no suitable gauged donor sites were found to be appropriate for QMED estimation, QMED was derived from catchment descriptors only. This resulted in the following flow estimates in **Table 2** below.

Return Period (Year)	Peak Flow (m^3/s)	
	ReFH2	FEH
30	0.69	0.66
100	0.96	0.90
100 + CC*	1.57	1.37
1,000	1.83	1.61

* CC denotes climate change allowance – 100-year peak flow increased by 52%

Table 2 – Flow Estimates

- **Climate Change**

An allowance for climate change over the lifetime of the site should be made (100-year for residential use). Information on climate change allowances has been outlined by the EA in the guidance entitled 'Flood Risk Assessments: Climate Change Allowances.' on the GOV.UK website. This specifies the Central Allowance should be used for a 'More Vulnerable' development such as this. When referring to the 'Peak River Flow Map' on the DEFRA website the uplift for Climate Change is 52% for the Central Allowance. In accordance with the

Environment Agency guidance, the 52% climate change allowance has been considered within the modelling exercises.

- **Summary**

The predicted flows have been calculated using the ReFH2 Method and the FEH Statistical Method. The flows calculated were higher using the ReFH2 Statistical Method, as such these flows have been used in the modelling as a conservative approach.

Full details of the flow calculations are included in **Appendix B**.

4.0 HEC-RAS HYDRAULIC MODELLING

Basic steady state flood modelling of the on-site watercourse has been carried out to assess the extent of the flood zones on the site, using HEC-RAS Version 6.4.1 developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Centre. The modelling has been carried out in order to assess the likely extents, depths, and velocities of flood water within the site.

- **HEC-RAS Data Inputs**

The model has been created using the topographic survey. LIDAR data has been used to supplement the surveyed information for the land surrounding the site location. A total of 3 no. cross sections were entered in the model.

The flood flow estimates defined in **Section 3.0** of this report were entered in the model at the upstream Cross Section Number 3. This included Flow Boundary Conditions for the Paul Stream. These were estimated using the typical gradient of the watercourse taken from the combined topographic survey and LIDAR data for the most upstream and downstream cross sections across the site.

Geometric data has also been considered using the worst-case scenario Manning's n values of heavy vegetation cover within the channel and un-kept floodplain areas. These values were taken from the HEC-RAS manual. This has been included in the model to represent the channel restrictions.

The HEC-RAS files for this project are available upon request to EDS.

- **Modelling Assumptions & Methodology**

The aim of this modelling study is to seek a quantifiable demonstration of the flood risk at the subject site and access. Rather than providing outputs for all return periods this modelling study focuses principally upon the 1 in 30-year, 1 in 100-year flood event including a 52% allowance for climate change and the 1 in 1,000-year flood event. Therefore, flood zone extents will be indicative of Flood Zones 2 and 3 as defined in the Planning Practice Guidance (PPG).

Flood levels, depths and velocities for each cross section have also been extracted directly from the model.

- **Modelling Results**

A summary of the flood levels for the site is presented below in **Table 3** for the main cross sections across the site. The full set of HEC-RAS results, can be found in **Appendix B**. The table below lists the estimated flood levels at each section. Flow velocities calculated by the HEC-RAS model have also been listed.

Cross Section	Return Period (year)	Water Level (m)	Channel Velocity (m/s)
3	30	83.20	1.55
3	100	83.27	1.70
3	100+CC (52%)	83.39	1.92
3	1000	83.49	2.00
2	30	82.74	2.28
2	100	82.78	2.49
2	100+CC (52%)	82.86	2.83
2	1000	82.88	2.94
1	30	82.57	1.50
1	100	82.63	1.59
1	100+CC (52%)	82.74	1.75
1	1000	82.78	1.80

Table 3 – Summary of HEC-RAS Results

The topographic survey and the development proposal for the site is located in **Appendix A**. **Figure 8** below indicates the site boundary and the location of all cross sections. The figure highlights that Cross Section 3 is the furthest upstream on the modelled drawing with Cross Section 2 running directly through the existing building and where the proposed reconstruction is planned.

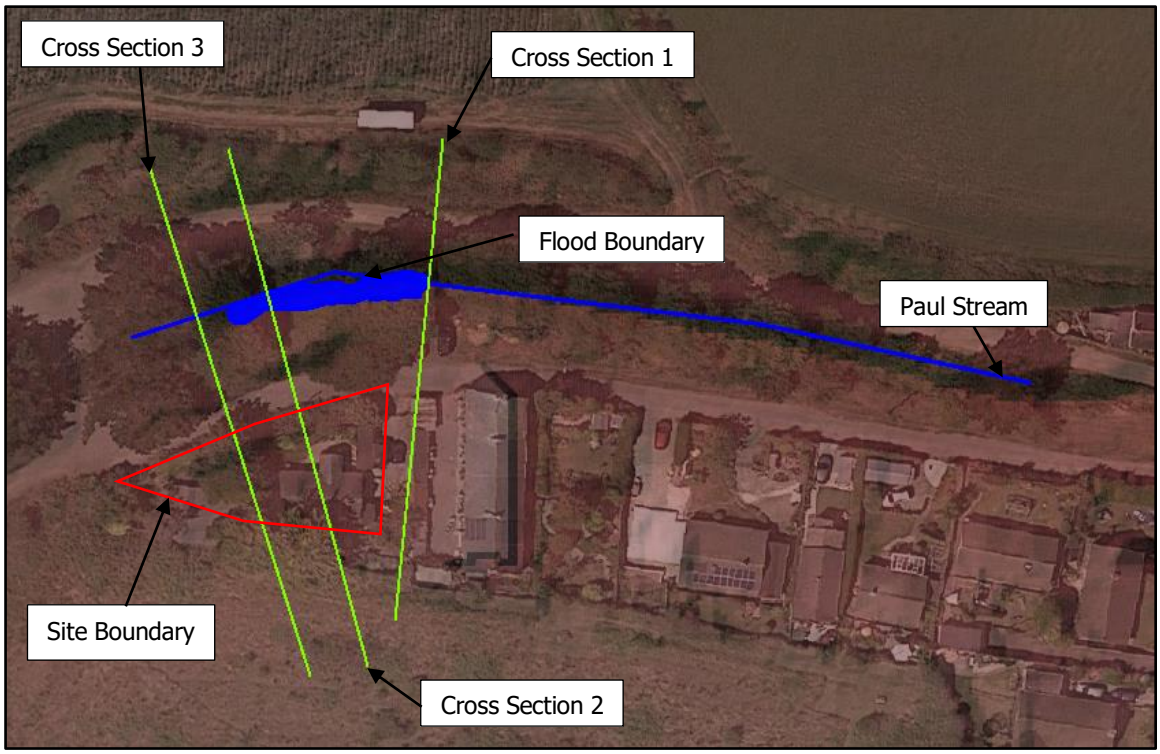


Figure 8 - Modelled Cross Sections and Site Location

Looking at **Figure 8** above, the proposed development at Merrifield, Trungle is not located in the Flood Zone as previously thought. The proposed FFL for the new dwelling is set at 84.50m AOD and the proposed FFL for the new studio is 85.00m AOD.

Based on the most upstream cross section, cross section 3, the predicted 1 in 100-year fluvial flood event is predicted to be 83.27m AOD, rising to 83.39m AOD with an allowance for climate change. The proposed reconstruction of the studio is 1.61m above the predicted flood level with an allowance for climate change.

Cross Section 2 runs through the existing residential dwelling on site. This is also the location of the proposed reconstruction. **Figure 9** below indicates Cross Section 2 and the location of the predicted building in relation to the Paul Stream. The present day 1 in 100-year fluvial flood event is predicted to flood up to 82.78m AOD, with a increase to 82.86m AOD with a 52% allowance for climate change based on the lifetime of the development.

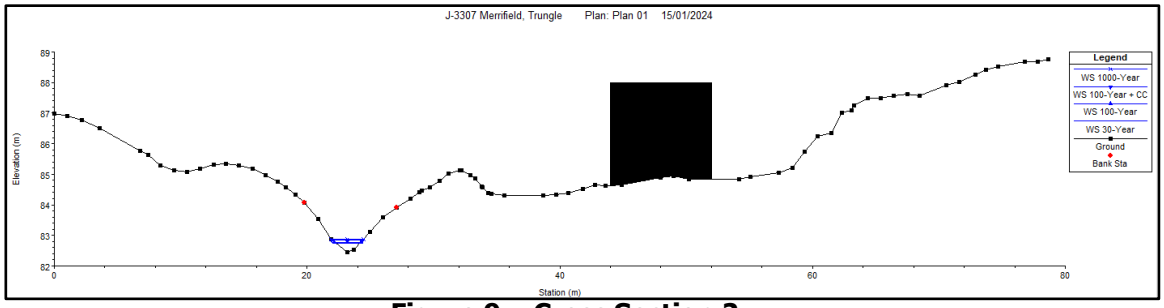


Figure 9 – Cross Section 2

The site slopes in a general south to north direction and based on the levels above the FFL of the proposed building (84.50m AOD) is 1.72m above the 1 in 100-year storm, decreasing to 1.64m with an allowance for climate change. As such, the proposed development is above the levels of the flood zone. Additionally, the proposed parking area is also set at an elevation of 84.50m AOD and is also above the flood zone based on the flood levels of cross section 2.

- **Sensitivity Analysis**

A sensitivity analysis has been undertaken for the site. The Manning 'n' values have been increased globally across the model by 0.01. This generally results in an increase in flood levels of around 0.2 – 0.01m across the model. A freeboard allowance of 600mm applied to the fluvial flood levels will account for any model sensitivity. Based on the HEC-RAS model alone, the proposed development is a minimum of 1.61m above the flood levels, therefore an increase in flood levels would not result in a change to the flood zone classification of the site.

- **Flood Summary**

The flood model indicates that in extreme fluvial flood events the channel capacity of the Paul Stream is not exceeded. The existing building and parking on site that is proposed for development is elevated such that it is above all predicted fluvial flood levels. A set of the full summary table is located in **Appendix B**.

5.0 MITIGATION MEASURES

The proposed development site has now been shown to be located in Flood Zone 1 with a minimum of 1.61m freeboard above the modelled flood levels, based on HEC-RAS alone. The following mitigation measures are recommended for the proposed development.

- No built development should be located within any of the areas susceptible to flooding, based on the predicted flood levels as displayed in **Appendix B**.

- It is recommended that finished floor levels for the development are set at a level no lower than 83.99m AOD. As taken from Cross Section 3 or as high as practically possible, based on the 1 in 100-year event + 52% climate change + 600mm freeboard.

- Any new electrical circuitry and apparatus should be installed at or higher than 83.99m AOD, (1 in 100-year + CC + 600mm) or as high as reasonably practicable. Alternatively, ground based electrical circuitry should be designed to withstand flooding.

  Further advice on flood resilient construction is available at Improving Flood Resilience of New Buildings which is available at:
  https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings

- Residents of the site should sign up to the Environment Agency's flood alert system for this area. This will ensure warning of a possible flood event provided to site occupants and allow adequate time to prepare for flooding in the area.

- The following actions are typically recommended for the site at each stage of notification:

FLOOD ALERT

Flooding is possible.
Be prepared.
- Staff to monitor flood warnings and advice issued by the Environment Agency, Council, the emergency services, and News channels.
- Prepare to implement Flood Warning and Evacuation Plan

FLOOD WARNING

Flooding is expected.
Immediate action required.
- Signage deployed on site to inform users that 'flooding is expected' or 'area closed'
- Continue to monitor flood warnings and advice
- Contact users already on the site via social media, web page, direct contact (if users have registered their contact details)
- Suitably trained designated staff member(s) deployed to supervise closure of main site access

SEVERE FLOOD WARNING

Severe flooding.
Danger to life.
- Access to the site via the main entrance will remain closed until the storm has subsided
- Return to site only when advised to do so by Emergency Services

6.0 ACCESS/EGRESS

The entire site has been found to be dry, safe and free from flooding in all considered flood events. This includes the sites entrance which has also been shown to be located in Flood Zone 1. There is only one means of access and egress onto the site, as seen on **Figure 10** below.

The sites entrance is accessed via an unnamed track that joins onto Fore Street, as indicated in **Figure 10** below. The sites entrance is set at a varied elevation, between 84.47m AOD to 83.94m AOD.

Based on the 1 in 100-year flood event at cross section 2 which is located at the sites entrance, this area of the site is predicted to flood up to 82.78m AOD and rising to 82.86m AOD with an allowance for climate change. The site entrance is 1.16m above the present day 1 in the 100-year storm and 1.08m with an allowance for climate change. Additionally, the elevations of the sites entrance is above the predicted flood levels at the upstream cross section 3. And as such, the sites access can be confirmed to be located in Flood Zone 1.

It is advised that persons or vehicles do not attempt to move through flood water unless necessary no matter what the flooding scenario. Persons and vehicles should avoid moving through the flood water.

The proposed access/egress route to be used is suggested below in **Figure 10** and is located in Flood Zone 1. Given the above, it is fair to conclude that access to and from the site is safe for all considered events. Any development proposals should seek the proposed access point that has direct access onto Fore Street. The figure also indicates a series of public Rights of Way and Byways which are also located in Flood Zone 1.

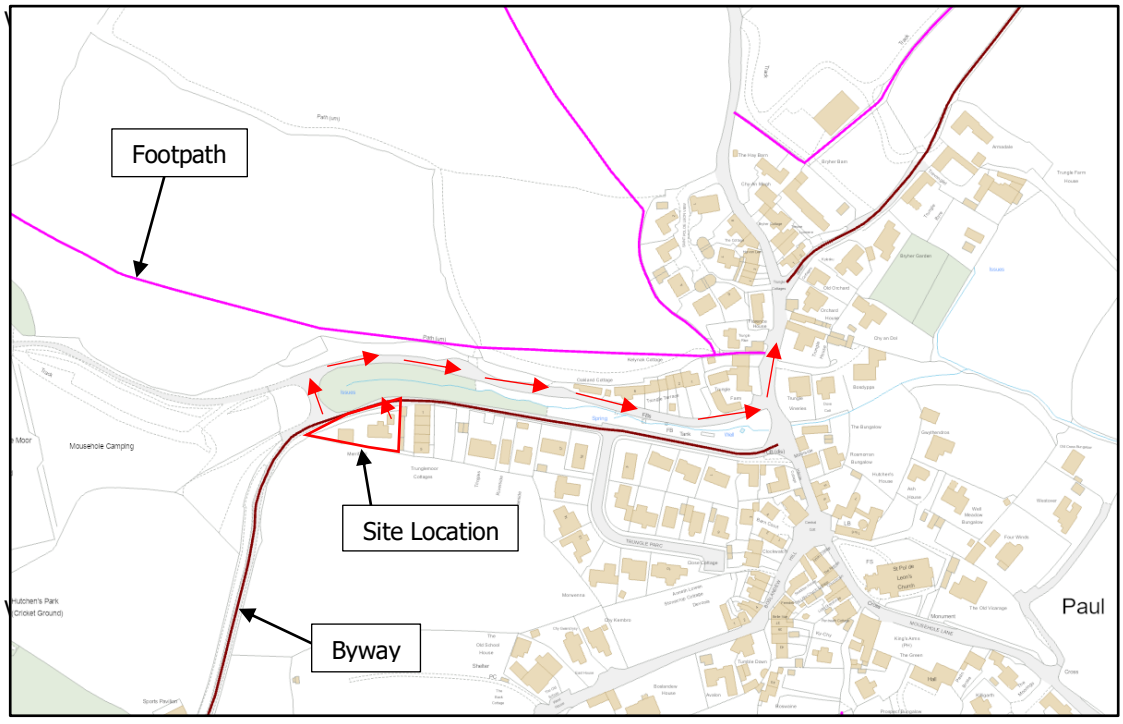


Figure 10 – Proposed Vehicle and Pedestrian Access Route

7.0 FLOOD RISK POLICY

Based on the findings of this study, the site is located in Flood Zone 1 (low risk) due to the site elevations located above the predicted flood levels.

Residential dwellings are considered to be '*More Vulnerable*' under '*Buildings used for dwelling houses*' according to the Planning Practice Guidance (PPG).

Referring to **Table 3** of PPG shown in **Figure 14** below, the proposed development is deemed to be appropriate on a flood risk basis.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

Figure 14 – Extract from PPG -Table 3 Flood risk vulnerability and flood zone 'compatibility'

Additionally, the proposed development meets the requirements of NPPF Paragraph 163:

a) *Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location:*

The proposed development is located outside of the flood zone and is entirely in Flood Zone 1. Additionally, the access and egress to the site is located in Flood Zone 1.

b) *The development is appropriately flood resilient and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment:*

Mitigation measures have been proposed in **Section 5.0** of this report. The proposed FFL of the dwelling is situated at a minimum level of 1.61m above the predicted flood events, including an allowance for climate change over the lifetime of the development.

c) *It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate:*

It is recommended that the impermeable areas created by the development should be drained via an appropriate SuDS system to ensure flood risk to properties downstream is not increased.

d) *Any residual risks can be managed safely:*

Residual risks are managed by mitigation measures as outlined in **Section 5.0** of this report.

e) *Safe access and escape routes are included where appropriate, as part of an agreed emergency plan:*

Safe pedestrian access and egress routes are located entirely within Flood Zone 1 and are available in more detail in **Section 6.0** of this report.

8.0 SUMMARY

This study has investigated flood mechanisms for the proposed development at Merrifield, Trungle, Paul, Penzance, TR19 6UF. Given the sites proximity to the Paul Stream, detailed investigations into fluvial flood risks have been undertaken.

A HEC-RAS model has been constructed with a view to quantifying the risk of fluvial flooding to the site and access route.

Flood flow estimates have been undertaken for the 30yr, 100yr, 100yr + 52% CC and 1000yr events using FEH flow data; the estimated flows are outlined in **Section 3.0**. The full set of HEC-RAS results from the model can be seen in **Appendix B** highlighting the flood levels and water velocities of the channel.

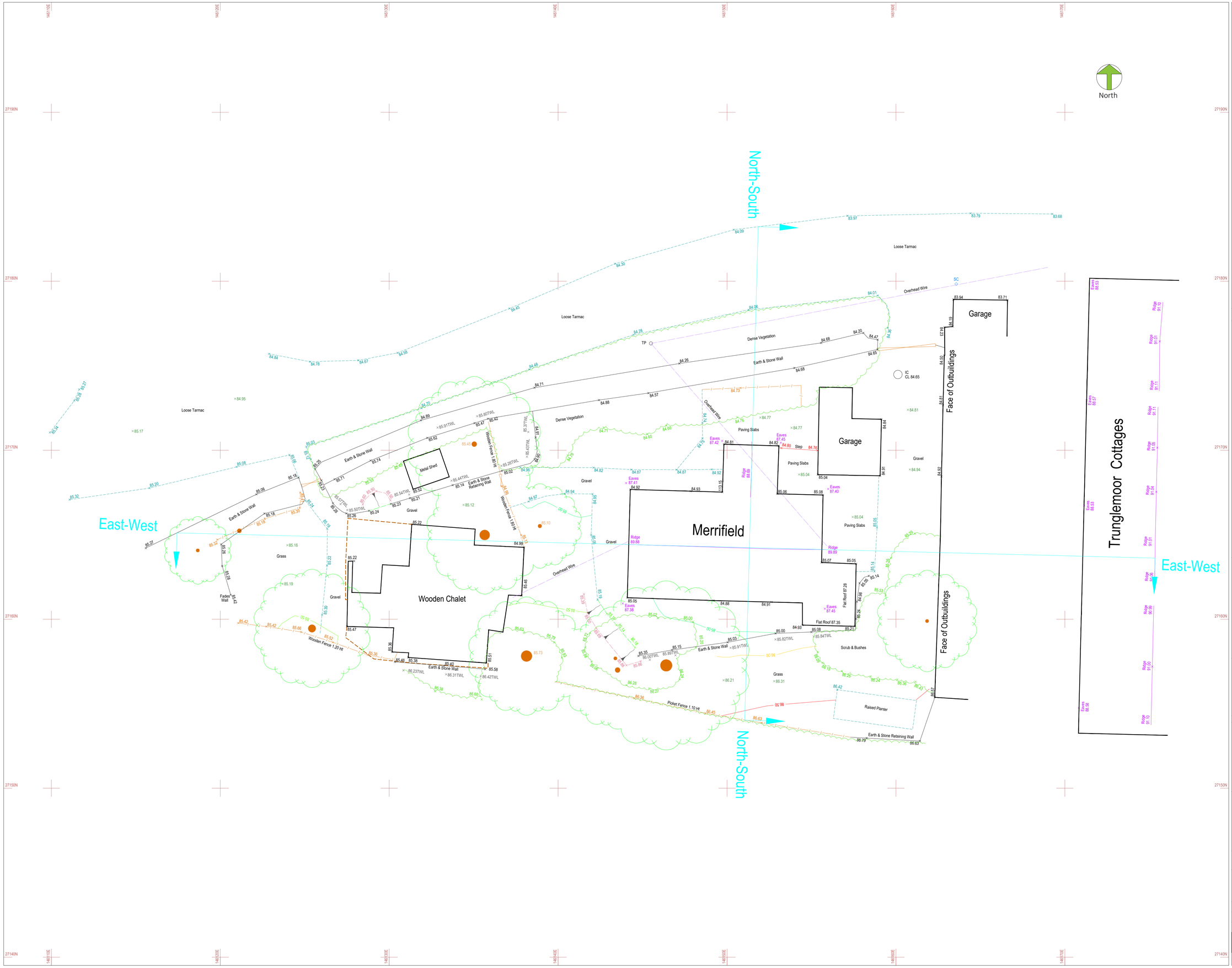
During all extreme fluvial flood events the channel capacity is not exceeded, at present and including climate change, the area of predicted fluvial flooding does not extend to the development site where the development is proposed.

It is proposed that the occupants of the site should connect to the EA flood alert system for the area, which would inform users of any flooding in the wider area.

Access to the site is clear, safe, and free from flooding. As such, residents have direct access to and from the site via a route that is free from flooding.

Considering the flood modelling undertaken as part of this study, the development site can be concluded as being situated within Flood Zone 1. NPPF states that '*More Vulnerable uses of land are appropriate in this zone'* from a flooding perspective. Consequently, with regard to flood risk, the proposed development is entirely appropriate in this zone, in line with advice given in NPPF.

APPENDIX A TOPOGRAPHIC SURVEY



LEGEND

UTILITY LINETYPES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating Pipes	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown	U
Electric	E	Unknown Cable	UC
Fire Hydrant Main	FH	Unknown Pipeline	UP
Fibre Optic	FO	Water	W
Fuel	FUEL		

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above): ASR — XXX — ASR — XXX — ASR — XXX

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern	AOC	Unable to Lift (cover)	UTL
Contracted Survey Area	SV-AREA	Unable to Trace	UTC
Previous Survey Area	PREVIOUS	Unable to Trace (due to blockage)	UTBD
Depth to Top of Service (metres)	(D.804)	Unable to Trace Further	UTeu
		End of Trace	UTeu

ABREVIATIONS used on a PAS 128 Survey

(D.804 837) 0.804 = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)	Barrier	Post	PO
Bielsha Beacon	BB	Rain Water Pipe	RWP
Bollard	B	Road Sign	RS
Borehole		Rodding Eye	RE
British Telecoms IC	BT IC	Sign Post	SP
Building (incomplete detail)		Spot Light	SL
Cable into Ground		Spot Height	50.00
Cable TV Box	CTV	Stop Cock	SC
CCTV Camera		Stop Valve	SV
Cover Level in metres	CL 50.00	Survey Station	
Direction of Flow (Drainage)		Telephone Pole	TP
Distribution Board	DB	Traffic Light	
Earth Rod	ER	Tree	
Electric Cabinet	EC		
Electric Pole	EP	Unknown Valve	UV
Electric Sign		Vent Pipe	VP
Embankment		Wall	
Feeder Pillar	FP	Waste Pipe	WP
Fire Hydrant	FH	Water Meter	WM
Flag Pole	FP	Water Valve	Water
Flood Light	FL		
Gas Valve	GV		
Gate			
Ground Level in metres	GL 50.00		
Gulley	GV		
Inspection Cover	IC	Building Canopy	
Invert Level in metres	⌀ 50.00	Crash Barrier	
Junction Box - BT	JB BT	Drainage Channel	50.00
Junction Box - Comms	JB COM	Drop Kerb (level in metres)	49.95
Junction Box - Elec	JB Elec	Edge Detail (level in metres)	50.00
Lamp Post	LP	Footpath (level in metres)	50.00
Light Bollard	LB	Fence	50.00
Light In-ground	ILUG	Heras Fence	HERAS
Manhole	MH	Kerb channel (level in metres)	50.00
Manhole Capped Port		Kerb top (level in metres)	50.00
Pipe Diameter in millimetres	1200	Overhead Service Line	
Pipe into Ground		Pedestrian Railing	

Sheet 01

SHEET LAYOUT

Notes:

Survey is referenced to OS Grid and Level Datum.

Rev	Description	Drwn/Chk	Date

Survey Dimensions Ltd
Measured surveys of land and buildings
01726 390 010
+44 (0) 7970 205 932
+44 (0) 7970 205 935
info@SurveyDimensions.co.uk
www.SurveyDimensions.co.uk

Project Title:
Merrifield
Trungle
Paul
Penzance
TR19 6UF

Client:
Roderick James Architects LLP

Drawing Title:
Topographical Survey

Scale:	1 : 100 @ A1	Drawn:	MWS
Date:	03-08-2023	Checked:	KC
Drawing Status:	SURVEY	Surveyor:	KC

Project Ref.	Dwg No.	Rev.
230626	01	

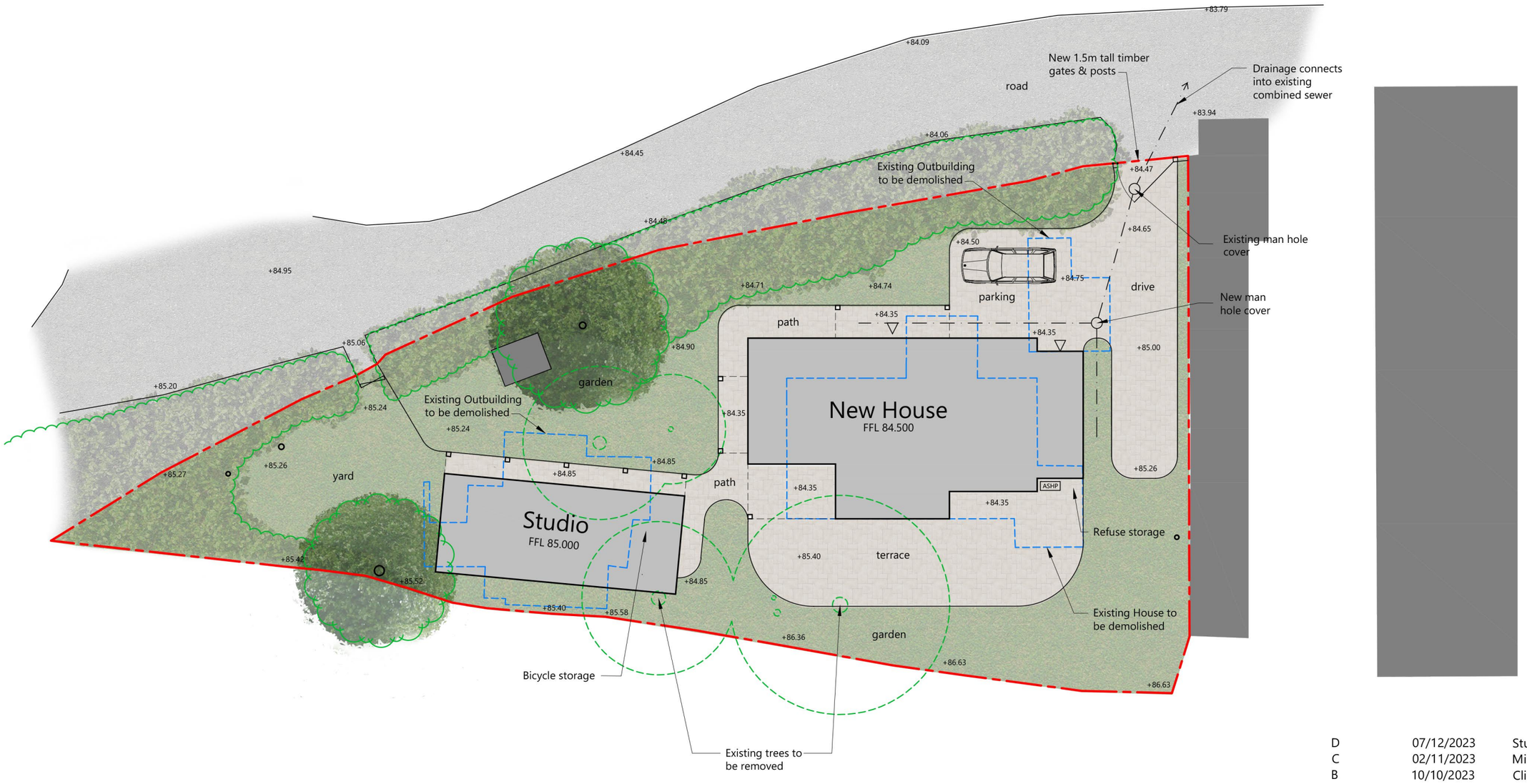
M 0 1 2 3 4 5 6 7 8

Ft 0 2 4 6 8 10 20 28

1:200

Notes:

1. These drawings are the copyright property of Roderick James Architects LLP.
2. This document should only be used for the purpose indicated by the drawing status below.



revision	date	details
D	07/12/2023	Studio amended
C	02/11/2023	Minor amendments
B	10/10/2023	Client amendments
A	04/09/2023	Client amendments

drawing status

PLANNING

Site Plan 1:200

North

Roderick James Architects LLP

DEVON - WILTSHIRE - SCOTLAND

tel: 01803 868 000 email: enquiries@rjarchitects.co.uk www.roderickjamesarchitects.co.uk

project: Proposed Replacement House, Merrifield, Trungle, Paul, Penzance, TR19 6UF		drawing: Proposed Site Plan	
client: L. Wagstaff & D. Dean		drawing number: WAGSTAFF/1/PL01	revision: D
scale: 1:200	date: Aug'23		

APPENDIX B CALCULATIONS AND SUMMARY TABLES

UK Design Flood Estimation

Generated on Monday, January 15, 2024 2:47:22 PM by EmmaBoulton
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

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

Site details Checksum: 7D96-1AC7

Site name: FEH_Catchment_Descriptors_146350_27250_v5_0_1

Easting: 146350

Northing: 27250

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.5

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 2013 model (mm):	46.01	Total runoff (ML):	5.13
Total Rainfall (mm):	32.37	Total flow (ML):	14.89
Peak Rainfall (mm):	8.80	Peak flow (m³/s):	0.69

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 - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.72	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	95.35	No
Cmax (mm)	361.6	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.16	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.49	No
BR	2.24	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.02	No
Urbext 2000	0.02	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

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	0.925	0.000	0.251	0.000	0.021	0.021
00:15:00	1.736	0.000	0.479	0.002	0.021	0.023
00:30:00	3.228	0.000	0.912	0.011	0.021	0.032
00:45:00	5.896	0.000	1.740	0.032	0.021	0.053
01:00:00	8.805	0.000	2.776	0.076	0.022	0.098
01:15:00	5.896	0.000	1.977	0.159	0.024	0.183
01:30:00	3.228	0.000	1.123	0.277	0.028	0.305
01:45:00	1.736	0.000	0.616	0.408	0.034	0.442
02:00:00	0.925	0.000	0.332	0.527	0.043	0.570
02:15:00	0.000	0.000	0.000	0.607	0.054	0.661
02:30:00	0.000	0.000	0.000	0.621	0.066	0.687
02:45:00	0.000	0.000	0.000	0.582	0.078	0.660
03:00:00	0.000	0.000	0.000	0.515	0.088	0.603
03:15:00	0.000	0.000	0.000	0.435	0.097	0.532
03:30:00	0.000	0.000	0.000	0.358	0.105	0.462
03:45:00	0.000	0.000	0.000	0.292	0.110	0.402
04:00:00	0.000	0.000	0.000	0.236	0.115	0.351
04:15:00	0.000	0.000	0.000	0.187	0.118	0.305
04:30:00	0.000	0.000	0.000	0.143	0.121	0.263
04:45:00	0.000	0.000	0.000	0.102	0.122	0.224
05:00:00	0.000	0.000	0.000	0.066	0.123	0.188
05:15:00	0.000	0.000	0.000	0.036	0.123	0.159
05:30:00	0.000	0.000	0.000	0.017	0.122	0.139
05:45:00	0.000	0.000	0.000	0.007	0.121	0.128
06:00:00	0.000	0.000	0.000	0.002	0.120	0.122
06:15:00	0.000	0.000	0.000	0.000	0.119	0.119
06:30:00	0.000	0.000	0.000	0.000	0.118	0.118
06:45:00	0.000	0.000	0.000	0.000	0.117	0.117
07:00:00	0.000	0.000	0.000	0.000	0.116	0.116
07:15:00	0.000	0.000	0.000	0.000	0.115	0.115
07:30:00	0.000	0.000	0.000	0.000	0.114	0.114
07:45:00	0.000	0.000	0.000	0.000	0.113	0.113
08:00:00	0.000	0.000	0.000	0.000	0.112	0.112
08:15:00	0.000	0.000	0.000	0.000	0.111	0.111
08:30:00	0.000	0.000	0.000	0.000	0.109	0.109

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)
08:45:00	0.000	0.000	0.000	0.000	0.108	0.108
09:00:00	0.000	0.000	0.000	0.000	0.107	0.107
09:15:00	0.000	0.000	0.000	0.000	0.106	0.106
09:30:00	0.000	0.000	0.000	0.000	0.105	0.105
09:45:00	0.000	0.000	0.000	0.000	0.104	0.104
10:00:00	0.000	0.000	0.000	0.000	0.103	0.103
10:15:00	0.000	0.000	0.000	0.000	0.102	0.102
10:30:00	0.000	0.000	0.000	0.000	0.102	0.102
10:45:00	0.000	0.000	0.000	0.000	0.101	0.101
11:00:00	0.000	0.000	0.000	0.000	0.100	0.100
11:15:00	0.000	0.000	0.000	0.000	0.099	0.099
11:30:00	0.000	0.000	0.000	0.000	0.098	0.098
11:45:00	0.000	0.000	0.000	0.000	0.097	0.097
12:00:00	0.000	0.000	0.000	0.000	0.096	0.096
12:15:00	0.000	0.000	0.000	0.000	0.095	0.095
12:30:00	0.000	0.000	0.000	0.000	0.094	0.094
12:45:00	0.000	0.000	0.000	0.000	0.093	0.093
13:00:00	0.000	0.000	0.000	0.000	0.092	0.092
13:15:00	0.000	0.000	0.000	0.000	0.091	0.091
13:30:00	0.000	0.000	0.000	0.000	0.091	0.091
13:45:00	0.000	0.000	0.000	0.000	0.090	0.090
14:00:00	0.000	0.000	0.000	0.000	0.089	0.089
14:15:00	0.000	0.000	0.000	0.000	0.088	0.088
14:30:00	0.000	0.000	0.000	0.000	0.087	0.087
14:45:00	0.000	0.000	0.000	0.000	0.086	0.086
15:00:00	0.000	0.000	0.000	0.000	0.086	0.086
15:15:00	0.000	0.000	0.000	0.000	0.085	0.085
15:30:00	0.000	0.000	0.000	0.000	0.084	0.084
15:45:00	0.000	0.000	0.000	0.000	0.083	0.083
16:00:00	0.000	0.000	0.000	0.000	0.082	0.082
16:15:00	0.000	0.000	0.000	0.000	0.082	0.082
16:30:00	0.000	0.000	0.000	0.000	0.081	0.081
16:45:00	0.000	0.000	0.000	0.000	0.080	0.080
17:00:00	0.000	0.000	0.000	0.000	0.079	0.079
17:15:00	0.000	0.000	0.000	0.000	0.079	0.079
17:30:00	0.000	0.000	0.000	0.000	0.078	0.078

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)
17:45:00	0.000	0.000	0.000	0.000	0.077	0.077
18:00:00	0.000	0.000	0.000	0.000	0.076	0.076
18:15:00	0.000	0.000	0.000	0.000	0.076	0.076
18:30:00	0.000	0.000	0.000	0.000	0.075	0.075
18:45:00	0.000	0.000	0.000	0.000	0.074	0.074
19:00:00	0.000	0.000	0.000	0.000	0.074	0.074
19:15:00	0.000	0.000	0.000	0.000	0.073	0.073
19:30:00	0.000	0.000	0.000	0.000	0.072	0.072
19:45:00	0.000	0.000	0.000	0.000	0.072	0.072
20:00:00	0.000	0.000	0.000	0.000	0.071	0.071
20:15:00	0.000	0.000	0.000	0.000	0.070	0.070
20:30:00	0.000	0.000	0.000	0.000	0.070	0.070
20:45:00	0.000	0.000	0.000	0.000	0.069	0.069
21:00:00	0.000	0.000	0.000	0.000	0.068	0.068
21:15:00	0.000	0.000	0.000	0.000	0.068	0.068
21:30:00	0.000	0.000	0.000	0.000	0.067	0.067
21:45:00	0.000	0.000	0.000	0.000	0.066	0.066
22:00:00	0.000	0.000	0.000	0.000	0.066	0.066
22:15:00	0.000	0.000	0.000	0.000	0.065	0.065
22:30:00	0.000	0.000	0.000	0.000	0.065	0.065
22:45:00	0.000	0.000	0.000	0.000	0.064	0.064
23:00:00	0.000	0.000	0.000	0.000	0.063	0.063
23:15:00	0.000	0.000	0.000	0.000	0.063	0.063
23:30:00	0.000	0.000	0.000	0.000	0.062	0.062
23:45:00	0.000	0.000	0.000	0.000	0.062	0.062
24:00:00	0.000	0.000	0.000	0.000	0.061	0.061
24:15:00	0.000	0.000	0.000	0.000	0.060	0.060
24:30:00	0.000	0.000	0.000	0.000	0.060	0.060
24:45:00	0.000	0.000	0.000	0.000	0.059	0.059
25:00:00	0.000	0.000	0.000	0.000	0.059	0.059
25:15:00	0.000	0.000	0.000	0.000	0.058	0.058
25:30:00	0.000	0.000	0.000	0.000	0.058	0.058
25:45:00	0.000	0.000	0.000	0.000	0.057	0.057
26:00:00	0.000	0.000	0.000	0.000	0.057	0.057
26:15:00	0.000	0.000	0.000	0.000	0.056	0.056
26:30:00	0.000	0.000	0.000	0.000	0.055	0.055

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)
26:45:00	0.000	0.000	0.000	0.000	0.055	0.055
27:00:00	0.000	0.000	0.000	0.000	0.054	0.054
27:15:00	0.000	0.000	0.000	0.000	0.054	0.054
27:30:00	0.000	0.000	0.000	0.000	0.053	0.053
27:45:00	0.000	0.000	0.000	0.000	0.053	0.053
28:00:00	0.000	0.000	0.000	0.000	0.052	0.052
28:15:00	0.000	0.000	0.000	0.000	0.052	0.052
28:30:00	0.000	0.000	0.000	0.000	0.051	0.051
28:45:00	0.000	0.000	0.000	0.000	0.051	0.051
29:00:00	0.000	0.000	0.000	0.000	0.050	0.050
29:15:00	0.000	0.000	0.000	0.000	0.050	0.050
29:30:00	0.000	0.000	0.000	0.000	0.050	0.050
29:45:00	0.000	0.000	0.000	0.000	0.049	0.049
30:00:00	0.000	0.000	0.000	0.000	0.049	0.049
30:15:00	0.000	0.000	0.000	0.000	0.048	0.048
30:30:00	0.000	0.000	0.000	0.000	0.048	0.048
30:45:00	0.000	0.000	0.000	0.000	0.047	0.047
31:00:00	0.000	0.000	0.000	0.000	0.047	0.047
31:15:00	0.000	0.000	0.000	0.000	0.046	0.046
31:30:00	0.000	0.000	0.000	0.000	0.046	0.046
31:45:00	0.000	0.000	0.000	0.000	0.046	0.046
32:00:00	0.000	0.000	0.000	0.000	0.045	0.045
32:15:00	0.000	0.000	0.000	0.000	0.045	0.045
32:30:00	0.000	0.000	0.000	0.000	0.044	0.044
32:45:00	0.000	0.000	0.000	0.000	0.044	0.044
33:00:00	0.000	0.000	0.000	0.000	0.043	0.043
33:15:00	0.000	0.000	0.000	0.000	0.043	0.043
33:30:00	0.000	0.000	0.000	0.000	0.043	0.043
33:45:00	0.000	0.000	0.000	0.000	0.042	0.042
34:00:00	0.000	0.000	0.000	0.000	0.042	0.042
34:15:00	0.000	0.000	0.000	0.000	0.041	0.041
34:30:00	0.000	0.000	0.000	0.000	0.041	0.041
34:45:00	0.000	0.000	0.000	0.000	0.041	0.041
35:00:00	0.000	0.000	0.000	0.000	0.040	0.040
35:15:00	0.000	0.000	0.000	0.000	0.040	0.040
35:30:00	0.000	0.000	0.000	0.000	0.040	0.040

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)
35:45:00	0.000	0.000	0.000	0.000	0.039	0.039
36:00:00	0.000	0.000	0.000	0.000	0.039	0.039
36:15:00	0.000	0.000	0.000	0.000	0.038	0.038
36:30:00	0.000	0.000	0.000	0.000	0.038	0.038
36:45:00	0.000	0.000	0.000	0.000	0.038	0.038
37:00:00	0.000	0.000	0.000	0.000	0.037	0.037
37:15:00	0.000	0.000	0.000	0.000	0.037	0.037
37:30:00	0.000	0.000	0.000	0.000	0.037	0.037
37:45:00	0.000	0.000	0.000	0.000	0.036	0.036
38:00:00	0.000	0.000	0.000	0.000	0.036	0.036
38:15:00	0.000	0.000	0.000	0.000	0.036	0.036

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km^2)	0.5	No
ALTBAR	101	No
ASPBAR	97	No
ASPVAR	0.63	No
BFIHOST	0.41	No
BFIHOST19	0.47	No
DPLBAR (km)	0.69	No
DPSBAR (mkm^{-1})	47.7	No
FARL	1	No
LDP	1.34	No
PROPWET	0.44	No
RMED1H	10.7	No
RMED1D	35.7	No
RMED2D	45.8	No
SAAR (mm)	1056	No
SAAR4170 (mm)	1092	No
SPRHOST	40.98	No
Urbext2000	0.02	No
Urbext1990	0.03	No
URBCONC	0.67	No
URBLOC	0.15	No
DDF parameter C	-0.03	No
DDF parameter D1	0.43	No
DDF parameter D2	0.33	No
DDF parameter D3	0.4	No
DDF parameter E	0.28	No
DDF parameter F	2.4	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.43	No
DDF parameter D2 (1km grid value)	0.33	No
DDF parameter D3 (1km grid value)	0.4	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.4	No

UK Design Flood Estimation

Generated on Monday, January 15, 2024 2:47:38 PM by EmmaBoulton
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

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

Site details Checksum: 7D96-1AC7

Site name: FEH_Catchment_Descriptors_146350_27250_v5_0_1

Easting: 146350

Northing: 27250

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.5

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 2013 model (mm):	61.83	Total runoff (ML):	7.23
Total Rainfall (mm):	43.51	Total flow (ML):	19.58
Peak Rainfall (mm):	11.83	Peak flow (m³/s):	0.96

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 - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.72	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	95.35	No
Cmax (mm)	361.6	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.16	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.49	No
BR	2.09	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.02	No
Urbext 2000	0.02	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

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	1.243	0.000	0.338	0.000	0.021	0.021
00:15:00	2.333	0.000	0.648	0.003	0.021	0.024
00:30:00	4.338	0.000	1.244	0.015	0.021	0.035
00:45:00	7.924	0.000	2.405	0.043	0.021	0.064
01:00:00	11.834	0.000	3.911	0.104	0.022	0.126
01:15:00	7.924	0.000	2.833	0.218	0.025	0.243
01:30:00	4.338	0.000	1.624	0.383	0.030	0.413
01:45:00	2.333	0.000	0.895	0.567	0.039	0.606
02:00:00	1.243	0.000	0.483	0.737	0.050	0.787
02:15:00	0.000	0.000	0.000	0.852	0.065	0.917
02:30:00	0.000	0.000	0.000	0.876	0.080	0.957
02:45:00	0.000	0.000	0.000	0.824	0.096	0.920
03:00:00	0.000	0.000	0.000	0.730	0.110	0.839
03:15:00	0.000	0.000	0.000	0.618	0.122	0.739
03:30:00	0.000	0.000	0.000	0.508	0.131	0.639
03:45:00	0.000	0.000	0.000	0.415	0.139	0.554
04:00:00	0.000	0.000	0.000	0.336	0.145	0.481
04:15:00	0.000	0.000	0.000	0.266	0.150	0.416
04:30:00	0.000	0.000	0.000	0.203	0.153	0.356
04:45:00	0.000	0.000	0.000	0.146	0.155	0.301
05:00:00	0.000	0.000	0.000	0.094	0.156	0.250
05:15:00	0.000	0.000	0.000	0.052	0.156	0.208
05:30:00	0.000	0.000	0.000	0.025	0.155	0.180
05:45:00	0.000	0.000	0.000	0.010	0.154	0.164
06:00:00	0.000	0.000	0.000	0.003	0.153	0.156
06:15:00	0.000	0.000	0.000	0.000	0.151	0.152
06:30:00	0.000	0.000	0.000	0.000	0.150	0.150
06:45:00	0.000	0.000	0.000	0.000	0.149	0.149
07:00:00	0.000	0.000	0.000	0.000	0.147	0.147
07:15:00	0.000	0.000	0.000	0.000	0.146	0.146
07:30:00	0.000	0.000	0.000	0.000	0.144	0.144
07:45:00	0.000	0.000	0.000	0.000	0.143	0.143
08:00:00	0.000	0.000	0.000	0.000	0.142	0.142
08:15:00	0.000	0.000	0.000	0.000	0.140	0.140
08:30:00	0.000	0.000	0.000	0.000	0.139	0.139

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)
08:45:00	0.000	0.000	0.000	0.000	0.138	0.138
09:00:00	0.000	0.000	0.000	0.000	0.137	0.137
09:15:00	0.000	0.000	0.000	0.000	0.135	0.135
09:30:00	0.000	0.000	0.000	0.000	0.134	0.134
09:45:00	0.000	0.000	0.000	0.000	0.133	0.133
10:00:00	0.000	0.000	0.000	0.000	0.131	0.131
10:15:00	0.000	0.000	0.000	0.000	0.130	0.130
10:30:00	0.000	0.000	0.000	0.000	0.129	0.129
10:45:00	0.000	0.000	0.000	0.000	0.128	0.128
11:00:00	0.000	0.000	0.000	0.000	0.127	0.127
11:15:00	0.000	0.000	0.000	0.000	0.125	0.125
11:30:00	0.000	0.000	0.000	0.000	0.124	0.124
11:45:00	0.000	0.000	0.000	0.000	0.123	0.123
12:00:00	0.000	0.000	0.000	0.000	0.122	0.122
12:15:00	0.000	0.000	0.000	0.000	0.121	0.121
12:30:00	0.000	0.000	0.000	0.000	0.120	0.120
12:45:00	0.000	0.000	0.000	0.000	0.119	0.119
13:00:00	0.000	0.000	0.000	0.000	0.117	0.117
13:15:00	0.000	0.000	0.000	0.000	0.116	0.116
13:30:00	0.000	0.000	0.000	0.000	0.115	0.115
13:45:00	0.000	0.000	0.000	0.000	0.114	0.114
14:00:00	0.000	0.000	0.000	0.000	0.113	0.113
14:15:00	0.000	0.000	0.000	0.000	0.112	0.112
14:30:00	0.000	0.000	0.000	0.000	0.111	0.111
14:45:00	0.000	0.000	0.000	0.000	0.110	0.110
15:00:00	0.000	0.000	0.000	0.000	0.109	0.109
15:15:00	0.000	0.000	0.000	0.000	0.108	0.108
15:30:00	0.000	0.000	0.000	0.000	0.107	0.107
15:45:00	0.000	0.000	0.000	0.000	0.106	0.106
16:00:00	0.000	0.000	0.000	0.000	0.105	0.105
16:15:00	0.000	0.000	0.000	0.000	0.104	0.104
16:30:00	0.000	0.000	0.000	0.000	0.103	0.103
16:45:00	0.000	0.000	0.000	0.000	0.102	0.102
17:00:00	0.000	0.000	0.000	0.000	0.101	0.101
17:15:00	0.000	0.000	0.000	0.000	0.100	0.100
17:30:00	0.000	0.000	0.000	0.000	0.099	0.099

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)
17:45:00	0.000	0.000	0.000	0.000	0.098	0.098
18:00:00	0.000	0.000	0.000	0.000	0.097	0.097
18:15:00	0.000	0.000	0.000	0.000	0.096	0.096
18:30:00	0.000	0.000	0.000	0.000	0.095	0.095
18:45:00	0.000	0.000	0.000	0.000	0.094	0.094
19:00:00	0.000	0.000	0.000	0.000	0.094	0.094
19:15:00	0.000	0.000	0.000	0.000	0.093	0.093
19:30:00	0.000	0.000	0.000	0.000	0.092	0.092
19:45:00	0.000	0.000	0.000	0.000	0.091	0.091
20:00:00	0.000	0.000	0.000	0.000	0.090	0.090
20:15:00	0.000	0.000	0.000	0.000	0.089	0.089
20:30:00	0.000	0.000	0.000	0.000	0.088	0.088
20:45:00	0.000	0.000	0.000	0.000	0.088	0.088
21:00:00	0.000	0.000	0.000	0.000	0.087	0.087
21:15:00	0.000	0.000	0.000	0.000	0.086	0.086
21:30:00	0.000	0.000	0.000	0.000	0.085	0.085
21:45:00	0.000	0.000	0.000	0.000	0.084	0.084
22:00:00	0.000	0.000	0.000	0.000	0.084	0.084
22:15:00	0.000	0.000	0.000	0.000	0.083	0.083
22:30:00	0.000	0.000	0.000	0.000	0.082	0.082
22:45:00	0.000	0.000	0.000	0.000	0.081	0.081
23:00:00	0.000	0.000	0.000	0.000	0.080	0.080
23:15:00	0.000	0.000	0.000	0.000	0.080	0.080
23:30:00	0.000	0.000	0.000	0.000	0.079	0.079
23:45:00	0.000	0.000	0.000	0.000	0.078	0.078
24:00:00	0.000	0.000	0.000	0.000	0.077	0.077
24:15:00	0.000	0.000	0.000	0.000	0.077	0.077
24:30:00	0.000	0.000	0.000	0.000	0.076	0.076
24:45:00	0.000	0.000	0.000	0.000	0.075	0.075
25:00:00	0.000	0.000	0.000	0.000	0.075	0.075
25:15:00	0.000	0.000	0.000	0.000	0.074	0.074
25:30:00	0.000	0.000	0.000	0.000	0.073	0.073
25:45:00	0.000	0.000	0.000	0.000	0.073	0.073
26:00:00	0.000	0.000	0.000	0.000	0.072	0.072
26:15:00	0.000	0.000	0.000	0.000	0.071	0.071
26:30:00	0.000	0.000	0.000	0.000	0.071	0.071

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)
26:45:00	0.000	0.000	0.000	0.000	0.070	0.070
27:00:00	0.000	0.000	0.000	0.000	0.069	0.069
27:15:00	0.000	0.000	0.000	0.000	0.069	0.069
27:30:00	0.000	0.000	0.000	0.000	0.068	0.068
27:45:00	0.000	0.000	0.000	0.000	0.067	0.067
28:00:00	0.000	0.000	0.000	0.000	0.067	0.067
28:15:00	0.000	0.000	0.000	0.000	0.066	0.066
28:30:00	0.000	0.000	0.000	0.000	0.065	0.065
28:45:00	0.000	0.000	0.000	0.000	0.065	0.065
29:00:00	0.000	0.000	0.000	0.000	0.064	0.064
29:15:00	0.000	0.000	0.000	0.000	0.064	0.064
29:30:00	0.000	0.000	0.000	0.000	0.063	0.063
29:45:00	0.000	0.000	0.000	0.000	0.062	0.062
30:00:00	0.000	0.000	0.000	0.000	0.062	0.062
30:15:00	0.000	0.000	0.000	0.000	0.061	0.061
30:30:00	0.000	0.000	0.000	0.000	0.061	0.061
30:45:00	0.000	0.000	0.000	0.000	0.060	0.060
31:00:00	0.000	0.000	0.000	0.000	0.060	0.060
31:15:00	0.000	0.000	0.000	0.000	0.059	0.059
31:30:00	0.000	0.000	0.000	0.000	0.058	0.058
31:45:00	0.000	0.000	0.000	0.000	0.058	0.058
32:00:00	0.000	0.000	0.000	0.000	0.057	0.057
32:15:00	0.000	0.000	0.000	0.000	0.057	0.057
32:30:00	0.000	0.000	0.000	0.000	0.056	0.056
32:45:00	0.000	0.000	0.000	0.000	0.056	0.056
33:00:00	0.000	0.000	0.000	0.000	0.055	0.055
33:15:00	0.000	0.000	0.000	0.000	0.055	0.055
33:30:00	0.000	0.000	0.000	0.000	0.054	0.054
33:45:00	0.000	0.000	0.000	0.000	0.054	0.054
34:00:00	0.000	0.000	0.000	0.000	0.053	0.053
34:15:00	0.000	0.000	0.000	0.000	0.053	0.053
34:30:00	0.000	0.000	0.000	0.000	0.052	0.052
34:45:00	0.000	0.000	0.000	0.000	0.052	0.052
35:00:00	0.000	0.000	0.000	0.000	0.051	0.051
35:15:00	0.000	0.000	0.000	0.000	0.051	0.051
35:30:00	0.000	0.000	0.000	0.000	0.050	0.050

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)
35:45:00	0.000	0.000	0.000	0.000	0.050	0.050
36:00:00	0.000	0.000	0.000	0.000	0.049	0.049
36:15:00	0.000	0.000	0.000	0.000	0.049	0.049
36:30:00	0.000	0.000	0.000	0.000	0.048	0.048
36:45:00	0.000	0.000	0.000	0.000	0.048	0.048
37:00:00	0.000	0.000	0.000	0.000	0.047	0.047
37:15:00	0.000	0.000	0.000	0.000	0.047	0.047
37:30:00	0.000	0.000	0.000	0.000	0.047	0.047
37:45:00	0.000	0.000	0.000	0.000	0.046	0.046
38:00:00	0.000	0.000	0.000	0.000	0.046	0.046
38:15:00	0.000	0.000	0.000	0.000	0.045	0.045

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km^2)	0.5	No
ALTBAR	101	No
ASPBAR	97	No
ASPVAR	0.63	No
BFIHOST	0.41	No
BFIHOST19	0.47	No
DPLBAR (km)	0.69	No
DPSBAR (mkm^{-1})	47.7	No
FARL	1	No
LDP	1.34	No
PROPWET	0.44	No
RMED1H	10.7	No
RMED1D	35.7	No
RMED2D	45.8	No
SAAR (mm)	1056	No
SAAR4170 (mm)	1092	No
SPRHOST	40.98	No
Urbext2000	0.02	No
Urbext1990	0.03	No
URBCONC	0.67	No
URBLOC	0.15	No
DDF parameter C	-0.03	No
DDF parameter D1	0.43	No
DDF parameter D2	0.33	No
DDF parameter D3	0.4	No
DDF parameter E	0.28	No
DDF parameter F	2.4	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.43	No
DDF parameter D2 (1km grid value)	0.33	No
DDF parameter D3 (1km grid value)	0.4	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.4	No

UK Design Flood Estimation

Generated on Monday, January 15, 2024 2:47:49 PM by EmmaBoulton
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

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

Site details Checksum: 7D96-1AC7

Site name: FEH_Catchment_Descriptors_146350_27250_v5_0_1

Easting: 146350

Northing: 27250

Country: England, Wales or Northern Ireland

Catchment Area (km^2): 0.5

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year 1.52 CC

Summary of results

Rainfall - FEH 2013 model (mm):	93.99	Total runoff (ML):	12.01
Total Rainfall (mm):	66.14	Total flow (ML):	29.22
Peak Rainfall (mm):	17.99	Peak flow (m^3/s):	1.57

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 - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.72	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Winter	No
Climate change factor	1.52	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	95.35	No
Cmax (mm)	361.6	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.16	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.49	No
BR	1.82	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.02	No
Urbext 2000	0.02	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

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	1.890	0.000	0.516	0.000	0.021	0.021
00:15:00	3.546	0.000	0.996	0.005	0.021	0.025
00:30:00	6.594	0.000	1.944	0.022	0.021	0.043
00:45:00	12.045	0.000	3.859	0.066	0.021	0.088
01:00:00	17.988	0.000	6.502	0.161	0.023	0.184
01:15:00	12.045	0.000	4.849	0.345	0.027	0.372
01:30:00	6.594	0.000	2.823	0.614	0.034	0.648
01:45:00	3.546	0.000	1.567	0.920	0.046	0.966
02:00:00	1.890	0.000	0.850	1.207	0.063	1.270
02:15:00	0.000	0.000	0.000	1.409	0.084	1.493
02:30:00	0.000	0.000	0.000	1.460	0.106	1.566
02:45:00	0.000	0.000	0.000	1.380	0.129	1.509
03:00:00	0.000	0.000	0.000	1.226	0.149	1.376
03:15:00	0.000	0.000	0.000	1.041	0.167	1.208
03:30:00	0.000	0.000	0.000	0.856	0.181	1.037
03:45:00	0.000	0.000	0.000	0.700	0.193	0.892
04:00:00	0.000	0.000	0.000	0.567	0.202	0.769
04:15:00	0.000	0.000	0.000	0.451	0.209	0.659
04:30:00	0.000	0.000	0.000	0.346	0.214	0.559
04:45:00	0.000	0.000	0.000	0.250	0.217	0.466
05:00:00	0.000	0.000	0.000	0.163	0.218	0.381
05:15:00	0.000	0.000	0.000	0.091	0.218	0.309
05:30:00	0.000	0.000	0.000	0.044	0.218	0.261
05:45:00	0.000	0.000	0.000	0.018	0.216	0.234
06:00:00	0.000	0.000	0.000	0.006	0.214	0.220
06:15:00	0.000	0.000	0.000	0.001	0.212	0.213
06:30:00	0.000	0.000	0.000	0.000	0.210	0.210
06:45:00	0.000	0.000	0.000	0.000	0.208	0.208
07:00:00	0.000	0.000	0.000	0.000	0.206	0.206
07:15:00	0.000	0.000	0.000	0.000	0.204	0.204
07:30:00	0.000	0.000	0.000	0.000	0.202	0.202
07:45:00	0.000	0.000	0.000	0.000	0.201	0.201
08:00:00	0.000	0.000	0.000	0.000	0.199	0.199
08:15:00	0.000	0.000	0.000	0.000	0.197	0.197
08:30:00	0.000	0.000	0.000	0.000	0.195	0.195

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)
08:45:00	0.000	0.000	0.000	0.000	0.193	0.193
09:00:00	0.000	0.000	0.000	0.000	0.191	0.191
09:15:00	0.000	0.000	0.000	0.000	0.190	0.190
09:30:00	0.000	0.000	0.000	0.000	0.188	0.188
09:45:00	0.000	0.000	0.000	0.000	0.186	0.186
10:00:00	0.000	0.000	0.000	0.000	0.184	0.184
10:15:00	0.000	0.000	0.000	0.000	0.183	0.183
10:30:00	0.000	0.000	0.000	0.000	0.181	0.181
10:45:00	0.000	0.000	0.000	0.000	0.179	0.179
11:00:00	0.000	0.000	0.000	0.000	0.177	0.177
11:15:00	0.000	0.000	0.000	0.000	0.176	0.176
11:30:00	0.000	0.000	0.000	0.000	0.174	0.174
11:45:00	0.000	0.000	0.000	0.000	0.172	0.172
12:00:00	0.000	0.000	0.000	0.000	0.171	0.171
12:15:00	0.000	0.000	0.000	0.000	0.169	0.169
12:30:00	0.000	0.000	0.000	0.000	0.168	0.168
12:45:00	0.000	0.000	0.000	0.000	0.166	0.166
13:00:00	0.000	0.000	0.000	0.000	0.165	0.165
13:15:00	0.000	0.000	0.000	0.000	0.163	0.163
13:30:00	0.000	0.000	0.000	0.000	0.161	0.161
13:45:00	0.000	0.000	0.000	0.000	0.160	0.160
14:00:00	0.000	0.000	0.000	0.000	0.158	0.158
14:15:00	0.000	0.000	0.000	0.000	0.157	0.157
14:30:00	0.000	0.000	0.000	0.000	0.155	0.155
14:45:00	0.000	0.000	0.000	0.000	0.154	0.154
15:00:00	0.000	0.000	0.000	0.000	0.153	0.153
15:15:00	0.000	0.000	0.000	0.000	0.151	0.151
15:30:00	0.000	0.000	0.000	0.000	0.150	0.150
15:45:00	0.000	0.000	0.000	0.000	0.148	0.148
16:00:00	0.000	0.000	0.000	0.000	0.147	0.147
16:15:00	0.000	0.000	0.000	0.000	0.146	0.146
16:30:00	0.000	0.000	0.000	0.000	0.144	0.144
16:45:00	0.000	0.000	0.000	0.000	0.143	0.143
17:00:00	0.000	0.000	0.000	0.000	0.141	0.141
17:15:00	0.000	0.000	0.000	0.000	0.140	0.140
17:30:00	0.000	0.000	0.000	0.000	0.139	0.139

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)
17:45:00	0.000	0.000	0.000	0.000	0.138	0.138
18:00:00	0.000	0.000	0.000	0.000	0.136	0.136
18:15:00	0.000	0.000	0.000	0.000	0.135	0.135
18:30:00	0.000	0.000	0.000	0.000	0.134	0.134
18:45:00	0.000	0.000	0.000	0.000	0.132	0.132
19:00:00	0.000	0.000	0.000	0.000	0.131	0.131
19:15:00	0.000	0.000	0.000	0.000	0.130	0.130
19:30:00	0.000	0.000	0.000	0.000	0.129	0.129
19:45:00	0.000	0.000	0.000	0.000	0.128	0.128
20:00:00	0.000	0.000	0.000	0.000	0.126	0.126
20:15:00	0.000	0.000	0.000	0.000	0.125	0.125
20:30:00	0.000	0.000	0.000	0.000	0.124	0.124
20:45:00	0.000	0.000	0.000	0.000	0.123	0.123
21:00:00	0.000	0.000	0.000	0.000	0.122	0.122
21:15:00	0.000	0.000	0.000	0.000	0.120	0.120
21:30:00	0.000	0.000	0.000	0.000	0.119	0.119
21:45:00	0.000	0.000	0.000	0.000	0.118	0.118
22:00:00	0.000	0.000	0.000	0.000	0.117	0.117
22:15:00	0.000	0.000	0.000	0.000	0.116	0.116
22:30:00	0.000	0.000	0.000	0.000	0.115	0.115
22:45:00	0.000	0.000	0.000	0.000	0.114	0.114
23:00:00	0.000	0.000	0.000	0.000	0.113	0.113
23:15:00	0.000	0.000	0.000	0.000	0.112	0.112
23:30:00	0.000	0.000	0.000	0.000	0.111	0.111
23:45:00	0.000	0.000	0.000	0.000	0.110	0.110
24:00:00	0.000	0.000	0.000	0.000	0.109	0.109
24:15:00	0.000	0.000	0.000	0.000	0.108	0.108
24:30:00	0.000	0.000	0.000	0.000	0.107	0.107
24:45:00	0.000	0.000	0.000	0.000	0.106	0.106
25:00:00	0.000	0.000	0.000	0.000	0.105	0.105
25:15:00	0.000	0.000	0.000	0.000	0.104	0.104
25:30:00	0.000	0.000	0.000	0.000	0.103	0.103
25:45:00	0.000	0.000	0.000	0.000	0.102	0.102
26:00:00	0.000	0.000	0.000	0.000	0.101	0.101
26:15:00	0.000	0.000	0.000	0.000	0.100	0.100
26:30:00	0.000	0.000	0.000	0.000	0.099	0.099

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)
26:45:00	0.000	0.000	0.000	0.000	0.098	0.098
27:00:00	0.000	0.000	0.000	0.000	0.097	0.097
27:15:00	0.000	0.000	0.000	0.000	0.096	0.096
27:30:00	0.000	0.000	0.000	0.000	0.095	0.095
27:45:00	0.000	0.000	0.000	0.000	0.094	0.094
28:00:00	0.000	0.000	0.000	0.000	0.093	0.093
28:15:00	0.000	0.000	0.000	0.000	0.093	0.093
28:30:00	0.000	0.000	0.000	0.000	0.092	0.092
28:45:00	0.000	0.000	0.000	0.000	0.091	0.091
29:00:00	0.000	0.000	0.000	0.000	0.090	0.090
29:15:00	0.000	0.000	0.000	0.000	0.089	0.089
29:30:00	0.000	0.000	0.000	0.000	0.088	0.088
29:45:00	0.000	0.000	0.000	0.000	0.087	0.087
30:00:00	0.000	0.000	0.000	0.000	0.087	0.087
30:15:00	0.000	0.000	0.000	0.000	0.086	0.086
30:30:00	0.000	0.000	0.000	0.000	0.085	0.085
30:45:00	0.000	0.000	0.000	0.000	0.084	0.084
31:00:00	0.000	0.000	0.000	0.000	0.083	0.083
31:15:00	0.000	0.000	0.000	0.000	0.083	0.083
31:30:00	0.000	0.000	0.000	0.000	0.082	0.082
31:45:00	0.000	0.000	0.000	0.000	0.081	0.081
32:00:00	0.000	0.000	0.000	0.000	0.080	0.080
32:15:00	0.000	0.000	0.000	0.000	0.080	0.080
32:30:00	0.000	0.000	0.000	0.000	0.079	0.079
32:45:00	0.000	0.000	0.000	0.000	0.078	0.078
33:00:00	0.000	0.000	0.000	0.000	0.077	0.077
33:15:00	0.000	0.000	0.000	0.000	0.077	0.077
33:30:00	0.000	0.000	0.000	0.000	0.076	0.076
33:45:00	0.000	0.000	0.000	0.000	0.075	0.075
34:00:00	0.000	0.000	0.000	0.000	0.074	0.074
34:15:00	0.000	0.000	0.000	0.000	0.074	0.074
34:30:00	0.000	0.000	0.000	0.000	0.073	0.073
34:45:00	0.000	0.000	0.000	0.000	0.072	0.072
35:00:00	0.000	0.000	0.000	0.000	0.072	0.072
35:15:00	0.000	0.000	0.000	0.000	0.071	0.071
35:30:00	0.000	0.000	0.000	0.000	0.070	0.070

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)
35:45:00	0.000	0.000	0.000	0.000	0.070	0.070
36:00:00	0.000	0.000	0.000	0.000	0.069	0.069
36:15:00	0.000	0.000	0.000	0.000	0.068	0.068
36:30:00	0.000	0.000	0.000	0.000	0.068	0.068
36:45:00	0.000	0.000	0.000	0.000	0.067	0.067
37:00:00	0.000	0.000	0.000	0.000	0.066	0.066
37:15:00	0.000	0.000	0.000	0.000	0.066	0.066
37:30:00	0.000	0.000	0.000	0.000	0.065	0.065
37:45:00	0.000	0.000	0.000	0.000	0.065	0.065
38:00:00	0.000	0.000	0.000	0.000	0.064	0.064
38:15:00	0.000	0.000	0.000	0.000	0.063	0.063

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km^2)	0.5	No
ALTBAR	101	No
ASPBAR	97	No
ASPVAR	0.63	No
BFIHOST	0.41	No
BFIHOST19	0.47	No
DPLBAR (km)	0.69	No
DPSBAR (mkm^{-1})	47.7	No
FARL	1	No
LDP	1.34	No
PROPWET	0.44	No
RMED1H	10.7	No
RMED1D	35.7	No
RMED2D	45.8	No
SAAR (mm)	1056	No
SAAR4170 (mm)	1092	No
SPRHOST	40.98	No
Urbext2000	0.02	No
Urbext1990	0.03	No
URBCONC	0.67	No
URBLOC	0.15	No
DDF parameter C	-0.03	No
DDF parameter D1	0.43	No
DDF parameter D2	0.33	No
DDF parameter D3	0.4	No
DDF parameter E	0.28	No
DDF parameter F	2.4	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.43	No
DDF parameter D2 (1km grid value)	0.33	No
DDF parameter D3 (1km grid value)	0.4	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.4	No

UK Design Flood Estimation

Generated on Monday, January 15, 2024 2:48:02 PM by EmmaBoulton
Printed from the ReFH2 Flood Modelling software package, version 3.3.8355.27598

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

Site details Checksum: 7D96-1AC7

Site name: FEH_Catchment_Descriptors_146350_27250_v5_0_1

Easting: 146350

Northing: 27250

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.5

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 1000 year

Summary of results

Rainfall - FEH 2013 model (mm):	106.88	Total runoff (ML):	14.13
Total Rainfall (mm):	75.21	Total flow (ML):	33.14
Peak Rainfall (mm):	20.46	Peak flow (m³/s):	1.83

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 - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:15:00	No
Timestep (hh:mm:ss)	00:15:00	No
SCF (Seasonal correction factor)	0.72	No
ARF (Areal reduction factor)	0.98	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	95.35	No
Cmax (mm)	361.6	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1.16	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0.02	No
BL (hr)	26.49	No
BR	1.72	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0.02	No
Urbext 2000	0.02	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

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	2.149	0.000	0.588	0.000	0.021	0.021
00:15:00	4.033	0.000	1.139	0.005	0.021	0.026
00:30:00	7.499	0.000	2.236	0.026	0.021	0.046
00:45:00	13.698	0.000	4.481	0.076	0.021	0.097
01:00:00	20.456	0.000	7.649	0.185	0.023	0.208
01:15:00	13.698	0.000	5.762	0.398	0.027	0.426
01:30:00	7.499	0.000	3.372	0.713	0.035	0.748
01:45:00	4.033	0.000	1.877	1.073	0.049	1.122
02:00:00	2.149	0.000	1.019	1.413	0.067	1.480
02:15:00	0.000	0.000	0.000	1.654	0.090	1.745
02:30:00	0.000	0.000	0.000	1.719	0.116	1.834
02:45:00	0.000	0.000	0.000	1.628	0.141	1.769
03:00:00	0.000	0.000	0.000	1.448	0.164	1.612
03:15:00	0.000	0.000	0.000	1.230	0.184	1.413
03:30:00	0.000	0.000	0.000	1.012	0.200	1.212
03:45:00	0.000	0.000	0.000	0.827	0.213	1.040
04:00:00	0.000	0.000	0.000	0.671	0.223	0.894
04:15:00	0.000	0.000	0.000	0.534	0.230	0.764
04:30:00	0.000	0.000	0.000	0.410	0.236	0.646
04:45:00	0.000	0.000	0.000	0.297	0.240	0.536
05:00:00	0.000	0.000	0.000	0.194	0.241	0.435
05:15:00	0.000	0.000	0.000	0.109	0.242	0.350
05:30:00	0.000	0.000	0.000	0.052	0.241	0.293
05:45:00	0.000	0.000	0.000	0.022	0.239	0.261
06:00:00	0.000	0.000	0.000	0.007	0.237	0.244
06:15:00	0.000	0.000	0.000	0.001	0.235	0.236
06:30:00	0.000	0.000	0.000	0.000	0.233	0.233
06:45:00	0.000	0.000	0.000	0.000	0.230	0.230
07:00:00	0.000	0.000	0.000	0.000	0.228	0.228
07:15:00	0.000	0.000	0.000	0.000	0.226	0.226
07:30:00	0.000	0.000	0.000	0.000	0.224	0.224
07:45:00	0.000	0.000	0.000	0.000	0.222	0.222
08:00:00	0.000	0.000	0.000	0.000	0.220	0.220
08:15:00	0.000	0.000	0.000	0.000	0.218	0.218
08:30:00	0.000	0.000	0.000	0.000	0.216	0.216

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)
08:45:00	0.000	0.000	0.000	0.000	0.214	0.214
09:00:00	0.000	0.000	0.000	0.000	0.212	0.212
09:15:00	0.000	0.000	0.000	0.000	0.210	0.210
09:30:00	0.000	0.000	0.000	0.000	0.208	0.208
09:45:00	0.000	0.000	0.000	0.000	0.206	0.206
10:00:00	0.000	0.000	0.000	0.000	0.204	0.204
10:15:00	0.000	0.000	0.000	0.000	0.202	0.202
10:30:00	0.000	0.000	0.000	0.000	0.200	0.200
10:45:00	0.000	0.000	0.000	0.000	0.198	0.198
11:00:00	0.000	0.000	0.000	0.000	0.196	0.196
11:15:00	0.000	0.000	0.000	0.000	0.194	0.194
11:30:00	0.000	0.000	0.000	0.000	0.193	0.193
11:45:00	0.000	0.000	0.000	0.000	0.191	0.191
12:00:00	0.000	0.000	0.000	0.000	0.189	0.189
12:15:00	0.000	0.000	0.000	0.000	0.187	0.187
12:30:00	0.000	0.000	0.000	0.000	0.185	0.185
12:45:00	0.000	0.000	0.000	0.000	0.184	0.184
13:00:00	0.000	0.000	0.000	0.000	0.182	0.182
13:15:00	0.000	0.000	0.000	0.000	0.180	0.180
13:30:00	0.000	0.000	0.000	0.000	0.179	0.179
13:45:00	0.000	0.000	0.000	0.000	0.177	0.177
14:00:00	0.000	0.000	0.000	0.000	0.175	0.175
14:15:00	0.000	0.000	0.000	0.000	0.174	0.174
14:30:00	0.000	0.000	0.000	0.000	0.172	0.172
14:45:00	0.000	0.000	0.000	0.000	0.170	0.170
15:00:00	0.000	0.000	0.000	0.000	0.169	0.169
15:15:00	0.000	0.000	0.000	0.000	0.167	0.167
15:30:00	0.000	0.000	0.000	0.000	0.166	0.166
15:45:00	0.000	0.000	0.000	0.000	0.164	0.164
16:00:00	0.000	0.000	0.000	0.000	0.163	0.163
16:15:00	0.000	0.000	0.000	0.000	0.161	0.161
16:30:00	0.000	0.000	0.000	0.000	0.159	0.159
16:45:00	0.000	0.000	0.000	0.000	0.158	0.158
17:00:00	0.000	0.000	0.000	0.000	0.156	0.156
17:15:00	0.000	0.000	0.000	0.000	0.155	0.155
17:30:00	0.000	0.000	0.000	0.000	0.154	0.154

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)
17:45:00	0.000	0.000	0.000	0.000	0.152	0.152
18:00:00	0.000	0.000	0.000	0.000	0.151	0.151
18:15:00	0.000	0.000	0.000	0.000	0.149	0.149
18:30:00	0.000	0.000	0.000	0.000	0.148	0.148
18:45:00	0.000	0.000	0.000	0.000	0.146	0.146
19:00:00	0.000	0.000	0.000	0.000	0.145	0.145
19:15:00	0.000	0.000	0.000	0.000	0.144	0.144
19:30:00	0.000	0.000	0.000	0.000	0.142	0.142
19:45:00	0.000	0.000	0.000	0.000	0.141	0.141
20:00:00	0.000	0.000	0.000	0.000	0.140	0.140
20:15:00	0.000	0.000	0.000	0.000	0.138	0.138
20:30:00	0.000	0.000	0.000	0.000	0.137	0.137
20:45:00	0.000	0.000	0.000	0.000	0.136	0.136
21:00:00	0.000	0.000	0.000	0.000	0.135	0.135
21:15:00	0.000	0.000	0.000	0.000	0.133	0.133
21:30:00	0.000	0.000	0.000	0.000	0.132	0.132
21:45:00	0.000	0.000	0.000	0.000	0.131	0.131
22:00:00	0.000	0.000	0.000	0.000	0.130	0.130
22:15:00	0.000	0.000	0.000	0.000	0.128	0.128
22:30:00	0.000	0.000	0.000	0.000	0.127	0.127
22:45:00	0.000	0.000	0.000	0.000	0.126	0.126
23:00:00	0.000	0.000	0.000	0.000	0.125	0.125
23:15:00	0.000	0.000	0.000	0.000	0.124	0.124
23:30:00	0.000	0.000	0.000	0.000	0.122	0.122
23:45:00	0.000	0.000	0.000	0.000	0.121	0.121
24:00:00	0.000	0.000	0.000	0.000	0.120	0.120
24:15:00	0.000	0.000	0.000	0.000	0.119	0.119
24:30:00	0.000	0.000	0.000	0.000	0.118	0.118
24:45:00	0.000	0.000	0.000	0.000	0.117	0.117
25:00:00	0.000	0.000	0.000	0.000	0.116	0.116
25:15:00	0.000	0.000	0.000	0.000	0.115	0.115
25:30:00	0.000	0.000	0.000	0.000	0.114	0.114
25:45:00	0.000	0.000	0.000	0.000	0.112	0.112
26:00:00	0.000	0.000	0.000	0.000	0.111	0.111
26:15:00	0.000	0.000	0.000	0.000	0.110	0.110
26:30:00	0.000	0.000	0.000	0.000	0.109	0.109

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)
26:45:00	0.000	0.000	0.000	0.000	0.108	0.108
27:00:00	0.000	0.000	0.000	0.000	0.107	0.107
27:15:00	0.000	0.000	0.000	0.000	0.106	0.106
27:30:00	0.000	0.000	0.000	0.000	0.105	0.105
27:45:00	0.000	0.000	0.000	0.000	0.104	0.104
28:00:00	0.000	0.000	0.000	0.000	0.103	0.103
28:15:00	0.000	0.000	0.000	0.000	0.102	0.102
28:30:00	0.000	0.000	0.000	0.000	0.101	0.101
28:45:00	0.000	0.000	0.000	0.000	0.100	0.100
29:00:00	0.000	0.000	0.000	0.000	0.099	0.099
29:15:00	0.000	0.000	0.000	0.000	0.099	0.099
29:30:00	0.000	0.000	0.000	0.000	0.098	0.098
29:45:00	0.000	0.000	0.000	0.000	0.097	0.097
30:00:00	0.000	0.000	0.000	0.000	0.096	0.096
30:15:00	0.000	0.000	0.000	0.000	0.095	0.095
30:30:00	0.000	0.000	0.000	0.000	0.094	0.094
30:45:00	0.000	0.000	0.000	0.000	0.093	0.093
31:00:00	0.000	0.000	0.000	0.000	0.092	0.092
31:15:00	0.000	0.000	0.000	0.000	0.091	0.091
31:30:00	0.000	0.000	0.000	0.000	0.091	0.091
31:45:00	0.000	0.000	0.000	0.000	0.090	0.090
32:00:00	0.000	0.000	0.000	0.000	0.089	0.089
32:15:00	0.000	0.000	0.000	0.000	0.088	0.088
32:30:00	0.000	0.000	0.000	0.000	0.087	0.087
32:45:00	0.000	0.000	0.000	0.000	0.086	0.086
33:00:00	0.000	0.000	0.000	0.000	0.086	0.086
33:15:00	0.000	0.000	0.000	0.000	0.085	0.085
33:30:00	0.000	0.000	0.000	0.000	0.084	0.084
33:45:00	0.000	0.000	0.000	0.000	0.083	0.083
34:00:00	0.000	0.000	0.000	0.000	0.082	0.082
34:15:00	0.000	0.000	0.000	0.000	0.082	0.082
34:30:00	0.000	0.000	0.000	0.000	0.081	0.081
34:45:00	0.000	0.000	0.000	0.000	0.080	0.080
35:00:00	0.000	0.000	0.000	0.000	0.079	0.079
35:15:00	0.000	0.000	0.000	0.000	0.079	0.079
35:30:00	0.000	0.000	0.000	0.000	0.078	0.078

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)
35:45:00	0.000	0.000	0.000	0.000	0.077	0.077
36:00:00	0.000	0.000	0.000	0.000	0.076	0.076
36:15:00	0.000	0.000	0.000	0.000	0.076	0.076
36:30:00	0.000	0.000	0.000	0.000	0.075	0.075
36:45:00	0.000	0.000	0.000	0.000	0.074	0.074
37:00:00	0.000	0.000	0.000	0.000	0.074	0.074
37:15:00	0.000	0.000	0.000	0.000	0.073	0.073
37:30:00	0.000	0.000	0.000	0.000	0.072	0.072
37:45:00	0.000	0.000	0.000	0.000	0.072	0.072
38:00:00	0.000	0.000	0.000	0.000	0.071	0.071
38:15:00	0.000	0.000	0.000	0.000	0.070	0.070

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km^2)	0.5	No
ALTBAR	101	No
ASPBAR	97	No
ASPVAR	0.63	No
BFIHOST	0.41	No
BFIHOST19	0.47	No
DPLBAR (km)	0.69	No
DPSBAR (mkm^{-1})	47.7	No
FARL	1	No
LDP	1.34	No
PROPWET	0.44	No
RMED1H	10.7	No
RMED1D	35.7	No
RMED2D	45.8	No
SAAR (mm)	1056	No
SAAR4170 (mm)	1092	No
SPRHOST	40.98	No
Urbext2000	0.02	No
Urbext1990	0.03	No
URBCONC	0.67	No
URBLOC	0.15	No
DDF parameter C	-0.03	No
DDF parameter D1	0.43	No
DDF parameter D2	0.33	No
DDF parameter D3	0.4	No
DDF parameter E	0.28	No
DDF parameter F	2.4	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.43	No
DDF parameter D2 (1km grid value)	0.33	No
DDF parameter D3 (1km grid value)	0.4	No
DDF parameter E (1km grid value)	0.29	No
DDF parameter F (1km grid value)	2.4	No

HEC-RAS Summary Table

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Paul Stream	3	30-Year	0.69	82.84	83.2	83.2	83.33	0.017017	1.55	0.44	1.84	1.01
Paul Stream	3	100-Year	0.96	82.84	83.27	83.27	83.41	0.016445	1.7	0.57	1.96	1.01
Paul Stream	3	100-Year + CC	1.57	82.84	83.39	83.39	83.58	0.015521	1.92	0.82	2.19	1
Paul Stream	3	1000-Year	1.83	82.84	83.43	83.43	83.64	0.015438	2	0.91	2.27	1.01
Paul Stream	2	30-Year	0.69	82.44	82.74	82.82	83	0.055697	2.28	0.3	1.84	1.79
Paul Stream	2	100-Year	0.96	82.44	82.78	82.88	83.1	0.056072	2.49	0.39	2.06	1.84
Paul Stream	2	100-Year + CC	1.57	82.44	82.86	82.98	83.26	0.056323	2.83	0.56	2.46	1.9
Paul Stream	2	1000-Year	1.83	82.44	82.88	83.02	83.32	0.056388	2.94	0.62	2.59	1.92
Paul Stream	1	30-Year	0.69	82.12	82.57	82.57	82.68	0.016837	1.5	0.46	2.08	1.01
Paul Stream	1	100-Year	0.96	82.12	82.63	82.63	82.76	0.016085	1.59	0.6	2.41	1.01
Paul Stream	1	100-Year + CC	1.57	82.12	82.74	82.74	82.9	0.015131	1.75	0.9	2.98	1.02
Paul Stream	1	1000-Year	1.83	82.12	82.78	82.78	82.95	0.014789	1.8	1.02	3.19	1.01

APPENDIX C ENVIRONMENT AGENCY INFORMATION

Flood risk assessment data

Location of site: 146143 / 27164 (shown as easting and northing coordinates)
Document created on: 4 January 2024
This information was previously known as a product 4.
Customer reference number: ENGGMH6KPDC4

Map showing the location that flood risk assessment data has been requested for.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

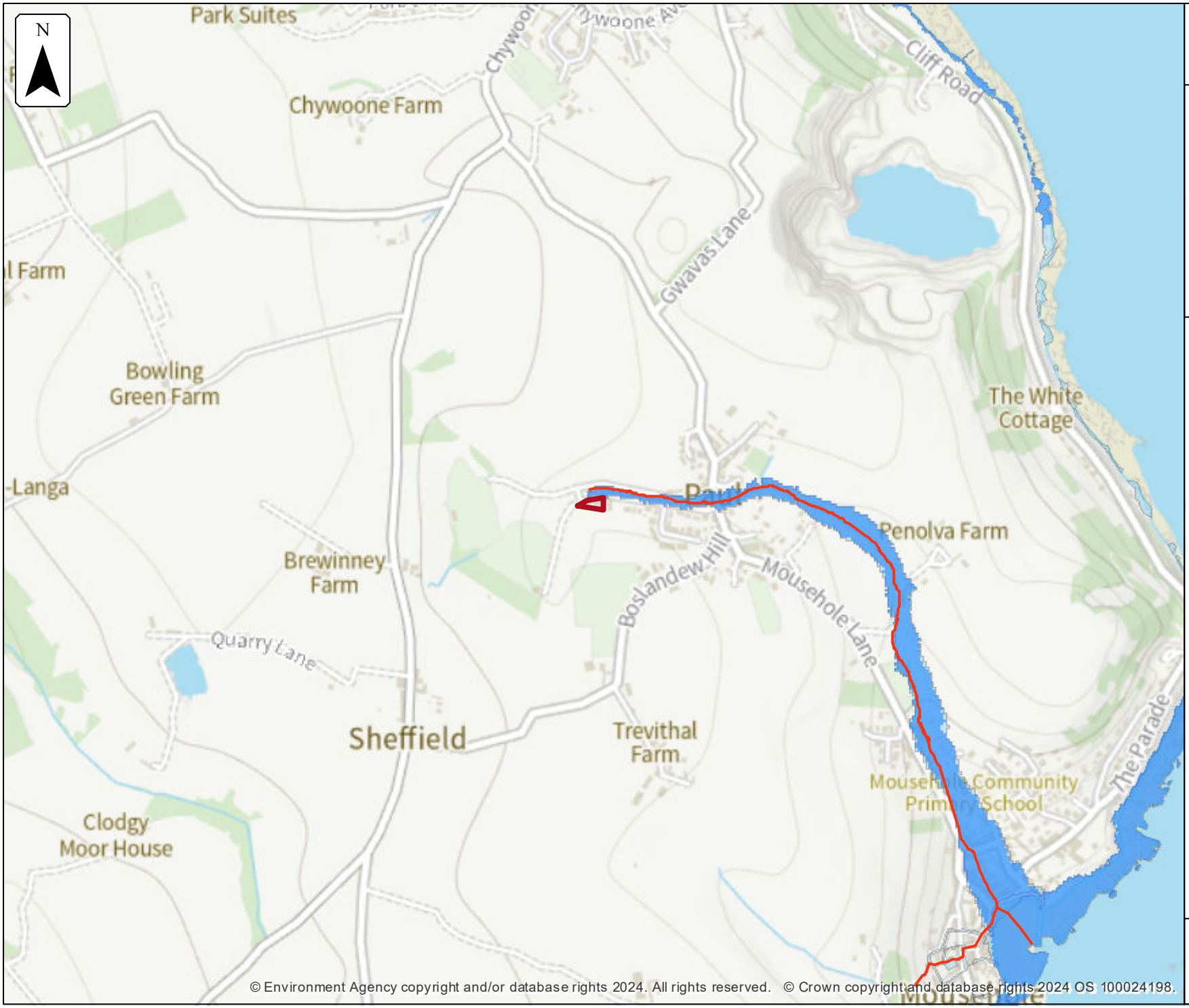
Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

This data is updated on a quarterly basis as better data becomes available.



Environment Agency

Flood map for planning

Location (easting/northing)
146143/27164

Scale
1:10,000

Created
4 Jan 2024

- Selected area
- Main river
- Flood zone 3
- Flood zone 2

0 100 200 300 400 500
metres

Historic Information

The map below is an indicative outline of areas that have previously flooded.

Historic outlines may not be visible where they overlap. You can download the outlines separately via the link below.

Download recorded flood outlines in GIS format

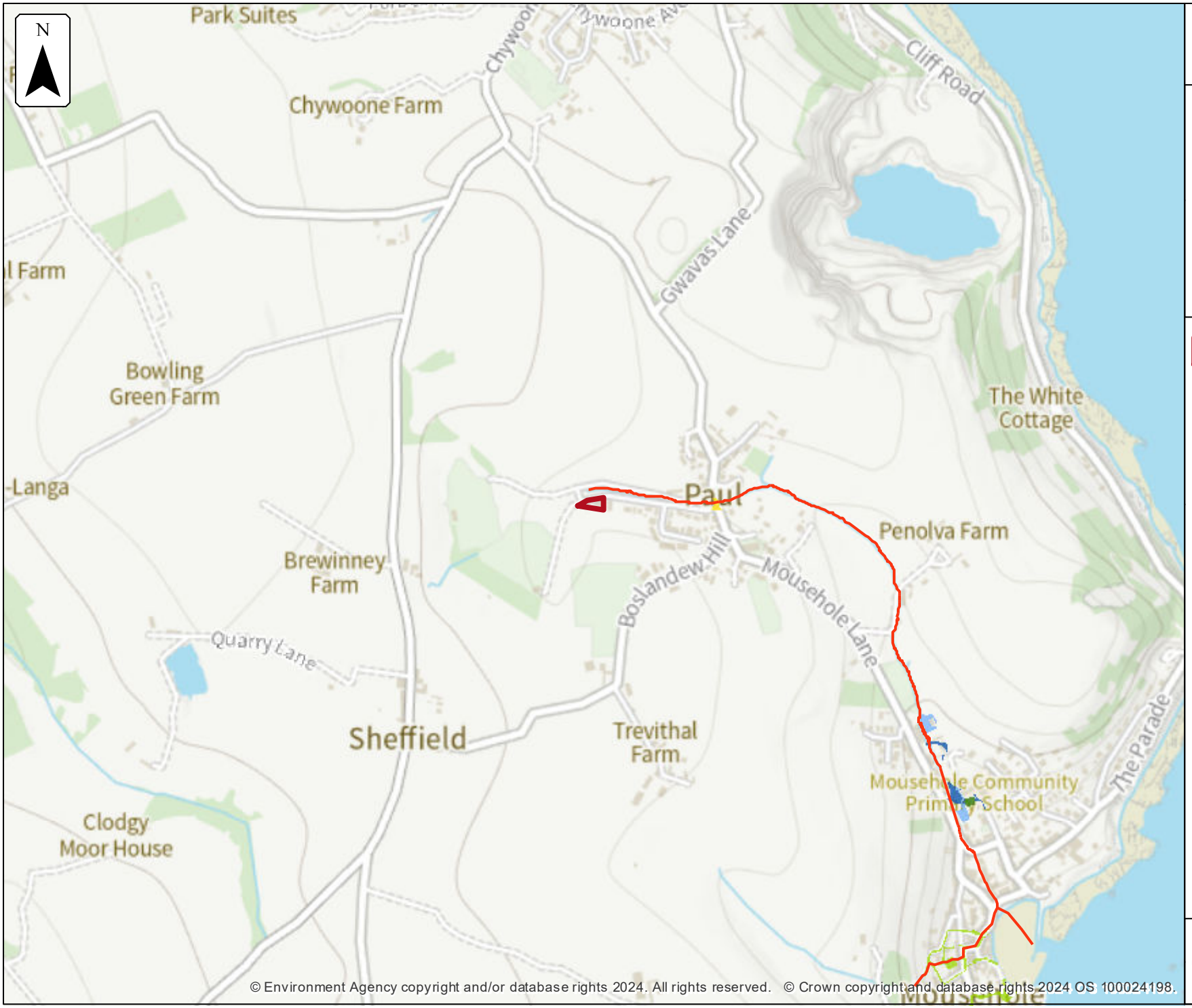
Our historic flood event outlines:

- are an indication of the geographical extent of an observed flood event. We map flooding to land, not individual properties.
- not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.
- are based on a combination of anecdotal evidence, Environment Agency staff observations and survey.
- do not provide a definitive record of flooding.

It is possible that there will be an absence of data in places where we have not been able to record the extent of flooding. It is also possible for errors to occur in the digitisation of historic records of flooding.

Remember that: other flooding may have occurred that we do not have records for

Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.



Environment Agency

Historic flood map

Location (easting/northing)
146143/27164

Scale
1:10,000

Created
4 Jan 2024

- Selected area
- Main river

Date of flood event

- August, 2020
- November, 2012
- July, 2012
- October, 2006
- January, 2003

0 100 200 300 400 500
metres

Historic flood event data

Start date	End date	Source of flood	Cause of flood	Affects location
27 August 2020	27 August 2020	ordinary watercourse	overtopping of defences	No
24 November 2012	24 November 2012	main river	obstruction/blockage - debris screen	No
6 July 2012	7 July 2012	main river	channel capacity exceeded (no raised defences)	No
22 October 2006	22 October 2006	main river	unknown	No
1 January 2003	1 January 2003	main river	channel capacity exceeded (no raised defences)	No

Records of flooding in the Paul area.

Date	Location	Detail	Cause	Estimated Number of Properties Flooded	Flood Source
06/02/2016	Mousehole	Mousehole - Culvert system and road drainage upstream of the school became overloaded causing flood water to run overland down the valley causing significant flooding to the school playground	Insufficient capacity in stream channel, culverted watercourse in this area, surface water run-off from road.	0	Fluvial
24/11/2012	Mousehole	Mousehole. The Paul Stream overtopped at the trash screen, flowing through the school and down Foxes Lane before discharging to the sea. The number of properties affected is unknown.	Fluvial, overtopping at the trash screen	0	Fluvial
07/07/2012	Paul	Paul. Evidence of minor flooding on the road, after the Paul Stream overtopped.	Heavy rainfall event, high river levels.	0	Fluvial

Date	Location	Detail	Cause	Estimated Number of Properties Flooded	Flood Source
22/10/2006	Mousehole	Mousehole. Flooding of gardens after trash screen became blocked at BT depot. No properties flooded.	Blocked trash screen, heavy rainfall on saturated ground.	0	Fluvial
18/08/2004	Paul	Paul. One property on Long Row affected by surface water runoff.	Unknown		Surface Water Runoff
12/03/2004	Paul	Paul. One property on Long Row affected by surface water runoff.	Blocked Highway Drainage		Surface Water Runoff
27/07/2003	Paul	Paul. The garden of one property flooded from the field behind.	Assumed run-off from fields behind property	1	Agriculture

Date	Location	Detail	Cause	Estimated Number of Properties Flooded	Flood Source
01/01/2003	Mousehole	Mousehole. Culvert system and road drainage upstream of the school became overloaded causing flood water to run overland down the valley, causing significant flooding around one property, before flooding down Paul Hill and inundating the school playground	Insufficient capacity in stream channel, culverted watercourse in this area, surface water run-off from road.	2	Fluvial & Surface Water Runoff
10/10/1993	Paul	Paul. The approach road to Paul above Bryher Barn flooded stranding a vehicle.	SW Sewer system surcharged	0	Surface Water

This list contains all the records of flooding we hold, in a 1km radius of the specified location. Although this information is compiled to the best of our knowledge, the absence of flooding does not mean that an area has not flooded in the past, nor guarantee it will not flood in the future. Our records are updated as more information comes to light, and as flood incidents occur.

Correct as of 04 / 01 / 2024

Modelled data

About the models used

Model name: JFLOW

Date: 2007

This model contains the most relevant data for your area of interest.

You will need to consider the latest flood risk assessment climate change allowances and factor in the new allowances to demonstrate the development will be safe from flooding.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1%chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

You asked us to provide you with depth / flow / water level data from the JFLOW model used to produce the Flood Zones.

The water depths have been produced from the JFLOW model (2007) as a 'by-product' of running the model to produce Flood Zones.

In 2013, over 600km of watercourses were remodelled using JFlow+. These watercourses were either previously not modelled in 2008, or where modelled using a lesser quality DTM. This project used an improved DTM, revised hydrology and the latest version of Jflow+.

You should be aware of the following points.

- Our work to produce Flood Zones followed a 10 year programme which delivered more detailed mapping for 821 locations. However, in order to complete Flood Zones we needed national coverage, hence a generalised approach was used to provide this national coverage within the time available, to fill the gaps between the 821 locations where we had more detailed information. The Flood Zones are therefore not as accurate as we would normally specify for river modelling, but they do provide an adequate indication of the extent of flood risk such that developers can consider flooding as part of their proposals to ensure they are not unknowingly putting additional lives at risk. This is the purpose for which the Flood Zones were produced

- Depths outputs were not specified when we commissioned this generalised modelling for Flood Zones. As the JFLOW modelling method was developed, tested and reviewed for production of the Flood Zone extents only, we currently have no information on the accuracy of the water depth data.

- The models were run using a Digital Terrain Model (DTM) with a grid generalised to between 5m and 100m (depending on the type of model and location, for reasons such as processing speed). Fluvial modelling produced depth data which can be processed using the DTM to provide water level data. However the differing grid sizes means that there is a significant potential for inaccuracy in producing level data, because of the DTM generalisation. Therefore because of the nature of the model and the DTM, in many cases it will not be possible to confidently assess whether or not a site is above the resulting water level. This is because there are further inherent uncertainties in the depth calculation and within the DTM itself.

- Depth or level outputs from the National Generalised Modelling (JFLOW) are suitable to be used for decision making at a broad catchment scale

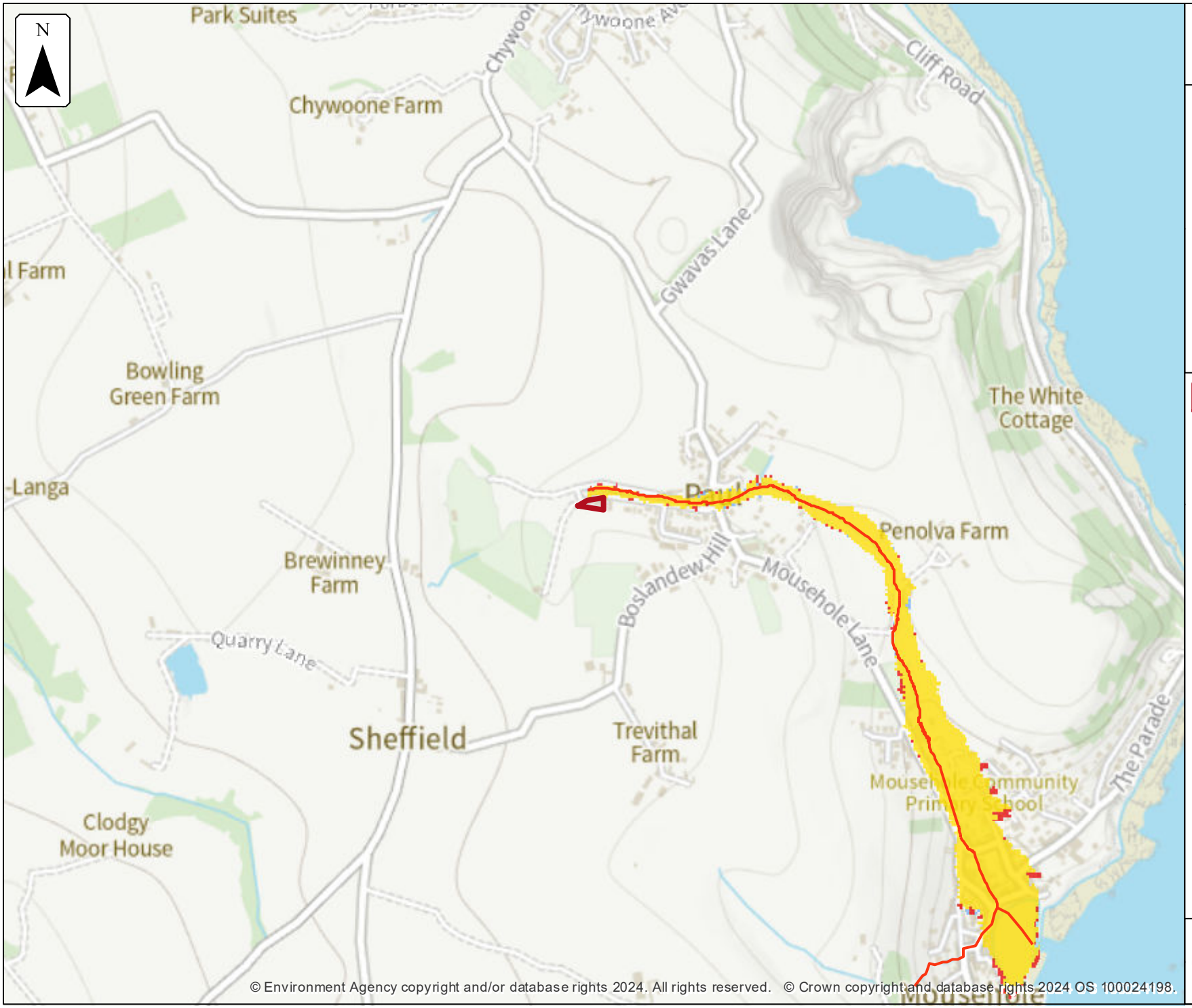
- JFLOW and JFlow+ is a suitable method for broad scale flood mapping. It may however fail to produce satisfactory results in some locations.

- They are not suitable for use in site specific Flood Risk Assessments or Strategic Flood Risk Assessments and must not normally be used for these studies. However, where in exceptional circumstances Nationalised Generalised Modelling outputs are requested to be used for anything other than at a broad catchment or Shoreline Management Plan coastal cell scale further verification must be undertaken.

- For the 2013 data we can provide the data for the 100 year plus climate change scenario. The influence of climate change on expected flows for the 2080 planning horizon was represented by increasing the 1 in 100-year flood hydrograph by 30%.

- Any assessment of Flood Risk undertaken must be appropriate for the decisions that need to be based upon it, consider the risks and also take into account any limitations of the data used.

- Please be aware that the Environment Agency does not guarantee that this data is suitable for your purposes.



Environment Agency

No defences exist modelled fluvial extent

Location (easting/northing)
146143/27164

Scale
1:10,000

Created
4 Jan 2024

Model name
JFLOW 2007 - area

Selected area

Main river

Modelled flood extent

1.33% AEP

1% AEP

0.1% AEP

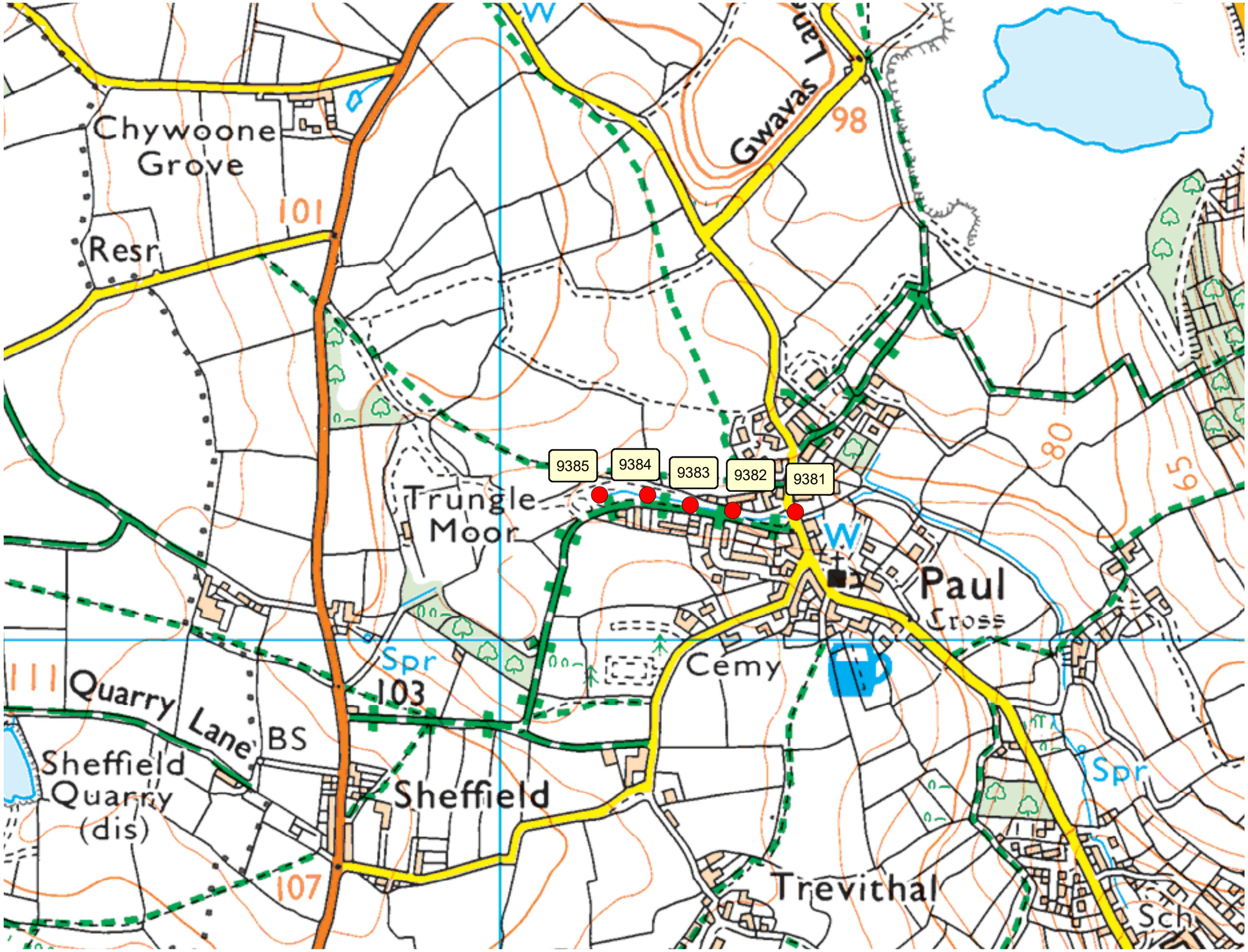
Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres

340535 - JFLOW Node Location Map

Please note this map is intended only as a guide - it is not accurate at individual property level

Environment Agency



Legend

JFLOW Node

Please refer to the enclosed table, for modelled water level data, and the enclosed caveat when considering modelled levels.

1:5,000

Correct as of the 8th January 2024

N

340535 - Modelled JFLOW Flood levels

This data is taken from the JFLOW model. Please refer to the attached caveat when considering JFLOW modelled levels.

Jflow Study: Jflow_2007

Node Reference	Easting	Northing	Modelled Flood levels, in mAOD	
			1% AEP (1 in 100 year)	0.1% AEP (1 in 1000 year)
9381	146389	27169	77.42	77.59
9382	146307	27171	80.15	80.14
9383	146251	27178	81.54	81.62
9384	146195	27191	83.73	82.81
9385	146132	27191	84.50	84.51

Correct as of 18 / 01 / 2024

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

Find out more about flood risk activity permits

Help and advice

Contact the Devon Cornwall and the Isles of Scilly Environment Agency team at dcisenquiries@environment-agency.gov.uk for:

- more information about getting a product 5, 6, 7 or 8
- general help and advice about the site you're requesting data for

DCIS Climate Change Allowances – Strategic and Development Planning

FIRST

Please check the latest Climate Change allowance :-

Flood risk assessments: climate change allowances - GOV.UK (www.gov.uk)

We expect you to use the scenario values as shown on the adjacent table for the different types of development. You may provide different scenario (i.e. High Cen for SLR) as additional assessment but we will use these values/allowances for our assessments of FRA/Designs

*CFB = Coastal Flood Boundary – available at data.gov.uk

Valid May 2022 – FCRM

Development Vulnerability NPPG	Rainfall 1% Storms		River Less than 5km2		Fluvial	Sea Level Rise (SLR) Upper End
	Exe & East Devon	All others	Urban	Rural	Use 2080s values for all	Added to CFB* 2017 data
Commercial 60yr lifetime	30%	30%	30%	? - tbc	Central Allowance- See map next page	0.74m (2082 value)
Residential 100yr lifetime	45%	50%	50%	? - tbc	Central Allowance - see map next page	1.445m (2122 value)
Essential Infrastructure	45%	50%	50%	? - tbc	Higher Central - See map next page	Please confirm with EA office

SPDC@environment-agency.gov.uk or SW_Exeter-PSO@environment-agency.gov.uk

Environment Agency

FIRST

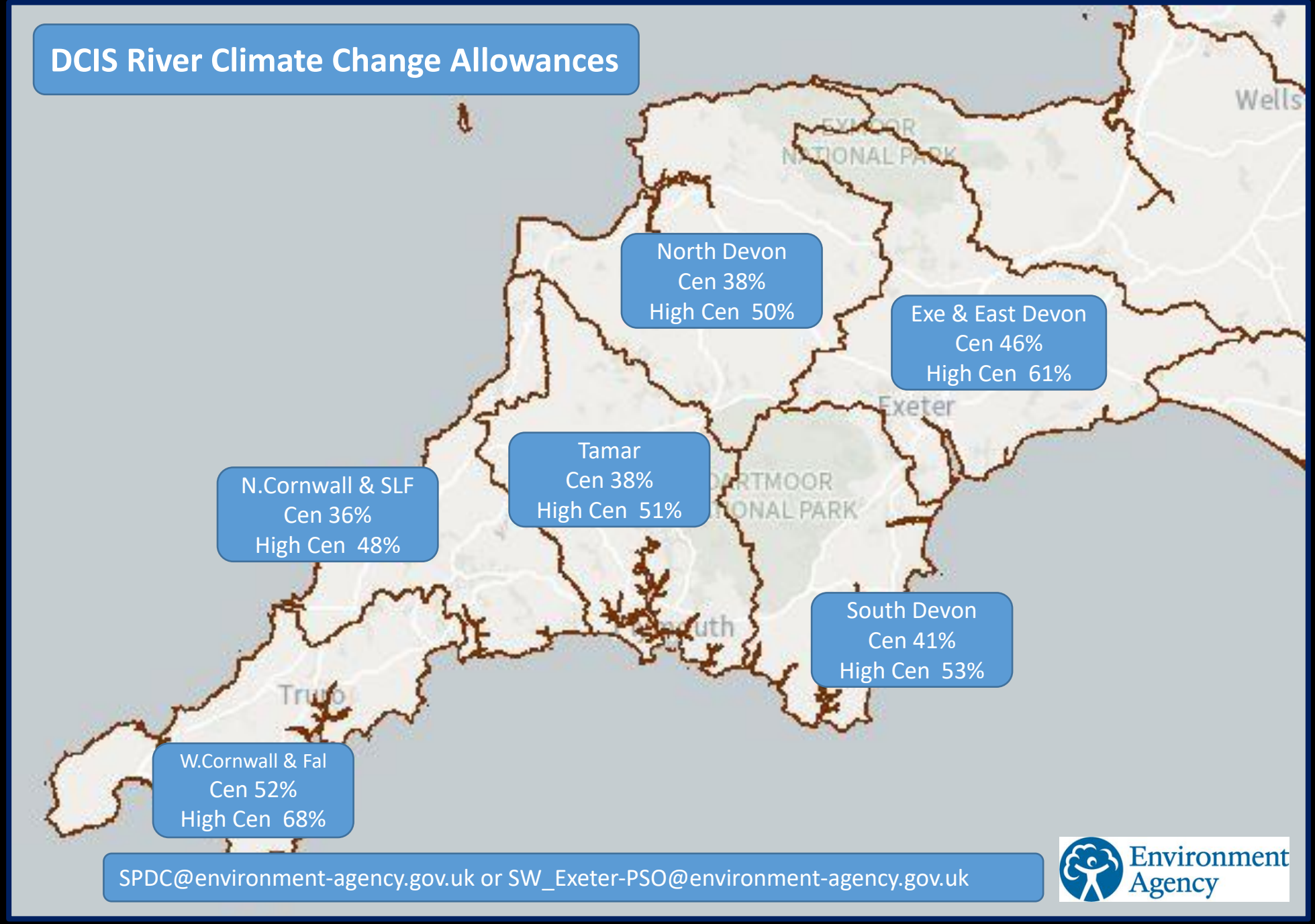
Please check the latest Climate Change allowance :-

[Flood risk assessments: climate change allowances - GOV.UK (www.gov.uk)]

- Wave Actions (Coastal & Estuary) will also have to be considered
- Freeboard will need to be added to set minimum floor or defence levels
- +40%CC Modelled scenarios, may still be used for some catchments (>5% diff from new values).

Valid May 2022 - FCRM

DCIS River Climate Change Allowances



SPDC@environment-agency.gov.uk or SW_Exeter-PSO@environment-agency.gov.uk

Environment Agency

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