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Church Farm: Flood Risk Assessment and Outline Drainage Strategy

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Church Farm: Flood Risk Assessment and Outline Drainage Strategy

Client

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1. Introduction

Aqua Terra Consultants Ltd (Aqua Terra) was instructed by Fairfax Acquisitions Ltd (the Client) to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) to support a residential led development on a parcel of land at Church Farm, Upper Beeding (the Site).

1.1. Background

The FRA is to support a planning application for the erection of 4No. dwellings with access from Church Farm Walk, Upper Beeding.

1.2. Scope

The scope of the FRA and DS is as follows:

- Preparation of a FRA, written in line with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance (PPG), to satisfy the Environment Agency (EA) and the Lead Local Flood Authority (LLFA, East Sussex County Council) that potential flood risks from all sources to and from the proposed development have been considered and that the proposed development is appropriate, as defined in the NPPF;
- Acquisition and review of modelled flood extents and levels for current and future climate scenarios from the EA;
- Where required, consideration of appropriate site-specific flood risk mitigation measures and provision of recommendations for a strategy for managing and mitigating potential flood risk posed on the Site;
- Review national, regional and local guidance and policies on surface water management;
- Estimate surface water runoff and preliminary attenuation storage requirements;
- Assessment of potential surface water runoff destinations;
- An appraisal of potentially feasible SuDS features for the Site; and,
- Provide a SuDS strategy for managing surface water runoff from the proposed development

1.3. Data sources

The main sources of data utilised in this assessment are summarised below:

- The proposed development plans as provided by the Client;
- LiDAR Digital Terrain Model (DTM) data obtained through data.gov.uk;
- EA flood risk data (Environment Agency, 2025);
- Soilscapes soil mapping (Cranfield Soil and AgriFood Institute, 2025);
- British Geological Survey (BGS) mapping (British Geological Society, 2025);
- Horsham District council – Strategic Flood Risk Assessment, Level 1 (AECOM, 2024)
- West Sussex County Council – Sustainable Drainage System Design Guide (online); and,
- Water. People. Places. A guide for master planning sustainable drainage into developments. Prepared by the Lead Local Flood Authorities of the South East of England (AECOM - 2013).

1.4. Limitations

This report is written strictly for the benefit of the Client and bound by the conditions presented in Appendix A.

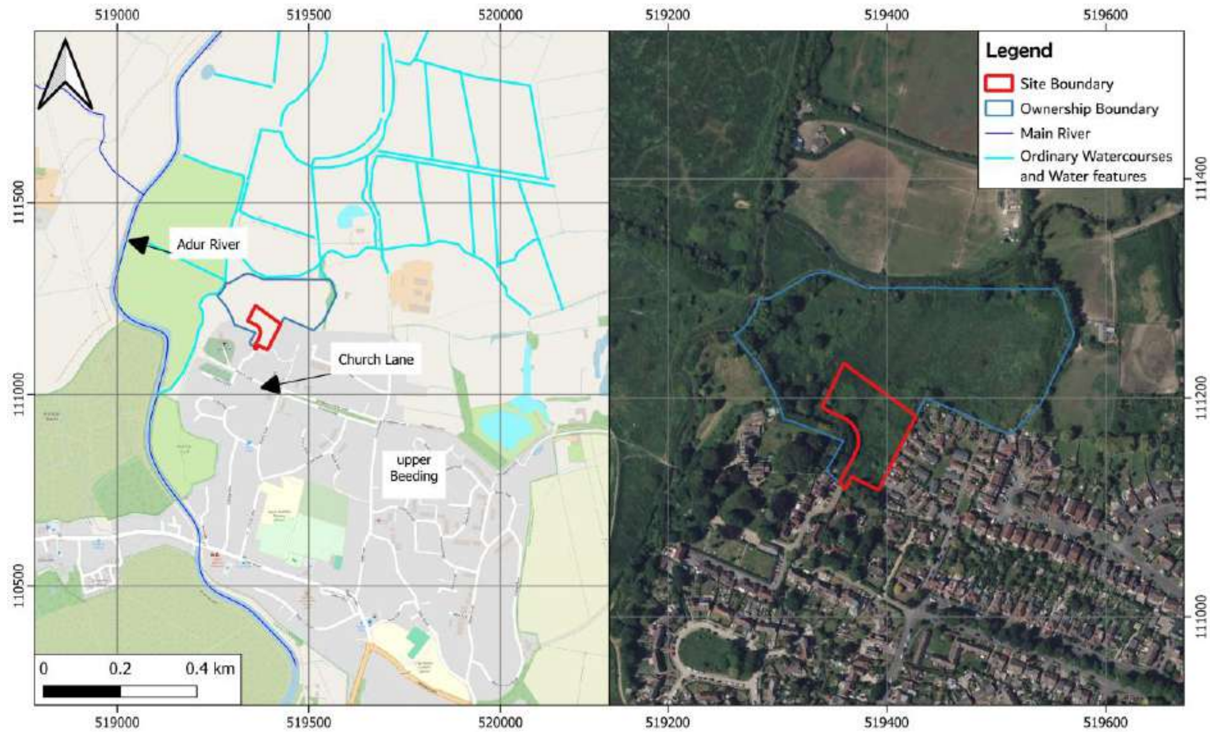
2. Site setting

2.1. Site location and description

The Site is located on the outskirts of Upper Beeding as shown in Figure 2-1, to the north of Church Lane. The Ordnance Survey Grid Reference for the approximate centre of the Site is TQ19400, 11177.

The Site currently comprises a greenfield Site with some scrub and young trees across the Site. The Site borders an existing residential area of Upper Beeding to the south. The Adur River (a Main River) lies to the west of the Site, and a detailed network of land drains drain land northwards of the Site. The overall area proposed to be developed is approximately 0.5Ha.

Figure 2-1 Site location



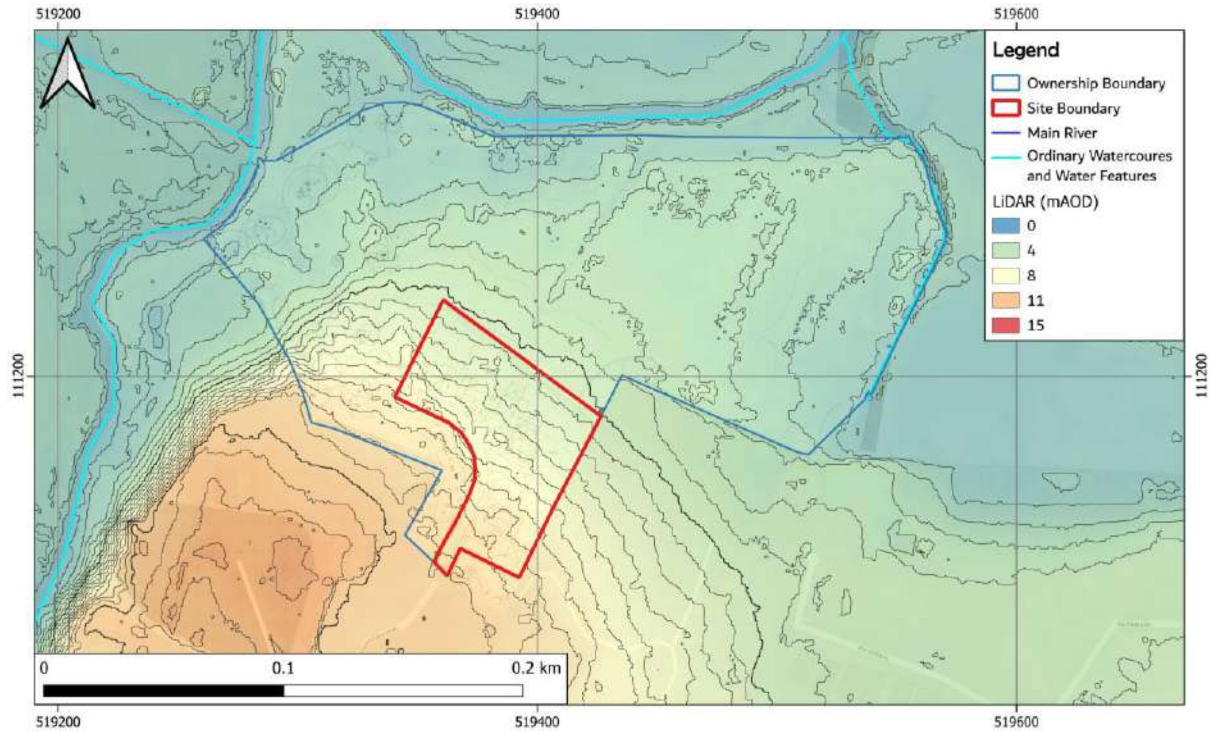
Contains Open Street Map data © OpenStreetMap and Bing Aerial imagery © Microsoft

2.2. Topography and current drainage arrangements

Figure 2-2 presents LiDAR topographical data. Ground elevations in the area around the Site slope generally north-eastwards. The ground elevation at the Site falls from approximately 9.5m above Ordnance Datum (m aOD) in the south to 6.08m aOD where the lowest dwellings are proposed, to a minimum of 2.5m aOD along the northern boundary of the ownership extent.

At present, the Site does not have a formal drainage system and surface water runoff will mostly infiltrate or flow overland with the topography. A network of land drains is located to the north and west of the Site where the Gault Formation (Mudstone) outcrops and may be where groundwater is emerging.

Figure 2-2 Existing ground elevations from LiDAR data



2.3. Geology and hydrogeology

2.3.1. Published soils and geology

A review of Soilscapes and British Geological Survey (BGS) 1:50,000 scale mapping indicates the geological sequence underlying the Site is as follows:

- Soils: Freely draining, lime-rich loamy soils
- Superficial geology (see Figure 2-3): River Terrace Deposits (sand and gravel) over majority over southern portion with Alluvium in the north.
- Solid geology (see Figure 2-4): West Melbury Marly Chalk Formation (White Chalk). A band of Upper Greensand Formation outcrops across the northern boundary of the land ownership, followed by Gault Formation Mudstone. A significant number of land drains are present over the Gault Formation indicating reduced natural infiltration.

The nearest borehole is shallow (2.53m depth) and located 412m south of the Site. Detail on the borehole scan is limited, though it describes the strata as 'Drift' underlain by 'L.Ck' (White Chalk).

Figure 2-3 Superficial deposits

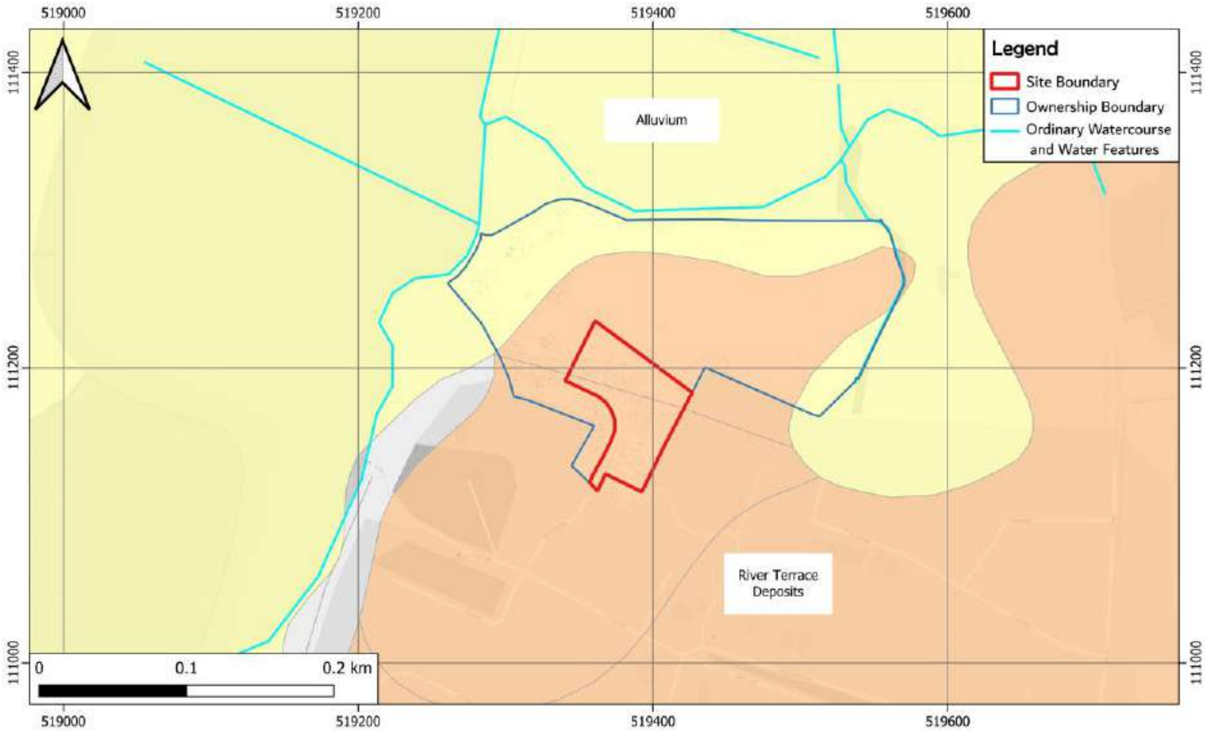
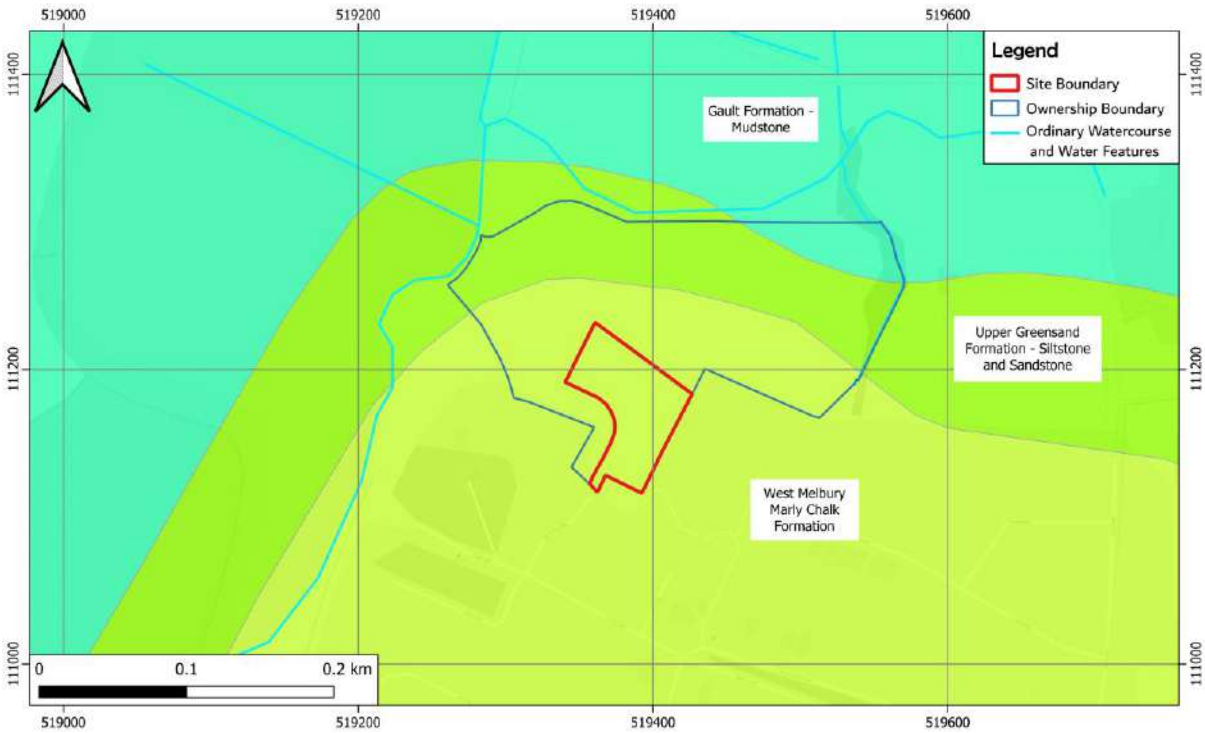


Figure 2-4 Bedrock Geology



2.3.2. Hydrogeology

The White Chalk is classified by the Environment Agency (EA) as a Principal Aquifer and the River Terrace Deposits are classified as a Secondary Undifferentiated aquifer. Principal and secondary aquifers provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands.

Groundwater vulnerability on Site is classed as high, and the Site is not within a source protection zone (SPZ).

The Water Framework Directive (WFD) classifies the Brighton Chalk Block groundwater body as having an overall, chemical and quantitative rating of poor.

2.4. Hydrology

Hydrological descriptors for the Site are provided in Table 2-1.

Table 2-1 Hydrological point descriptors

Descriptor	Value
NGR	TQ 19353 11157
BFIHOST19	0.797
PROPWET	0.34
SAAR6190	848 mm

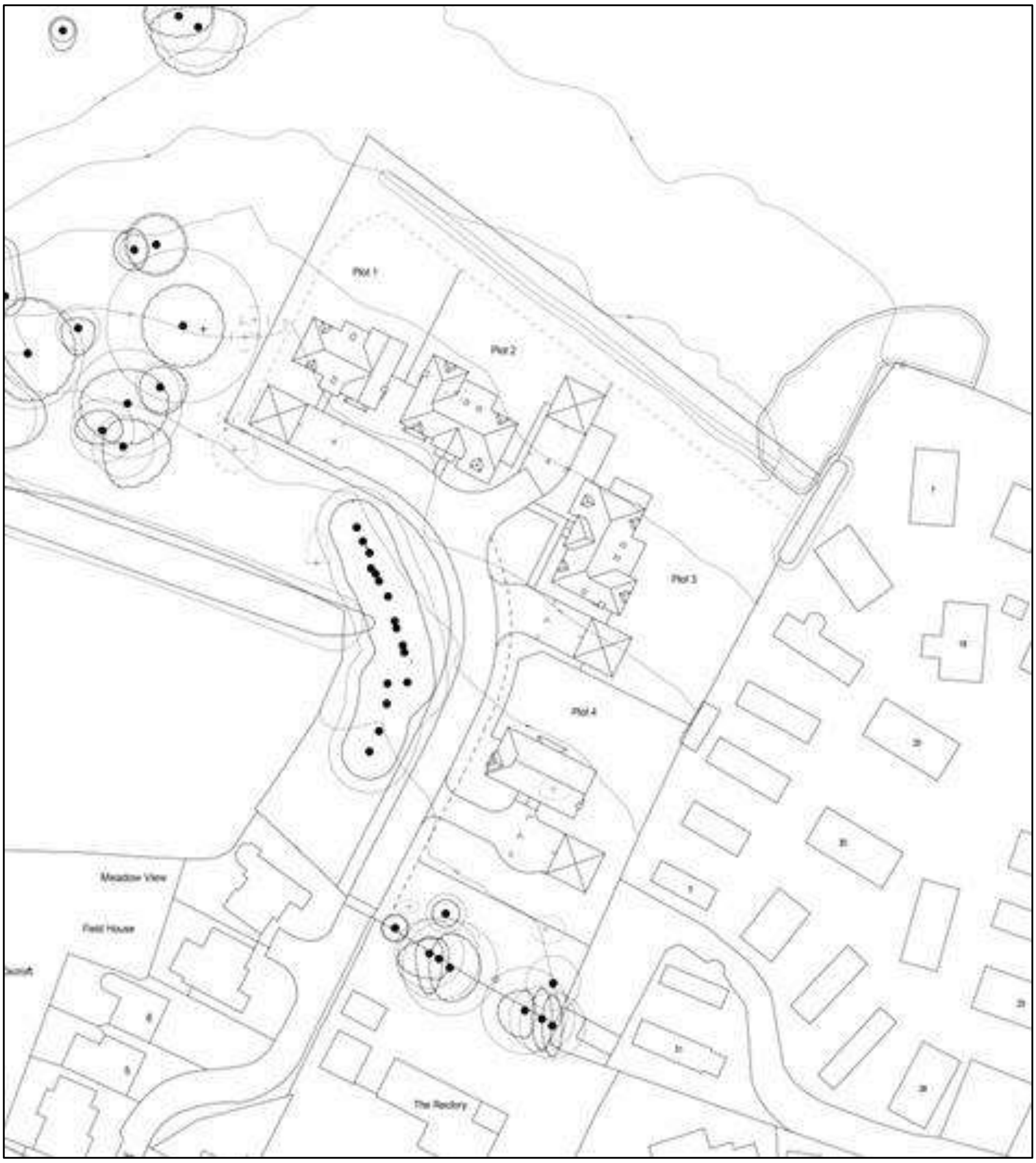
The nearest key surface water feature is the River Adur which lies 220m west of the Site. However, several surface water drains and streams feeding the River Adur are present surrounding the Site including immediately north, 105m east and 120m west of the land ownership boundary. The drains located to the north of the site are indicative of the change in bedrock from a highly permeable chalk to a more impermeable mudstone.

The Site lies does not lie within a specific WFD surface water body catchment, but does lie within the Adur Upper Operational Catchment.

3. Proposed Development

The Proposed Development comprises the erection of 4No. dwellings, with access from Church Farm Walk. An illustrative masterplan of the proposed development has been supplied to Aqua Terra and is presented in Figure 3-1. More detailed plans are provided in Appendix B.

Figure 3-1 Illustrative masterplan



Source: Paul Hewett (December 2025)

4. Flood risk to the proposed development

4.1. Fluvial and tidal

The EA's Flood Map for Planning (see Figure 4-1) indicates that the River Adur floodplain extends to the west and north of the Site, however not over the Site, and the Site is within Flood Zone 1. The flood zones including an assessment of Climate change (see Figure 4-2) indicate that the proposed area for development remains outside of the defended flood zones, with the undefended flood zone extending over the proposed swale along the northern boundary of the Site.

Flood defences along the River Adur are substantial, and raised above the surrounding land. Adjacent to the Site, the defences have a crest level of 4.47m aOD, approximately 3m above the floodplain ground levels, and a 100 year standard of protection.

Product 4 Flood Risk Data has been received from the EA for the Site (see Appendix C) and provides modelled flood levels for a range of scenarios. The flood levels have been summarised in Table 4-1 based on Node 3 provided by the EA as the closest node to areas that are proposed to be developed, that is within the flood extents for most events. Due to the extensive floodplain, levels are reasonably consistent, and it considered acceptable to use this point to provide indicative levels at the Site.

Table 4-1 EA Modelled flood levels

Scenario	Fluvial Flood level (m aOD)				Tidal Flood level (m aOD)		
	1%	1% + CC (37%)	1% + CC (55%)	1% + CC (107%)	0.5%	0.5% (2067)	0.5% (2117)
Fluvial Undefended	3.96	4.62	4.87	5.51			
Fluvial Defended	-	4.76	5.07	5.72			
Tidal Undefended					-	3.74	4.17
Tidal Defended					-	-	-

The modelled flood levels indicate that the fluvial defended scenario provides the worst-case, however the flood map, including an allowance for climate change (see Figure 4-2) which is based on the 0.1% AEP extents, suggests that the undefended scenario is worst-case. The difference is likely to be due to how during smaller events, a defended scenario when only some defences are overtopped can lead to higher water levels where those defence are overtopped, than if flood waters were allowed to spill over the full floodplain (as in the undefended scenario). For larger events more defences are overtopped, and therefore that difference diminishes, and the more typical scenario of the undefended extents being larger is observed.

Minimum ground levels for all residential built elements (including access road and gardens, excluding SuDS features) is 5.37m aOD, and the minimum for all built development (including SuDS features) is 5.04m aOD, and therefore based on the EA modelled data, and the Flood Zones incorporating climate change, all residential built elements are free from flooding up to the 1% + 55% CC, and during the 0.1% AEP with climate change (Central estimate for 2080s – 37%). The SuDS features are free from flooding up to the 1% + 37% CC scenario (both defended and undefended) , and during the 0.1% with climate change defended scenario. The SuDS features are however at risk of flooding during the 0.1% with climate change undefended scenario based on the EA Flood Zone data. This scenario represents an unlikely case whereby all defences along the River Adur are removed.

The proposed built development may be at risk of flooding during the 1% + 107% CC scenario which relates to the upper end climate change allowance for the 2080s.

The Flood risk assessment climate change allowance guidance indicates that for 'more vulnerable' development the central allowance should be used (37% increase). It is therefore considered that the proposed residential built areas are within Flood Zone 1 and at very low risk of fluvial and tidal flooding. Notwithstanding the above, the minimum ground elevation at proposed dwellings is 6.00m aOD, and therefore all dwellings will remain flood free in even the most extreme scenario modelled (1% + 107% CC).

Figure 4-1 Risk of Flooding from Rivers and Sea (present day)

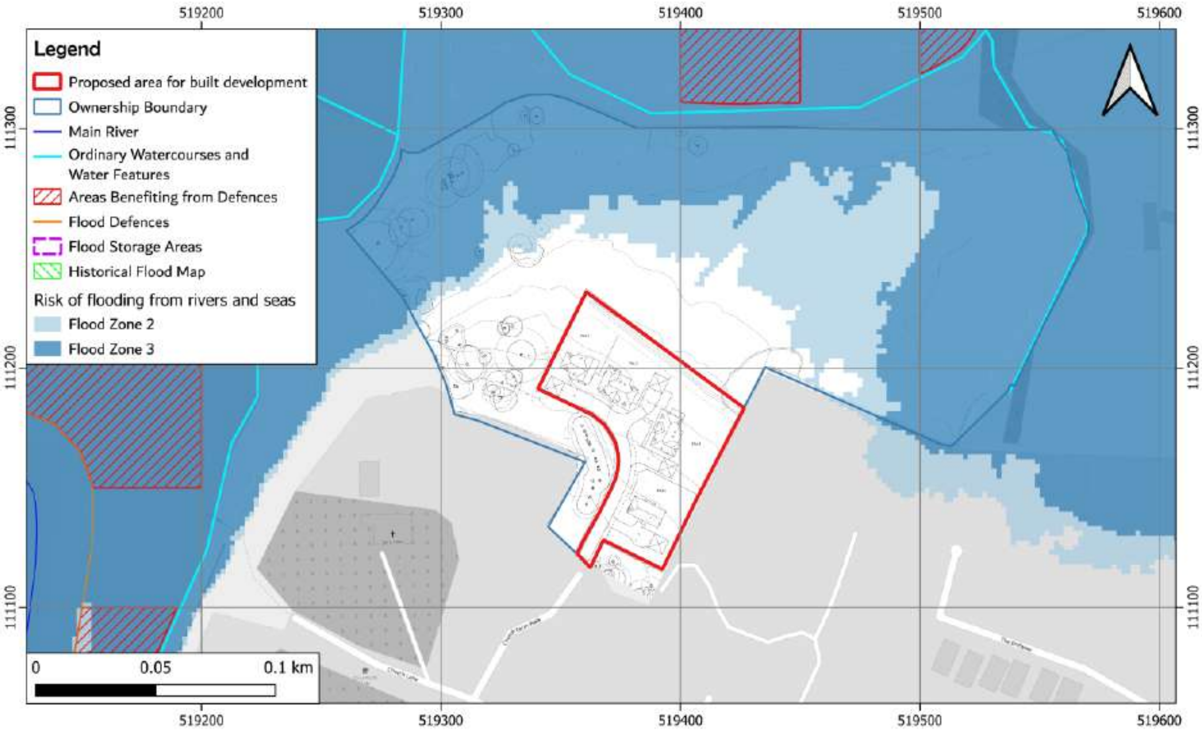
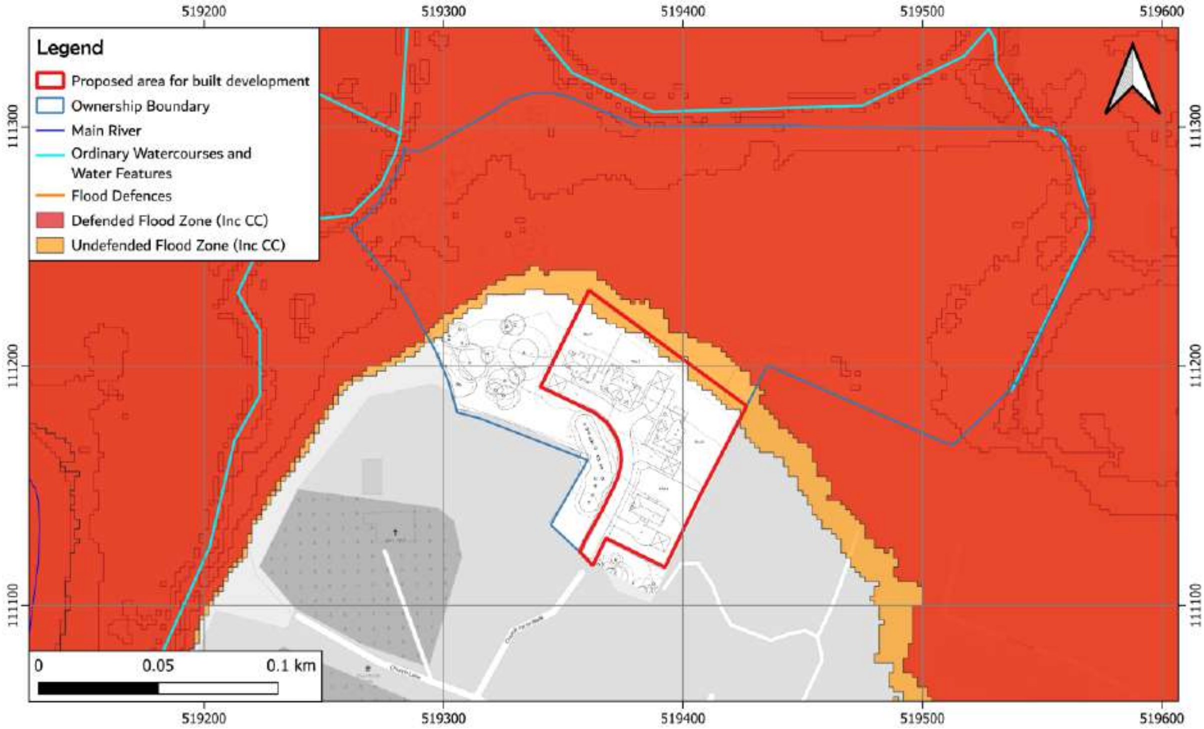


Figure 4-2 Risk of Flooding from Rivers and Sea (0.1% AEP with 37% Climate Change allowance)

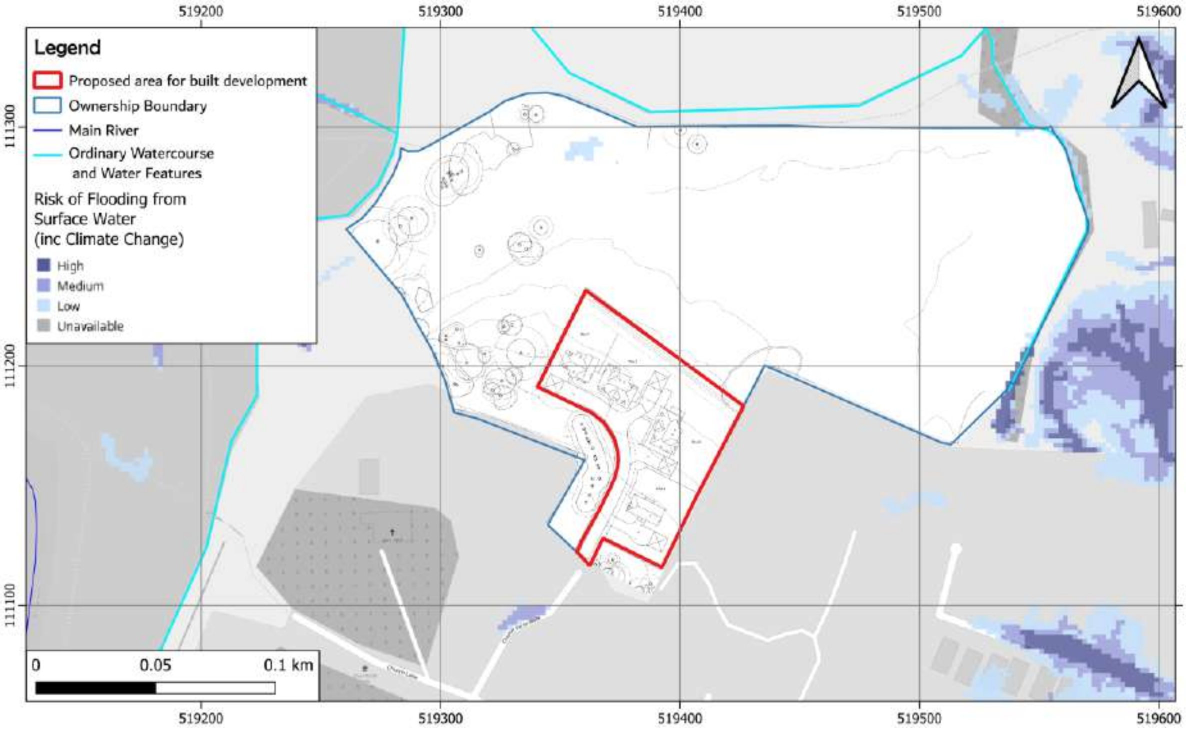


4.2. Surface water

Surface water (pluvial) flooding is usually associated with extreme rainfall events but may also occur when rain falls on land that is already saturated or has a low permeability. Rainfall that is unable to infiltrate into the ground generates overland flow which can lead to flooding or 'ponding' in localised topographical depressions before the runoff is able to enter local drainage systems and watercourses.

The EA's Risk of Flooding from Surface Water (RoFSW) flood map, updated in February 2025 to account for climate change, is shown in Figure 4-3. No Surface water flood risk is present within the area proposed for development, and there are some very small isolated 'Low' risk areas within the north of the Ownership extent. The Site is considered to be at very low risk of surface water flooding.

Figure 4-3 Risk of Flooding from Surface Water

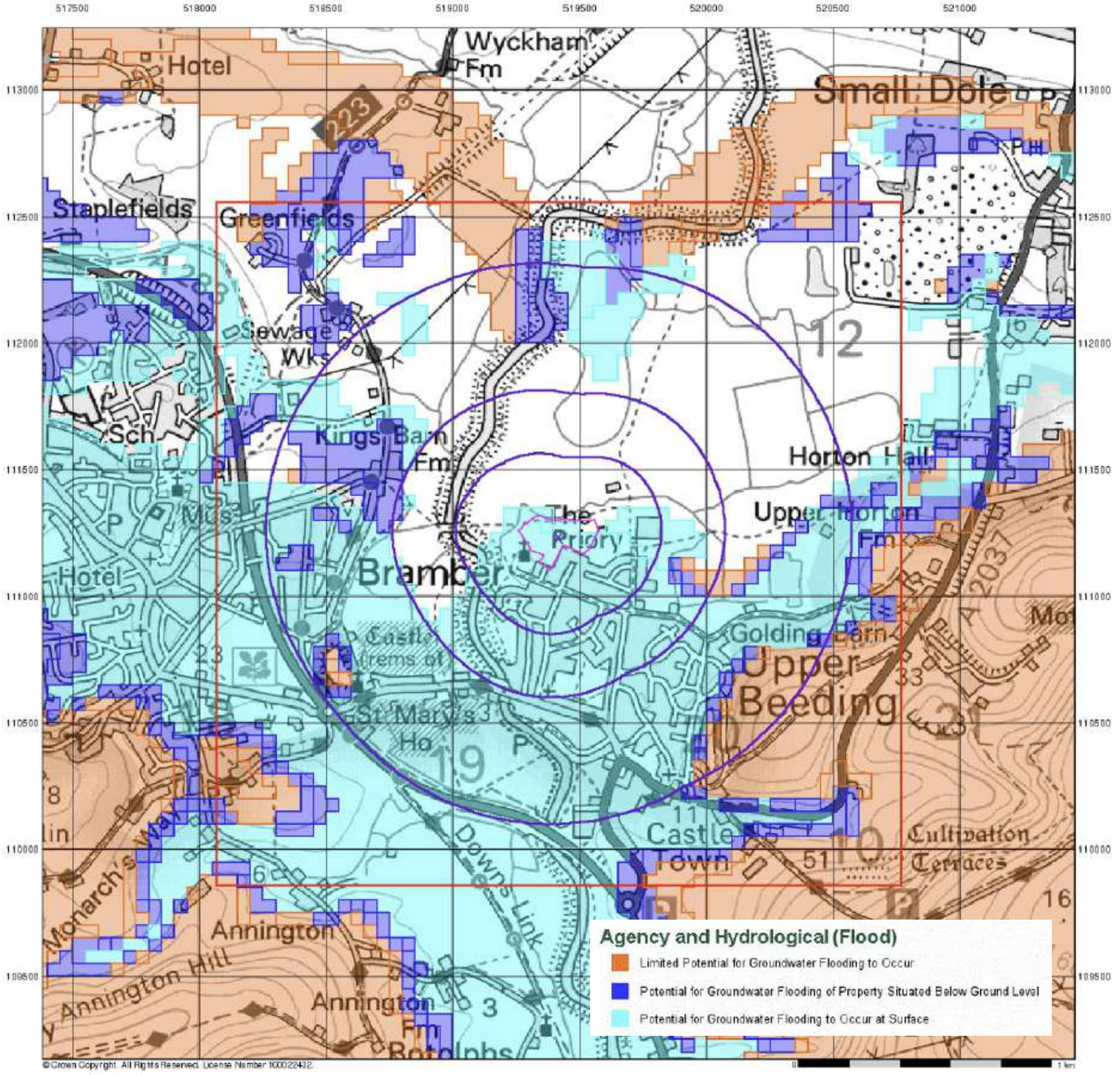


4.3. Groundwater

Groundwater flooding occurs when the water table rises above the surface elevation (or the floor of sub-surface structures).

The Horsham Strategic Flood Risk Assessment (AECOM, 2020) indicates that the area is on a transition between an area of High groundwater flood risk to the south, and an area of low risk to the north. Envirocheck assessment (see Figure 4-4 - sourced from BGS Flood GFS Data) also confirms that the Site is within an area where there is potential for groundwater flooding to occur at the surface.

Figure 4-4 Flood Risk from Groundwater



Source: Envirocheck

4.4. Sewer flooding

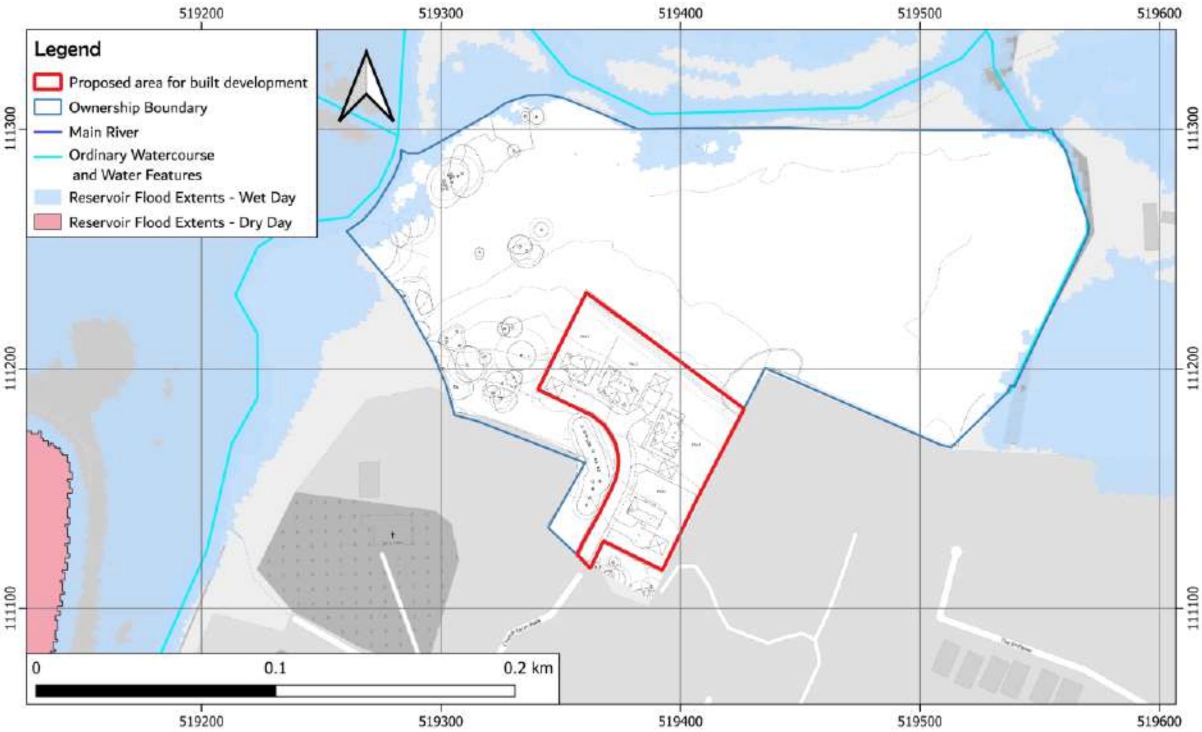
Sewer flooding can occur during periods of intense rainfall and /or if a sewer becomes blocked with debris. Whilst the Site is crossed by a sewer there is currently no connection on the Site to this network.

It has not been possible to obtain detailed sewer flooding records for the area, however the Horsham District Council SFRA Level 1 report suggests there were between 21 and 30 sewer flooding incidents recorded between 2014 and 2024 within postcode area BN44, which includes the urban areas of Steyning, and Upper Beeding in addition to several other smaller villages.

4.5. Catastrophic failures

This section considers catastrophic failures of water bearing infrastructure in the area of interest. The data.gov.uk datasets suggest no risk of catastrophic flooding from reservoir failure within the proposed area for development, however some risk within the Adur floodplain in the far reaches of the ownership extent (see Figure 4-5).

Figure 4-5 Flood Risk from Reservoir Failure



4.6. Historical flooding

There are no recorded flood outlines for the area, and the EA have stated that they do not have past flooding data for this location.

5. Flood Risk Mitigation Measures

The NPPF states that:

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

The proposed area for built development lies entirely within Flood Zone 1 (low probability) now and in the future, and outside of any areas of surface water flood risk now and in the future. The proposed swale is partially located within the undefended 0.1% AEP with climate change extents. However, as this is protected by off-Site defences which are legally required to be maintained, this may be considered to be a residual risk from defence failure only. No land raising is proposed in this area, and this scenario is not considered to be representative of likely risk of flooding now or in the future. Therefore in accordance with the NPPF, the Sequential Test is not required.

To meet the PPG requirements, the proposed development will be considered appropriate in this location provided the following conditions are met:

- Remains safe in times of flooding whilst taking climate change into account;
- Does not result in a net loss of floodplain storage;
- Does not impede existing water flow pathways; and,
- Does not increase the volume and rate of surface water runoff leaving a site over its intended design lifetime.

5.1. Remain safe in times of flooding

The only potential risk of flooding to the Site is from groundwater. It is recommended that floor levels are raised a minimum of 150mm above external levels. This should ensure that, based on Site topographic levels, any groundwater which emerges at the surface will flow northwards off-Site and not create a flood risk. Additional mitigation measures relating to the groundwater flood risk include:

- Impermeable membrane / solid concrete slabs under buildings.
- Appropriate foundation design for potentially high water tables.

5.2. No net loss of floodplain storage or impediment to flow paths

The proposed development will not result in a net loss of floodplain storage, or impede existing water flow pathways based on the very low risk from fluvial, tidal and surface water flooding.

The proposed swale within the undefended 0.1% AEP with climate change extents will not require land raising although some minor levelling may be required to maintain a consistent crest level along the length of the swale. This will be minimised through contouring the swale along the line of the existing ground levels. The PPG states that "*Loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal*". It is therefore considered that as the only flood risk to the swale is during the undefended scenario this minor levelling is acceptable.

5.3. No increase in volume and rate of surface water runoff

The following stipulations are provided in the EA guidance for managing rainfall runoff:

- Stormwater runoff rates and volumes discharged from urban developments should approximate to the Site greenfield response over a range of storm frequencies of occurrence (return periods).
- Runoff for extreme events should be managed on-Site. This requires:
  - The peak rate of stormwater run-off to be limited.
  - The volume of run-off to be limited.
- The pollution load to receiving waters from stormwater runoff to be minimised.
- The assessment of overland flows and temporary flood storage across the Site.

Section 6 describes the drainage strategy for the Site, which is designed in such a way as to prevent an increase in runoff rates from the Site under a range of design storm scenarios. This includes suitable allowances for future increases in rainfall intensity caused by climate change.

Due to the likelihood of high groundwater levels it has not been possible to limit the volume of run-off to greenfield volumes, however in line with the National standards for sustainable drainage systems (SuDS) runoff rates will be limited to the 50% AEP greenfield runoff rate (or 3 l/s/ha, whichever is greater) for all events up to and including the design event (1% AEP with 45% Climate change).

The Drainage Strategy also assesses measures for ensuring pollution load to receiving water courses from stormwater runoff are minimised and an assessment of overland flows and temporary flood storage across the Site.

6. Drainage Strategy

The NPPF stipulates that all new developments must be "safe, without increasing flood risk elsewhere". The National Standards for Sustainable Drainage Systems (HM Government, 2025) expand on these principles by setting a clear hierarchy for runoff destinations and defining seven technical standards covering runoff control, management of everyday and extreme rainfall, water quality, amenity, biodiversity and consideration of structural design, construction and long-term maintenance.

The proposed drainage design is described under Section 6.1 with subsequent sections covering each of the 7 standards that are required to be demonstrated for all SuDS schemes. Appendix D provides a plan of the proposed drainage scheme.

6.1. Proposed Drainage Design

A SuDS Strategy has been drafted and includes at source controls through porous paving acting as attenuation storage along the access road, leading to a swale running along the back of the proposed dwellings, before discharging to a surface drain at a controlled rate which will drain to the River Adur.

It is proposed at detailed design stage to undertake infiltration testing and groundwater monitoring to determine if discharge via infiltration is likely to be feasible (further discussed in Section 6.2.2) however due to concerns relating to (shallow) depth to groundwater a scheme has been developed that does not rely on infiltration, which is described below. If infiltration is found to be possible at detailed design stage (in particular for the dwellings in the south of the Site) reductions in swale sizes could be achieved and a reduction in discharge to surface water bodies.

6.1.1. Assessment of catchment areas

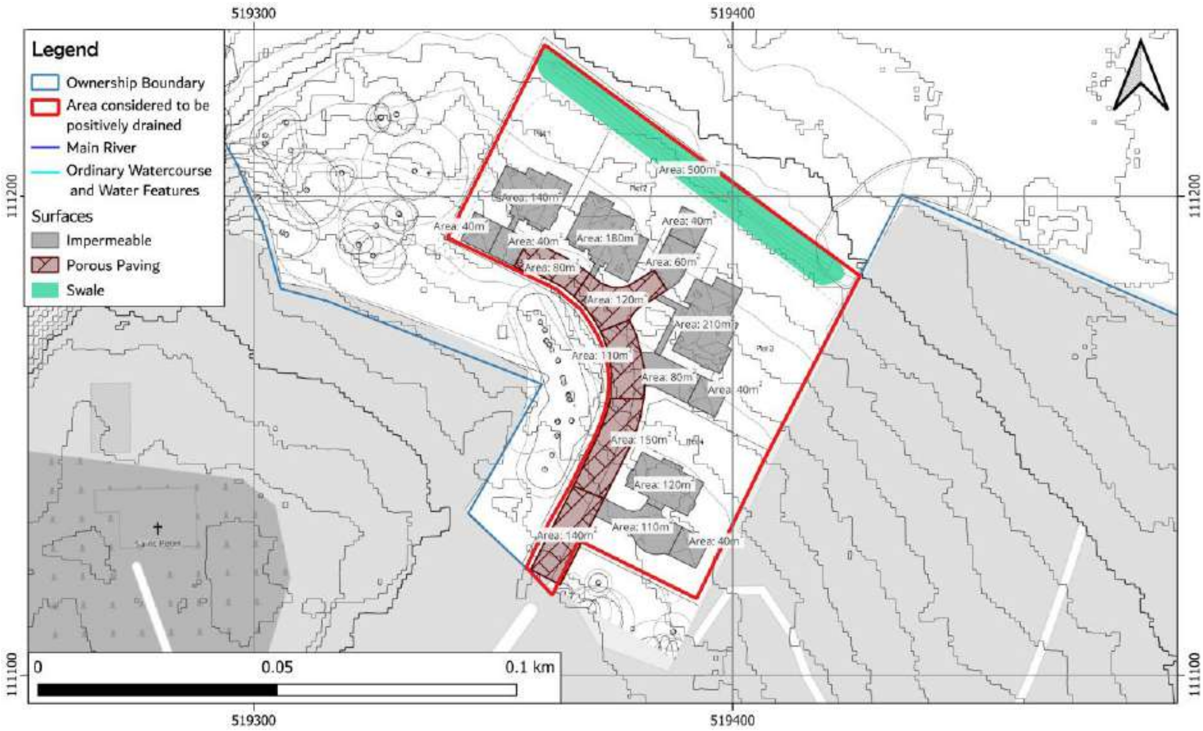
Due to the proposed design incorporating a swale along the northern boundary of the Site, it is likely that the swale will intercept all runoff, including that from permeable surfaces from the Site. The assessment has therefore considered the full area from the access road to the swale (as indicated on Figure 6-1) to be positively drained – this is an area of 0.53 ha.

GIS has been used to define the impermeable areas of Site, and a 10% urban creep allowance applied. The remaining greenfield areas have been calculated and a ReFH 2 hydrograph will be applied to the swale to represent the runoff from these areas. The swale itself has been treated as an impermeable surface with no urban creep allowance. Calculations are provided in Table 6-1, and the impermeable surfaces in Figure 6-1.

Table 6-1 Catchment area analysis

Description	Area (ha)
Impermeable developed areas	0.184
Urban creep at 10% on above areas	0.018
Swale footprint*	0.050
Total impermeable area	0.243
Total positively drained area	0.530
Remaining greenfield areas (for ReFH2 hydrograph)	0.288

Figure 6-1 Impermeable Surfaces



6.1.2. Proposed storage and control elements

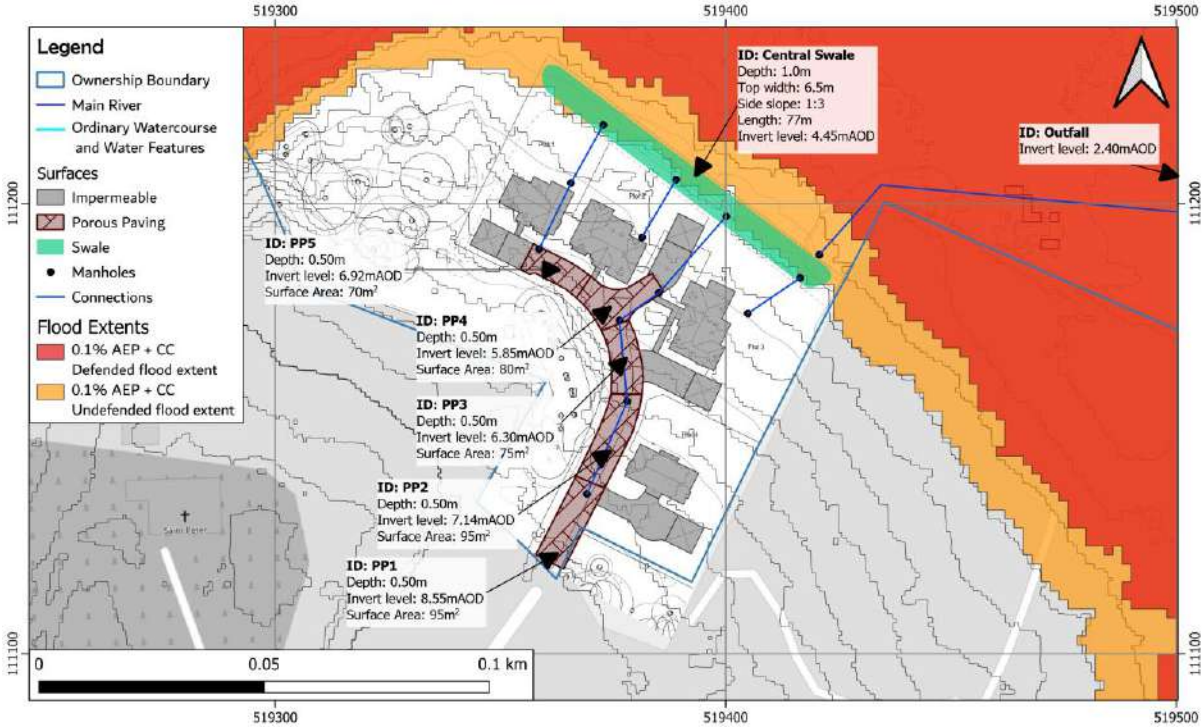
Porous paving has been proposed for low traffic roads (as indicated in Figure 6-1). Areas of porous paving have been assumed to have a 35% porosity and a depth of 0.50m. Orifices have been used as flow controls on the porous paving areas to limit flow rates passing onto downstream detention basins. Orifice dimensions are small (minimum of 20 mm) and therefore will need to be robustly protected from blockage risk as per the National SuDS Standards. As these orifices are located within the porous paving, the paving will already provide a measure of filtration. Further measures will be provided at detailed design.

A swale is proposed along the northern boundary. The swale is proposed to be 1m in depth, with a 0.4m base and 6.4m top width (1:3 slopes). The swale has a length of 77m. Discharge from the swale is controlled via hydrobrake.

As the layout plans for the Site progress, the required storage could be distributed over additional features such as rain gardens or tree pits adjacent to the larger roads to comprise a "SuDS train" within the Site.

Figure 6-2 details the location and key properties of SuDS features. Details of the modelled scheme in the form of a Causeway Flow report are provided in Appendix E.

Figure 6-2 Properties of key SuDS features



6.1.3. Performance calculation parameters

Causeway Flow has been used to model the proposed drainage design using a source control approach – therefore not all details have been provided but rather the model has been used to confirm that the overall storage provision on Site is sufficient.

Key model parameters are as follows:

- Model run for the 50%, 3.3% and 100% AEP events with a 40% and 45% allowance for climate change for the 3.3% and 100% AEP events respectively, representing the upper end peak rainfall climate change allowance for the Adur and Ouse Management Catchment.
- FEH22 rainfall profiles used, with full range of storm durations from 15 minutes to 1,440 minutes.
- Volumetric runoff coefficient set to 1 for both winter and summer storms to represent capture of all runoff from impermeable surfaces.
- No infiltration has been assumed for any of the SuDS features.
- ReFH2 hydrograph has been applied to the swale to represent runoff from permeable surfaces such as gardens.

The results from the modelling are presented under the relevant standards, with a detailed output report from Causeway Flow presented in Appendix E.

6.2. Standard 1: Runoff Destinations

Surface water runoff must be disposed of according to a hierarchy of destinations as follows:

- Priority 1: collected for non-potable use
- Priority 2: Infiltrated to ground
- Priority 3: Discharged to an above ground surface water body

- Priority 4: Discharged to a surface water sewer, or another piped surface water drainage system
- Priority 5: Discharged to a combined sewer

The suitability of each of these options is discussed below.

6.2.1. Water re-use

Water re-use (i.e. the use of water butts or more sophisticated tank systems to capture rainwater for re-use) could be implemented at the Site. These sites collect water from clean surfaces (such as rooftops) for (generally non-potable) use on Site.

Rainwater harvesting is particularly useful at Sites with a low infiltration potential and limited space for attenuation features. It also has wider sustainability benefits with regards to lowering the water supply demand. It is anticipated that water re-use will be incorporated as part of the detailed drainage design however they have not been included in the SuDS strategy to ensure the system has sufficient capacity.

6.2.2. Infiltration to ground

The Site is underlain by the White Chalk, and therefore infiltration rates may be above the recommended minimum of 1×10^{-6} m/s for relying on infiltration as a means of discharge. However due to the proximity of the Mudstone to the north of the Site, and low-lying floodplain it is likely that groundwater levels are close to surface. There is also a risk of groundwater flooding identified at the Site (see Section 4.3). Whilst it may be possible to incorporate infiltration to ground, particularly for Plot 4 which is located in the south of the Site and at a higher elevation, the drainage strategy has conservatively assumed that this will not be possible, and infiltration rates have been set to 0.

It is recommended that at detailed design infiltration testing and groundwater monitoring over a winter period is undertaken across the Site to determine if infiltration, particularly in the south of the Site, is possible. If infiltration is found to be feasible then the porous paving in the south could be unlined, and a plot soakaway provided for all plots where infiltration will be feasible. This will not change the overall design of the scheme, but may allow the size of the swale, and discharge to surface water body to be reduced.

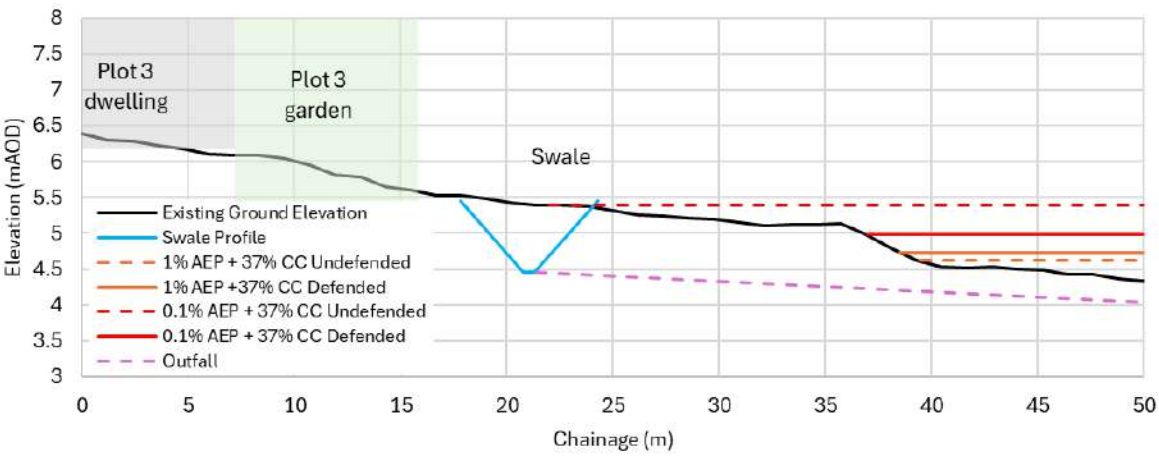
6.2.3. Discharge to surface water body

Discharge of runoff at restricted rates to the drain (see Figure 6-3) located to the north-east of the Site, and onto the River Adur is a feasible destination for surface runoff from the Site. The drain runs along the eastern boundary of the land ownership and is 140m away from the Site boundary. It is recommended that the open drain is extended to the Site to allow for a surface discharge option, rather than relying on a piped discharge across the field. A condition survey of the drain should be undertaken to confirm that water can freely flow within the drain without obstruction.

Figure 6-4 shows a cross-section profiles through the swale and towards the outfall drain (which has an invert of 2.4m aOD). This demonstrates that the proposed elevations for the swale will allow discharge to the drain. There is potential for the outfall to become surcharged due to fluvial flooding of the land to the north of the Site. An additional model run has been undertaken with a surcharged outfall at a level of 4.76m aOD which corresponds to the fluvial flood level for the 1% AEP with 35% CC (Central estimate). This run (see Appendix F) demonstrates that the surcharged outfall scenario results in flooding from the swale of 33.3m^3. Flooding from the swale would spill into the field to the north, which would already be inundated due to the fluvial event. The additional volume spilling from the basin would be offset by a reduction in flow out of the outfall (which would otherwise also be contributing to the same hydrologically linked area of flooding). Conservatively assuming that the additional flood water (with no offset for a reduction in flow through the outflow) would spread out over only the extent of flood zone 2 that is within the land ownership boundary (approximately 1.5 ha), this results in a less than 2mm increase in flood depths.

Figure 6-3 Photo of drain on eastern boundary of land ownership

Figure 6-4 Cross-section profile through swale



6.2.4. Discharge to surface water drains and/or combined drain

Given the likely feasibility of discharging to a surface water body, this option would unlikely be used in this instance.

6.3. Standard 2: Management of everyday rainfall

Drainage schemes should ensure that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems. Runoff from positively drained surfaces, for at least 5mm of rainfall must either be collected for use, infiltrated into the ground, or else captured, conveyed and stored within SuDS features where these features will naturally absorb or retain runoff and therefore not discharge off the Site.

If infiltration is feasible at the Site then the management of everyday rainfall will be readily achieved via infiltration from the areas of porous paving, and infiltration from the swale.

If however infiltration across the Site is not possible, or the swale in the lower portion of the Site is required to be lined to prevent groundwater ingress then managing the first 5mm of rainfall through infiltration alone will not be possible.

Table 6-2 details the potential scenarios relating to infiltration feasibility, and how everyday rainfall will be managed in each scenario based on the interception measures provided in the National SuDS standards.

The base area of the swale is relatively small (38.5m^2) in order to maximise the storage volume, and therefore, particularly if lined will provide limited compliance (192m^2). It is therefore likely that unless infiltration is possible across the whole Site, then rainwater harvesting measures, compliant to BS EN 16941, will be required.

Table 6-2 Management of everyday rainfall

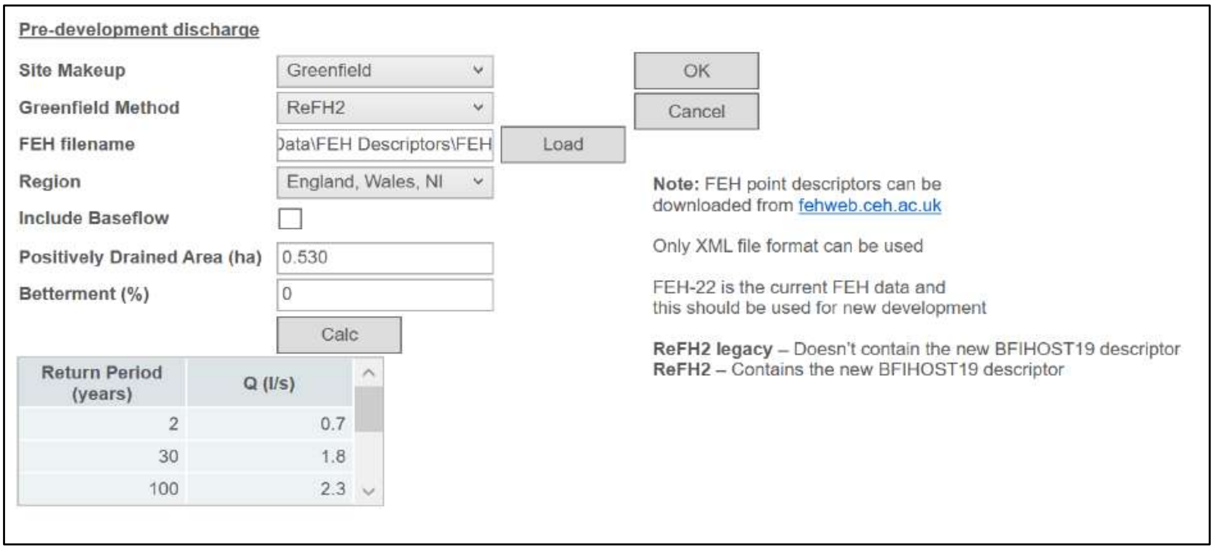
Scenario	Measures for ensuring management of everyday rainfall
Infiltration possible across the Site. No lining of features required	Infiltration from porous paving areas will provide compliance for up to 5 times the permeable surface area. Swale will provide interception for impermeable surfaces up to 25 times the base area Outfall from swale will be raised above invert of swale to ensure compliance for impermeable areas draining within 5 m from the swale outlet, and any residual non-compliant surfaces
Infiltration possible in south of Site, however swale required to be lined to prevent groundwater ingress	Infiltration from porous paving areas in south of Site will provide compliance for up to 5 times the permeable surface area. Swale to provide compliance for up to 5 times the base area. Rainwater harvesting measures required for residential runoff from plots 1, 2 and 3 (Plot 4 drained entirely via porous paving)
No infiltration possible across the Site and all features lined	Porous paving areas will not provide any compliance as they receive runoff from contributing impermeable areas. Swale to provide compliance for up to 5 times the base area. Rainwater harvesting measures required for residential runoff from plots 1, 2, 3 and 4

6.4. Standard 3: Management of extreme rainfall and flooding

6.4.1. Greenfield runoff rates and volumes

The total positively drained area for the Site is 0.53ha. The ReFH2 method (Using FEH22 rainfall model) has been utilised to estimate the greenfield runoff rates for the Site (see Figure 6-5).

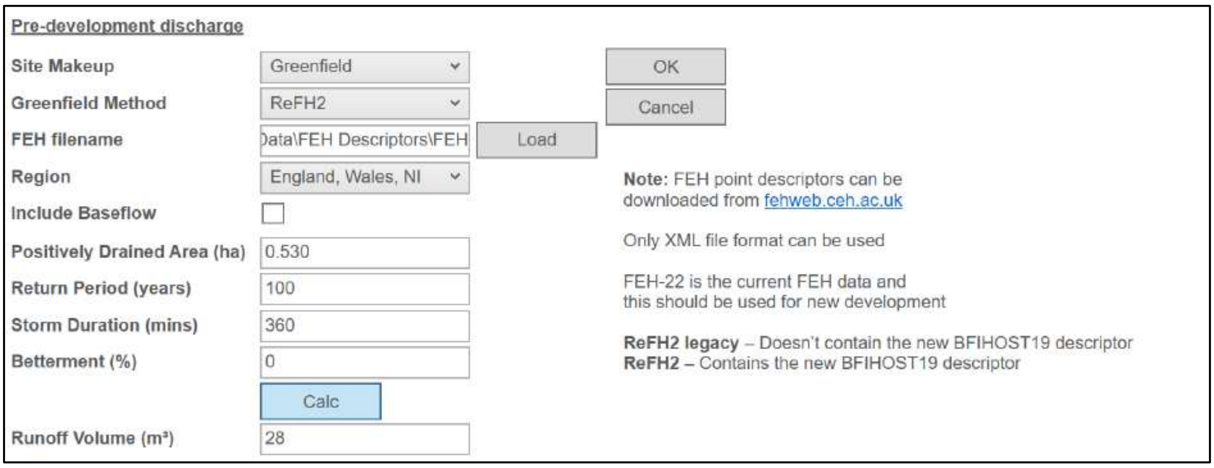
Figure 6-5 Greenfield Runoff Rates



Due to infiltration potentially not being feasible at the Site, the volume of runoff discharged from the proposed development for the 1% AEP, 6 hour rainfall event will be greater than the volume of greenfield runoff for the same rainfall event. Therefore the peak allowable discharge rate from the development for all events up to and including the 1% AEP with Climate change is the 50% AEP greenfield runoff rate (0.7l/s) based on the National Standards for SuDS, or 3 l/s/ha whichever is greatest. In this case 3 l/s/ha is 1.6 l/s and is the greater of the two and has been used as the discharge limit.

The Greenfield runoff volume for the Site for the 1% AEP, 6 hour storm duration event has also been calculated and is presented in Figure 6-6.

Figure 6-6 Greenfield Runoff Volume



6.5. Performance assessment

The principal SuDS features have been modelled using Causeway Flow software to ensure there is sufficient storage volume within the system and discharge rates can be limited to the 50% AEP greenfield runoff rates.

Table 6-3 and Table 6-4 summarise the model results at the SuDS features for the 3.3% AEP +40% and 1% AEP + 45% scenarios. This confirms that, based on the parameters described above, the proposed drainage scheme will be able to attenuate and discharge runoff to greenfield runoff rates for both events.

Detailed model outputs are provided in Appendix E.

Table 6-3 Summary of 1 in 30 year + 40% climate change model results

Feature name	Critical storm	Peak water depth[1] (m aOD)	Peak outflow (l/s)	Flood Risk Status
PP1	60 Min: Winter	0.316	2.5	OK
PP2	60 Min: Summer	0.274	3.0	OK
PP3	60 Min: Winter	0.324	1.7	OK
PP4	120 Min: Summer	0.199	0.7	OK
PP5	120 Min: Summer	0.215	1.0	OK
Swale	720 Min: Winter	0.831	1.5	FLOOD RISK
Total Discharge			**1.5**	

Table 6-4 Summary of 1 in 100 year + 45% climate change model results

Feature name	Critical storm	Peak water depth (m aOD)	Peak outflow (l/s)	Flood Risk Status
PP1	60 Min: Winter	0.443	2.6	OK
PP2	60 Min: Summer	0.384	3.1	OK
PP3	60 Min: Winter	0.459	1.9	FLOOD RISK
PP4	120 Min: Summer	0.267	0.7	OK
PP5	120 Min: Summer	0.321	1.0	OK
Swale	960 Min: Summer	0.995	1.6	FLOOD RISK
Total Discharge			**1.6**	

6.5.1. Exceedance flow paths

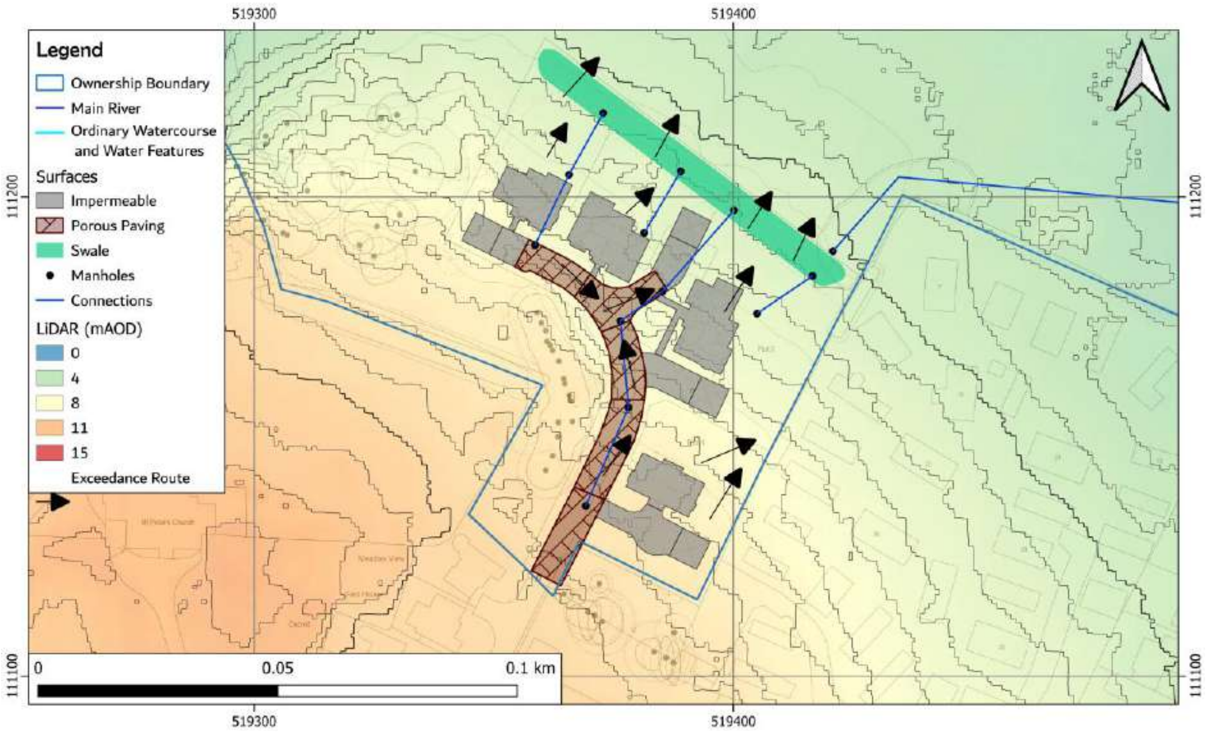
Whilst the strategy has aimed to ensure no flooding during the extreme 1 in 100 year + 45% climate change scenario, there is always a residual risk that flooding may occur for example due to more extreme events or blockage of structures. Under these conditions, exceedance flows will be designed to follow the existing preferential surface water flow paths towards the north of the Site, via the road network. Raised kerbs or bunds will be created along roads to direct flows where required. Flow will

[1] Calculated as peak level – feature invert level. Note this is different to the depth reported in Causeway which uses the invert of the manhole not the storage feature.

be directed towards the swale where any remaining capacity can be utilised, before spilling to the open fields to the north of the swale.

Very high level exceedance flow directions are illustrated in Figure 6-7 based on topographic data. A more detailed analysis of exceedance flows will be undertaken during as part of the detailed drainage strategy.

Figure 6-7 Exceedance flow routes



6.6. Standard 4: Water Quality

SuDS techniques can be used to effectively manage the quality of surface water flowing across a site. Different methods can be used to intercept pollutants and allow them to degrade or be stored in-situ without impacting the quality of water further downstream. Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5mm to 10mm of rainfall (i.e. the 'first flush') should be adequately treated using SuDS.

The proposed development will primarily consist of residential dwellings, low traffic roads and driveways. The CIRIA SuDS manual categorises runoff from residential dwellings as presenting a very low water quality hazard and runoff from low usage roads and residential driveways as presenting a low hazard rating (see Table 6-5).

Table 6-5 Water quality hazard ratings (CIRIA, 2015)

Land use	Hazard level
Residential roof drainage	Very low
Residential, amenity uses including low usage car parking spaces and roads, other roof drainage . Non-residential car parking with infrequent change (<e.g. schools, offices, i.e. < 300 traffic movements/day)	Low
Commercial uses including car parking spaces and roads (e.g. hospitals, retail, excluding low usage roads, trunk roads and motorways)	Medium
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemical and fuels (other than domestic fuel oil) are delivered, handled, stored used or manufactured, industrial sites	High
Trunk roads and motorways	High

The CIRIA SuDS manual (CIRIA, 2015) advocates a qualitative approach to designing a SuDS scheme for a site with a low hazard rating. This should provide adequate controls on pollutants contained in runoff water.

As the proposed development is predominantly residential in nature with a low hazard rating, hazard indices of 0.5 for Total Suspended Solids (TSS), 0.4 for Metals and 0.4 for Hydrocarbons are considered applicable.

The measures detailed in Table 6-6 are examples which are suitable for inclusion in a drainage strategy for a residential development to mitigate a potential increase in pollutant load within on-site and off-site runoff – note text in bold are measures included in this SuDS Strategy. Removal indices are included for each feature type relative to the specific pollutant.

Table 6-6 Mitigation indices for SuDS components

Component type	TSS	Metals	Hydrocarbons
Filter drain	0.4	0.4	0.4
Swale	**0.5**	**0.6**	**0.6**
Permeable paving	**0.7**	**0.6**	**0.7**
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5

The inclusion of detention basins within the SuDS strategy for the Site will provide adequate treatment to mitigate the low hazard associated with runoff from the development provided all runoff flows through at least one of these components (as per the SuDS strategy), and most passing through both permeable paving and detention basins. Causeway Fow has been used to model the water quality indices, and demonstrates that at the outfall sufficient mitigation has been provided (Appendix E).

Sediment traps (i.e. sumps within the inspection chambers of the final manhole upstream of each feature) will be used to facilitate the maintenance of these SuDS features and reduce the build-up of potentially polluted material.

6.7. Standard 5 & 6: Amenity and Biodiversity

SuDS schemes present opportunities to enhance habitat for wildlife on-site and this often improves the biodiversity of the surrounding areas. Ponds, constructed wetlands and other surface water features are landscape assets that have amenity value and improve the aesthetics of a site more than conventional drainage systems.

The use of the swale along the northern boundary of the Site will provide opportunity for native planting within the swale and thereby both provide additional habitat potential and increase the visual impact of the features. The swale will be maintained by a management company ensuring that they remain in good condition. Further details of the planting will be provided in the detailed drainage strategy and landscape reports.

6.8. Standard 7: Design of drainage for construction, operation, maintenance, decommissioning and structural integrity

The Construction (Design and Management) Regulations 2015 include requirements for designers to take account of the health and safety risks associated with the construction, operation and maintenance and decommissioning of the drainage system to minimise these risk as far as reasonably practicable.

SuDS features should be built and operated in accordance with guidance outlined in the CiRIA SuDS Manual.

The drainage design can be delivered as a gravity fed system which reduces the reliance on mechanical systems and the cost of operation.

6.8.1. Maintenance Schedules

Inspection and long-term maintenance of SuDS components ensure efficient operation and prevents failure. Management of the surface water drainage system will be undertaken by a Management Company.

This section outlines the maintenance and management schedules for the proposed drainage system. The schedules have been formulated in line with guidelines contained within the CIRIA SuDS Manual (CIRIA, 2015). There are three categories of maintenance activities referred to in this report, although not all are required for each SuDS feature:

- **Regular maintenance** – tasks which are required to be undertaken on a weekly or monthly basis, or as required.
- **Occasional maintenance** – tasks which are required to be undertaken periodically, typically at intervals of three months or more.
- **Remedial maintenance** – tasks which are not required on a regular basis but are done when necessary.

This section is intended to give an overview of the operation and maintenance for the range of drainage features included within the surface water drainage strategy and in relation to typical/ standard details only.

Maintenance schedules for the proposed SuDS components are provided in the following tables. These schedules are not exhaustive and should be reassessed at regular intervals to determine if any additional maintenance requirements are required to preserve the performance and condition of the drainage system.

Table 6-7 Maintenance for pipes and manholes

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove any accumulation of silt, sediment, leaves and debris etc	Monthly, or as required
	Inspect for evidence of poor operation	Monthly (during the first year), then half yearly
Occasional maintenance	High pressure water jet removal of silt build-up and avoid blockages, particularly at bends or changes in direction	Six monthly, or as required
	Remove or control tree roots where they are encroaching pipe runs, using recommended methods	As required
Remedial actions	Clear pipework and gully grates of blockages	As required
	Replace any damaged or failed pipes, gullies or manholes	As required

Table 6-8 Maintenance for pervious pavements

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeks by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration

Maintenance schedule	Required action	Frequency
		performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 6-9 Maintenance for swales

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly (or as required)
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter stripe	As required

Maintenance schedule	Required action	Frequency
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 6-10 Maintenance for control devices

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect/check pipework to ensure that the flow control is in good condition and operating as designed	Monthly
	Inspect for evidence of poor operation	Monthly, or as required
Occasional maintenance	High pressure water jet removal of silt build-up	Six monthly, or as required
Remedial actions	Clear pipework of blockages	As required
	Replace the flow control if it becomes damaged	As required

6.9. Further SuDS considerations

The detailed design strategy should include:

- Infiltration testing and groundwater monitoring across the Site to determine if infiltration is possible.
- Means of ensuring that small orifices (<0.05m diameter) are robustly protected from blockage.
- Consideration of rainwater harvesting calculations to support interception of the first 5mm of rainfall, particularly if infiltration is not feasible within the northern portion of the Site.
- Planting proposals for the swale to enhance biodiversity and amenity.

7. Foul Drainage

Foul water from the proposed development will be managed through a connection to the public foul sewerage network. A capacity check is underway with Southern Water the statutory undertaker responsible for foul water drainage services.

It is likely that foul network connections are present along Church Farm Walk to which the proposed development could connect to, however these are up-slope of the proposed units and therefore a pumped solution would be required.

A formal S106 application will be required to be completed and approved by Southern Water prior to a connection being made. No surface water will be discharged into the foul sewer network.

8. Conclusions

The Proposed Development for 4No. dwellings on a parcel of land at Church Farm, Upper Beeding, lies within an area of overall low flood risk. Flood zones associated with the River Adur extend onto the northern edge of the Site during the extreme (0.1% AEP event) during the undefended scenario when climate change is considered, however the proposed area to be developed is not at risk during the design (1% AEP event with climate change), and within the defended Flood Zone 1 (including climate change). There is no surface water flood risk at the Site within areas that are proposed to be developed. Groundwater poses the only source of flood risk, and it is proposed that finished floor levels are raised 150 mm above surrounding ground levels to ensure that any groundwater emerging at the surface flows around dwellings.

The proposed development is classified as 'More Vulnerable' with regards to flood risk, and all development will be within Flood Zone 1.

The Site will remain safe from flooding through the raising of floor levels above potential groundwater emergence, and through the implementation of SuDS to ensure no increase in runoff rates from the Site.

A drainage strategy has been prepared for the Site which given the risk of groundwater flooding does not rely on infiltration to ground and instead proposed a discharge to a drain to the north-east of the Site, which is linked to the River Adur. Attenuation is provided on Site via porous paving on low traffic roads, and through a swale along the northern boundary of the Site. Discharge at a rate of 3/l/s/ha is proposed for all events up to the design 1% AEP with climate change event.

There is potential that infiltration, particularly in the southern portion of the Site which is at a higher elevation may be possible. It is recommended that the infiltration testing and groundwater monitoring is undertaken to determine this feasibility. If infiltration is possible, then the size of the swale may be able to be reduced. The drainage strategy has conservatively assumed no infiltration to ensure sufficient capacity is available on Site if SuDS features are required to be lined to prevent groundwater ingress.

Performance calculations to assess the storage requirements have demonstrated that the design can limit discharge to the 3 l/s/ha flow rate for both the 3.33% and 1% AEP events with climate change. the Site is not expected to require significant land raising / lowering to accommodate a gravity driven drainage system as there is a suitable gradient over the Site.

The detailed design must consider the use of rain water harvesting to ensure compliance with the national SuDS standards regarding management of everyday rainfall, and the proposed planting of the swale to enhance amenity and biodiversity.

A foul drainage capacity check is underway with Southern Water and it is likely that any sewer connection will need to be pumped.

9. References

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HM Government. (2025). *National Standards for Sustainable Drainage Systems.*

Appendix A Report conditions

Report Conditions

This report has been prepared by Aqua Terra Consultants Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

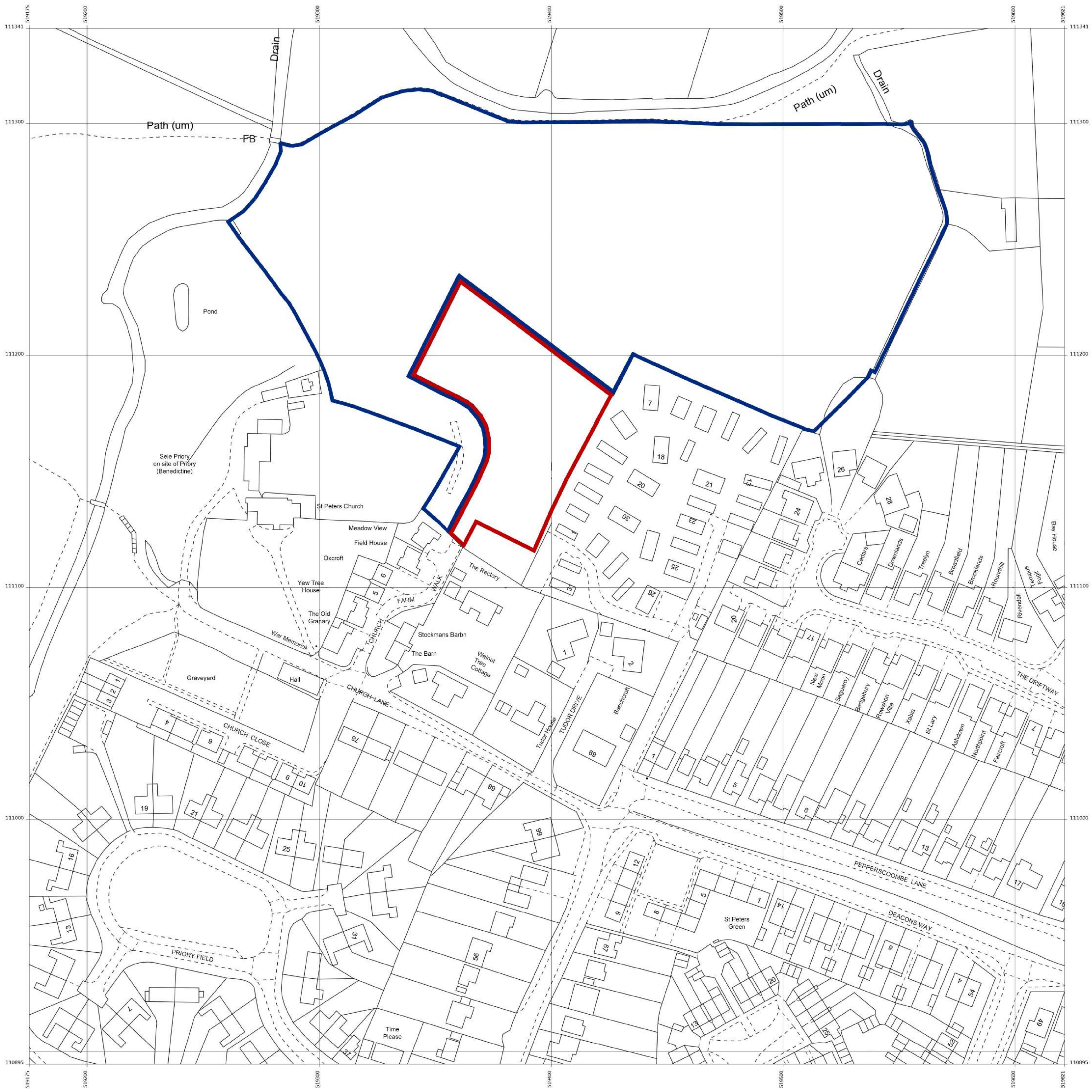
The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Aqua Terra take no responsibility for variation in ground conditions between exploratory positions.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.

Appendix B Proposed Development Plans



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Reference: OI1297180
Centre coordinates: 519398 111118

Fairfax

project:

Development at:

CHURCH FARM
CHURCH FARM WALK
UPPER BEEDING

title:

LOCATION PLAN

date:	Dec '25	scale:	1 : 1250 @ A2

drawing number:	Rev.
2517/PL.01	

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0 5 10 15 20 25 30 35 40
SCALEBAR 1 : 500

N

Fairfax

project:

Development at:

CHURCH FARM
CHURCH FARM WALK
UPPER BEEDING

title:

BLOCK PLAN - B&W

date: Dec '25 **scale:** 1 : 500 @ A1

drawing number:	**Rev.**
2517/PL.03	F

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Appendix C EA Flood Data

Flood risk assessment data

Location of site: Land off Church Farm, Upper Beeding
Document created on: 25 September 2025
This information was previously known as a product 4.
Customer reference number: EIR2025/28432

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

How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- flood defences and attributes
- information to help you assess if there is a reduced flood risk from rivers and the sea because of defences
- modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

- past floods

We do not have past flooding data for this location.

Please note that:

- flooding may have occurred that we do not have records for
- flooding can come from a range of different sources
- we can only supply flood risk data relating to floodng from rivers or the sea

You can contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

Surface water and other sources of flooding

When using the surface water map on the check your long term flood risk service the following considerations apply:

- surface water extents are suitable for use in planning
- surface water climate change scenarios may help to inform risk assessments, but the available data fall short of what is required to assess planned development
- surface water depth information should not be used for planning purposes

To find out about other factors that might affect the flood risk of this location, you should also check:

- reservoir flood risk
- groundwater flood risk - you could use the British Geological Survey groundwater flooding data, groundwater: current status and flood risk and the guide on mining and groundwater constraints for development - further information may be available from the lead local flood authority (LLFA)
- your local planning authority's SFRA, which includes future flood risk

Your Lead Local Flood Authority is West Sussex County.

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: River Adur Intertidal Model Updates
Scenario(s): Defended fluvial, Undefended fluvial, Defended tidal, Undefended tidal
Date: 2022

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

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.

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:

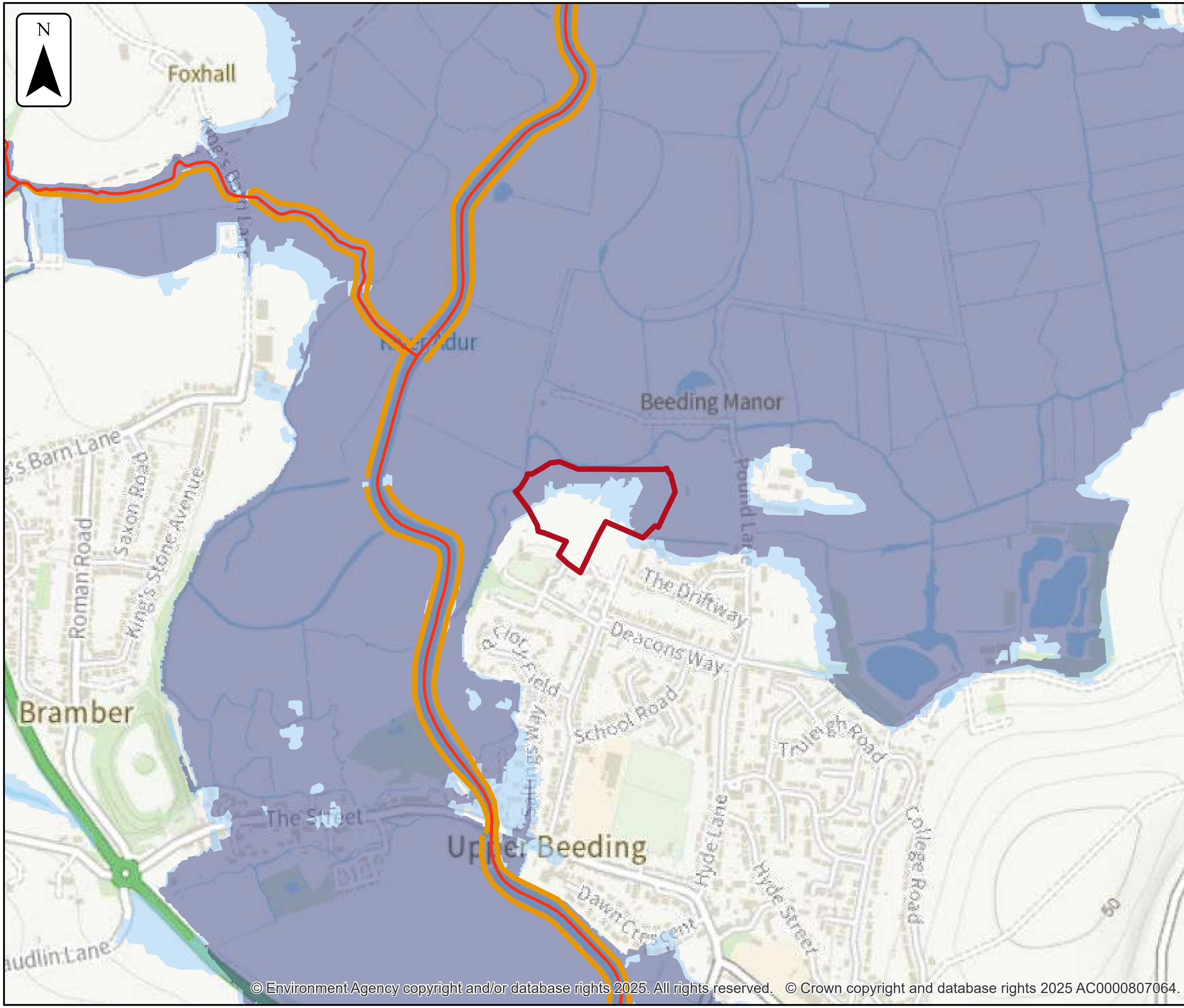
- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

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



Environment Agency

Flood map for planning

Location (easting/northing)
519414/111233

Scale
1:10,000

Created
25 Sep 2025

- Selected area
- Main river
- Flood defence
- Flood Zone 3
- Flood Zone 2

0 100 200 300 400 500
metres

Flood defences and attributes

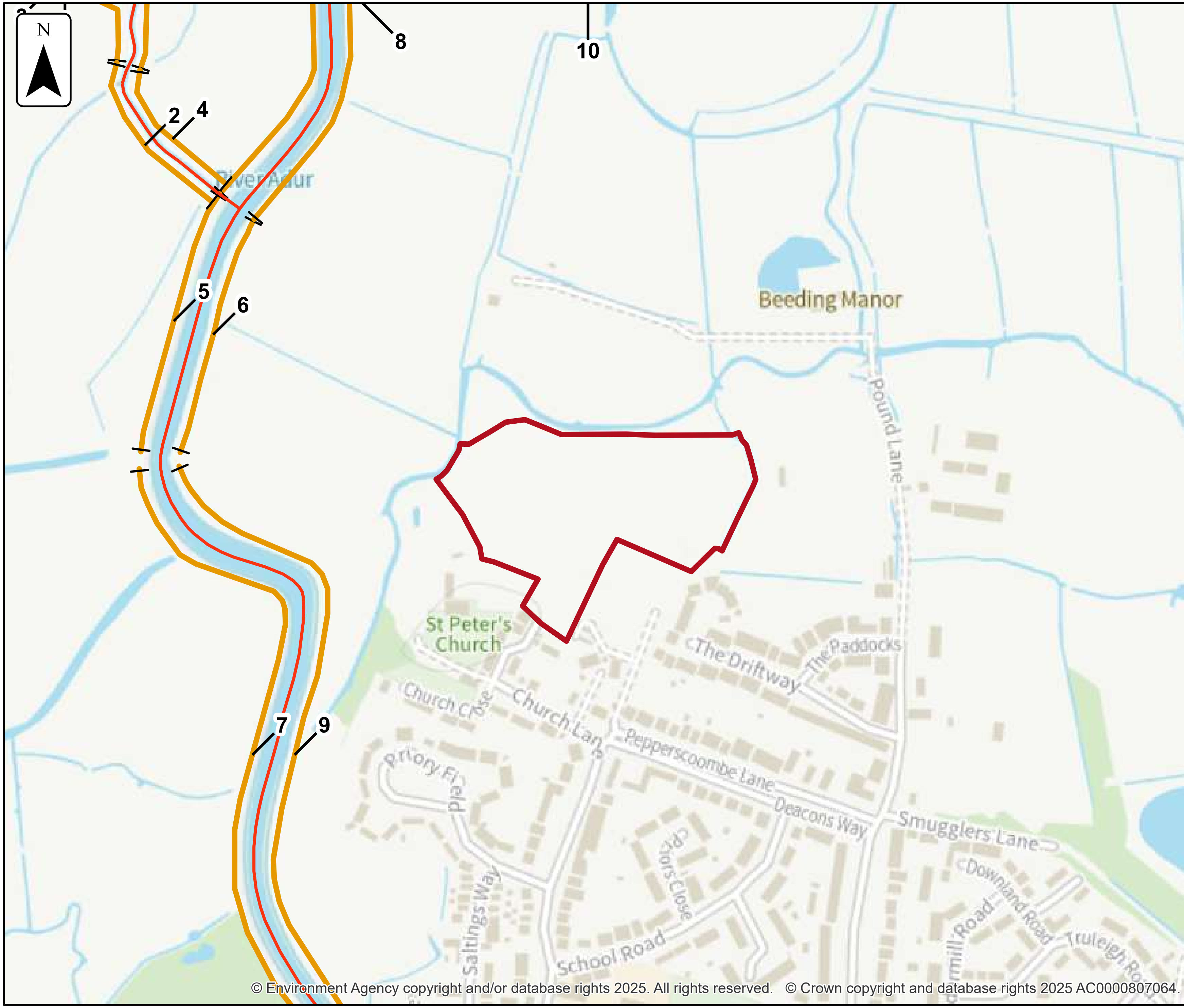
The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is In mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.

Use this information:

- to help you assess if there is a reduced flood risk for this location because of defences
- with any information in the modelled data section to find out the impact of defences on flood risk



Environment Agency

Flood defences

Location (easting/northing)
519414/111233

Scale
1:5,000

Created
25 Sep 2025

- Selected area
- Main river
- Flood defence

0 50 100 150 200 250
metres

Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	21564	Embankment	60		4.27	4.29	
2	87586	Embankment	60		4.25	4.29	
3	19939	Embankment	30		3.90	4.0	
4	21562	Embankment	50		4.09	4.12	
5	73571	Embankment	70		4.20	4.22	
6	178163	Embankment	100		4.47	4.47	
7	73570	Embankment	150		4.26	4.20	
8	142299	Embankment	110		4.22	4.67	
9	136618	Embankment	150		4.54	4.47	
10	73821	Embankment	100		4.47	4.59	

Any blank cells show where a particular value has not been recorded for an asset.

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

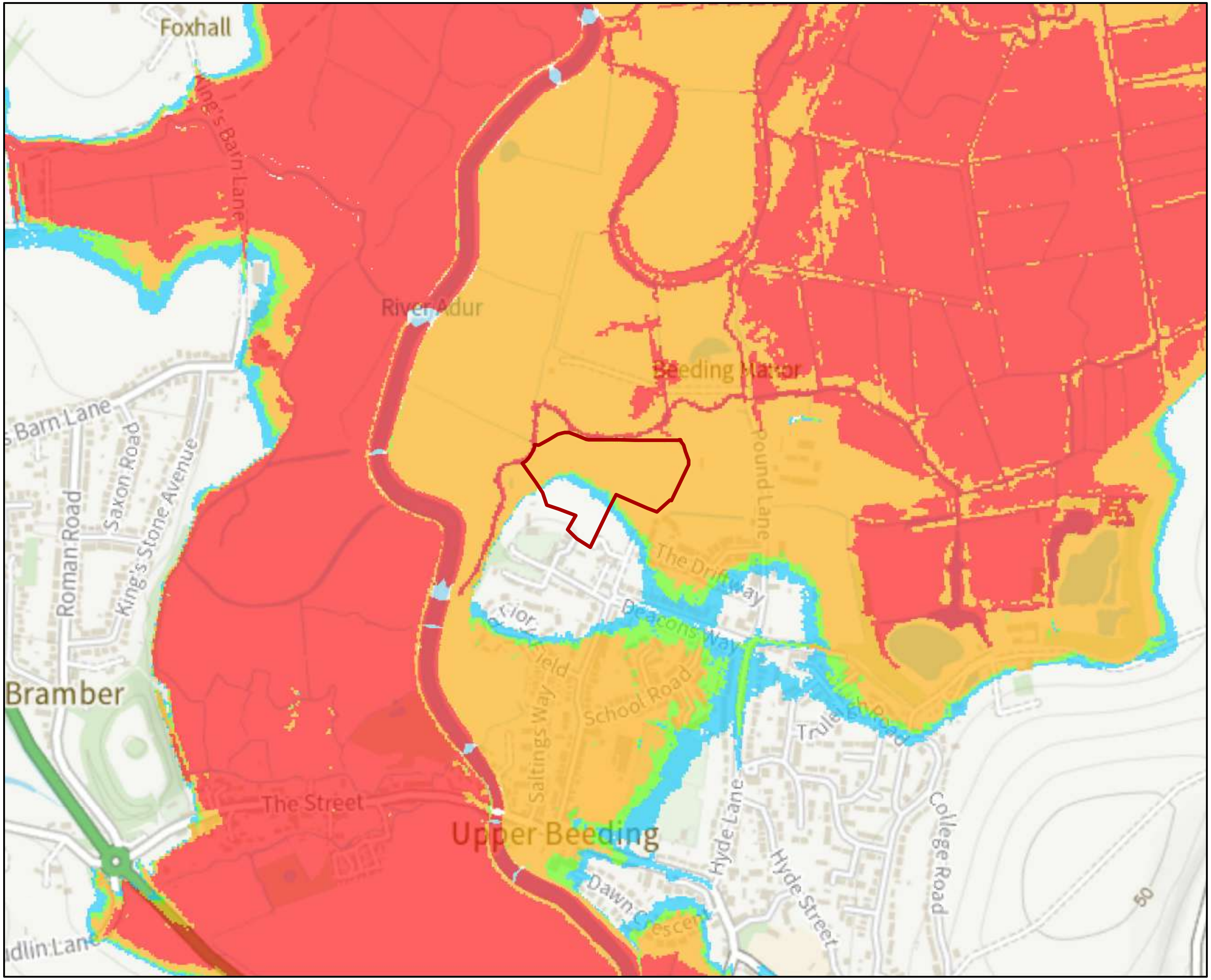
The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended modelled tidal: risk of flooding from the sea where there are flood defences
- Defences removed modelled tidal: risk of flooding from the sea where flood defences have been removed

Modelled Flood Outlines (Defended Fluvial). Centred TQ 19400 11241. Created 25/09/2025.



Environment Agency

N

Legend

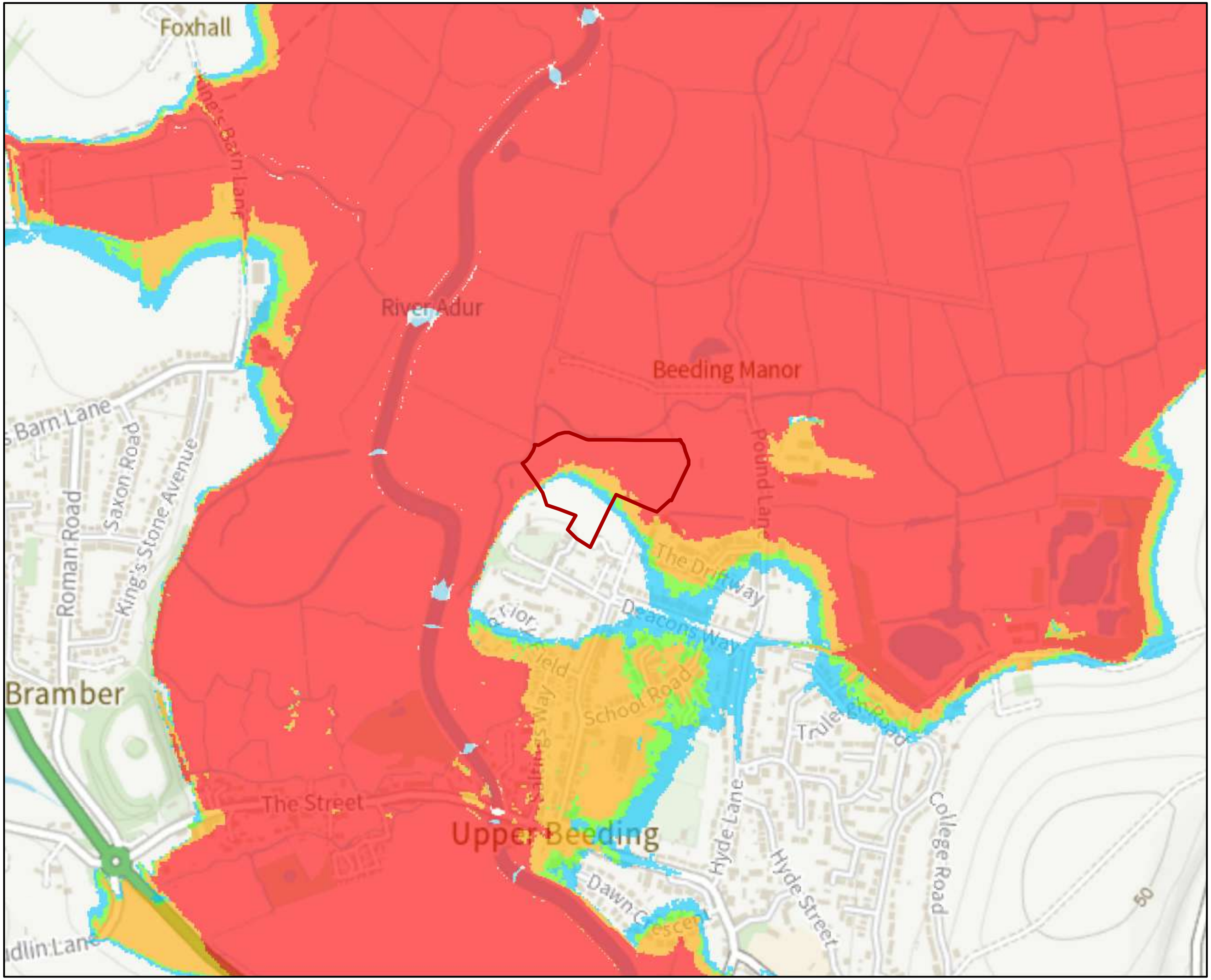
- Site Boundary
- 1% AEP (Defended Fluvial)
- 1% AEP +CC 37% (Defended Fluvial)
- 1% AEP +CC 55% (Defended Fluvial)
- 1% AEP +CC 107% (Defended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

Modelled Flood Outlines (Undefended Fluvial). Centred TQ 19400 11241. Created 25/09/2025.



N

Legend

- Site Boundary
- 1% AEP (Undefended Fluvial)
- 1% AEP +CC 37% (Undefended Fluvial)
- 1% AEP +CC 55% (Undefended Fluvial)
- 1% AEP +CC 107% (Undefended Fluvial)

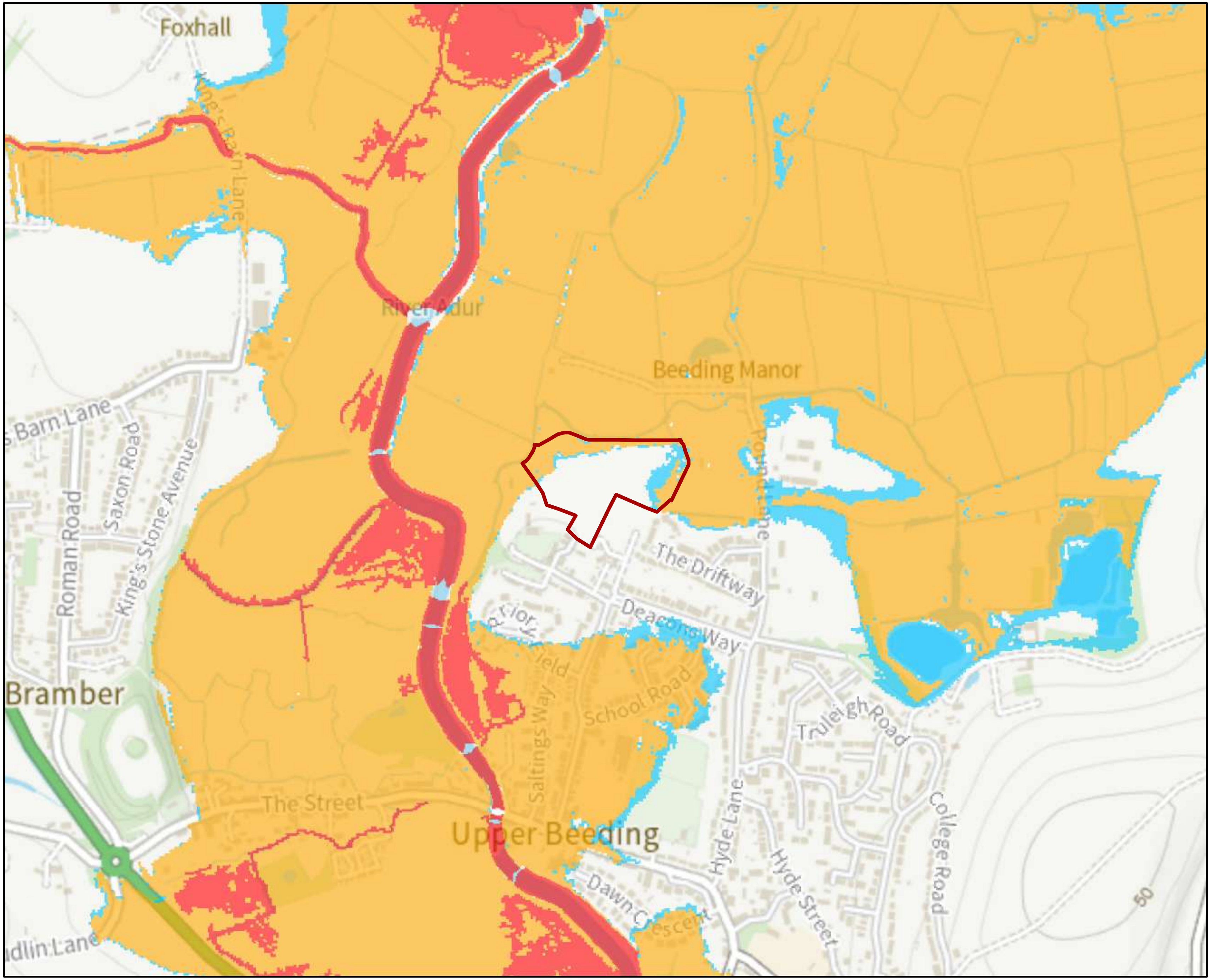
Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Modelled Flood Outlines (Defended Tidal). Centred TQ 19400 11241. Created 25/09/2025.



Environment Agency

N

Legend

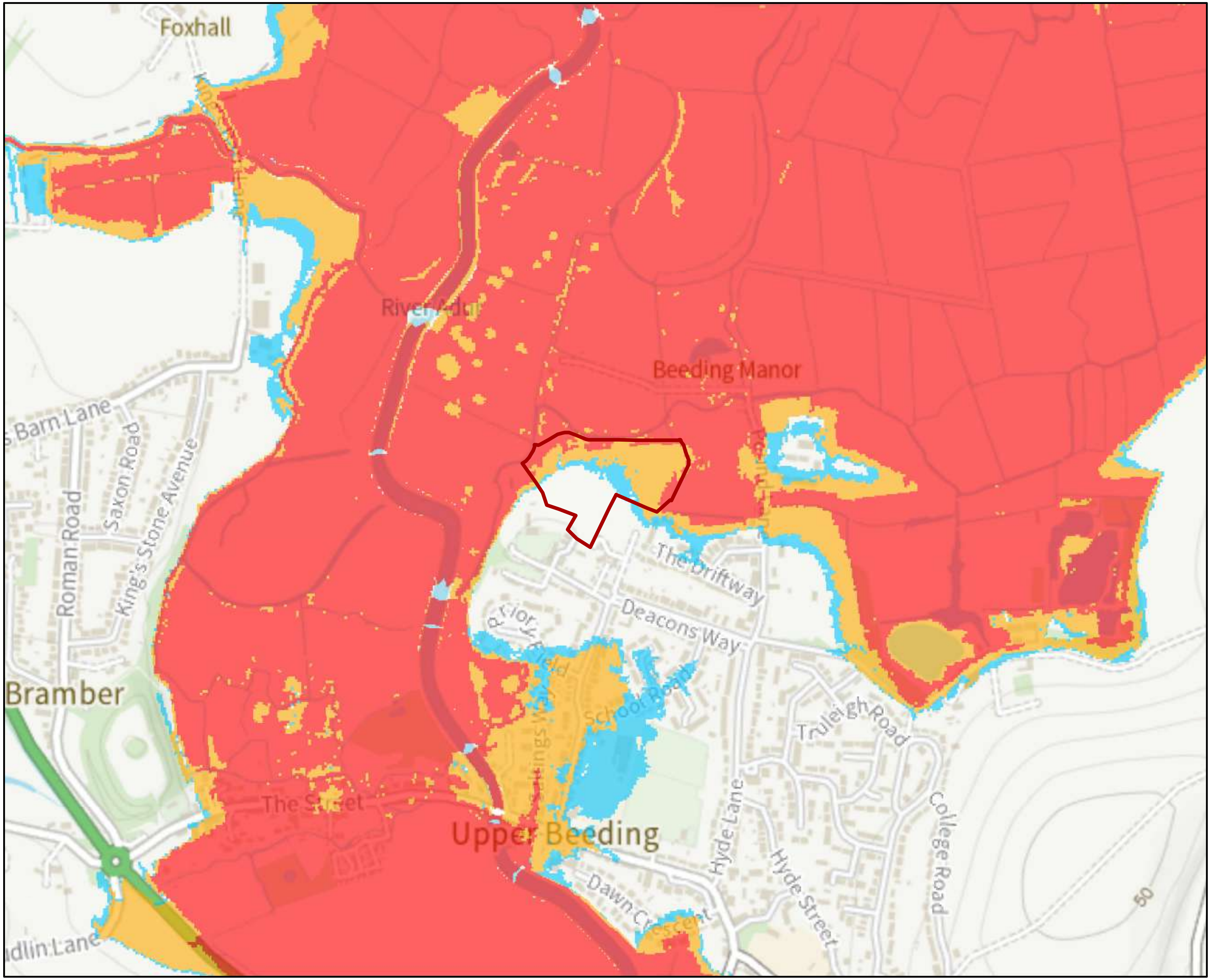
- Site Boundary
- 0.5% AEP (Defended Tidal)
- 0.5% AEP (2067) (Defended Tidal)
- 0.5% AEP (2117) (Defended Tidal)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

Modelled Flood Outlines (Undefended Tidal). Centred TQ 19400 11241. Created 25/09/2025.



Environment Agency

N

Legend

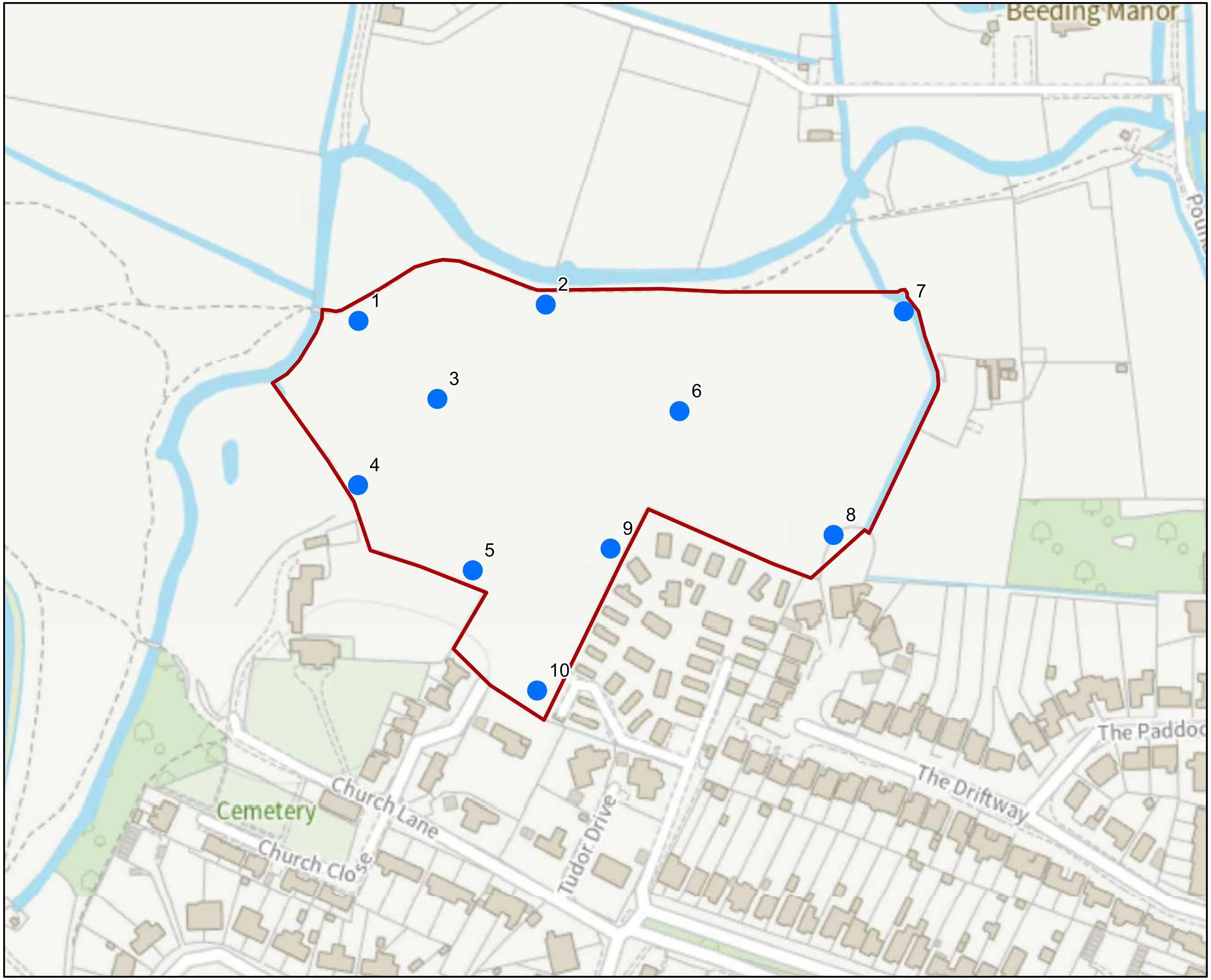
- Site Boundary
- 0.5% AEP (Undefended Tidal)
- 0.5% AEP (2067) (Undefended Tidal)
- 0.5% AEP (2117) (Undefended Tidal)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000

0 0.225 0.45
Kilometers

FRA Site Boundary & Node Points. Centred TQ 19400 11241. Created 25/09/2025.



Environment Agency

N

Legend

- Site Nodes
- Site Boundary

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:2,500

0 0.05 0.1
Kilometers

Product 4 Flood Risk Data Requested by: Aqua Terra Consultants

Site: Land off Church Farm, Upper Beeding

Table 1: Water Levels: Fluvial Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	1%	1% +CC (37%)	1% +CC (55%)	1% +CC (107%)
1	519300	111287	3.95	4.62	4.87	5.50
2	519388	111295	3.96	4.63	4.88	5.53
3	519337	111251	3.96	4.62	4.87	5.51
4	519300	111211	-	-	-	5.49
5	519354	111171	-	-	-	-
6	519450	111245	3.96	4.64	4.89	5.54
7	519555	111291	3.96	4.64	4.89	5.54
8	519522	111187	3.97	4.64	4.89	5.54
9	519418	111121	-	-	-	5.54
10	519384	111115	-	-	-	-

Table 2: Water Levels: Fluvial Defended

	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability			
Node Ref	Eastings	Northings	1%	1% +CC (37%)	1% +CC (55%)	1% +CC (107%)
1	519300	111287	-	4.76	5.07	5.72
2	519388	111295	-	4.76	5.08	5.74
3	519337	111251	-	4.76	5.07	5.72
4	519300	111211	-	-	-	5.70
5	519354	111171	-	-	-	-
6	519450	111245	-	4.76	5.08	5.74
7	519555	111291	-	4.77	5.08	5.75
8	519522	111187	-	4.77	5.08	5.75
9	519418	111121	-	-	-	5.74
10	519384	111115	-	-	-	-

Office Address: Teville Gate House, Teville Road, Worthing, West Sussex, BN11 1UR
Customer services line: 03708 506 506. Email: enquiries@environment-agency.gov.uk
www.gov.uk/government/organisations/environment-agency

Table 3: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability		
Node Ref	**Eastings**	**Northings**	**0.5%**	**0.5% (2067)***	**0.5% (2117)***
1	519300	111287	2.91	3.76	4.18
2	519388	111295	2.76	3.74	4.17
3	519337	111251	-	3.74	4.17
4	519300	111211	-	-	-
5	519354	111171	-	-	-
6	519450	111245	-	3.74	4.17
7	519555	111291	-	3.74	4.17
8	519522	111187	2.76	3.74	4.17
9	519418	111121	-	-	-
10	519384	111115	-	-	-

Table 4: Water Levels: Tidal Defended

	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability		
Node Ref	**Eastings**	**Northings**	**0.5%**	**0.5% (2067)***	**0.5% (2117)***
1	519300	111287	-	3.39	3.63
2	519388	111295	-	3.04	3.26
3	519337	111251	-	-	-
4	519300	111211	-	-	-
5	519354	111171	-	-	-
6	519450	111245	-	-	-
7	519555	111291	-	2.93	3.23
8	519522	111187	-	2.91	3.23
9	519418	111121	-	-	-
10	519384	111115	-	-	-

Table 5: Water Depths: Fluvial Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability			
Node Ref	**Eastings**	**Northings**	**1%**	**1% +CC (37%)**	**1% +CC (55%)**	**1% +CC (107%)**
1	519300	111287	1.31	1.98	2.23	2.87
2	519388	111295	1.48	2.16	2.41	3.05
3	519337	111251	0.18	0.85	1.09	1.73
4	519300	111211	-	-	-	0.03
5	519354	111171	-	-	-	-
6	519450	111245	0.25	0.93	1.18	1.83
7	519555	111291	0.96	1.64	1.89	2.54
8	519522	111187	1.31	1.99	2.34	2.89
9	519418	111121	-	-	-	0.07
10	519384	111115	-	-	-	-

Table 6: Water Depths: Fluvial Defended

	NGR		Modelled Flood Depths in Metres Defended Annual Exceedance Probability			
Node Ref	**Eastings**	**Northings**	**1%**	**1% +CC (37%)**	**1% +CC (55%)**	**1% +CC (107%)**
1	519300	111287	-	2.02	2.33	2.98
2	519388	111295	-	2.31	2.63	3.28
3	519337	111251	-	0.98	1.29	1.94
4	519300	111211	-	-	-	0.06
5	519354	111171	-	-	-	-
6	519450	111245	-	1.08	1.40	2.06
7	519555	111291	-	1.76	2.08	2.74
8	519522	111187	-	2.15	2.46	3.13
9	519418	111121	-	-	-	0.24
10	519384	111115	-	-	-	-

Table 7: Water Depths: Tidal Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability		
Node Ref	**Eastings**	**Northings**	**0.5%**	**0.5% (2067)***	**0.5% (2117)***
1	519300	111287	0.20	1.05	1.47
2	519388	111295	0.28	1.26	1.69
3	519337	111251	-	0.01	0.39
4	519300	111211	-	-	-
5	519354	111171	-	-	-
6	519450	111245	-	0.06	0.48
7	519555	111291	-	0.73	1.16
8	519522	111187	0.09	1.06	1.49
9	519418	111121	-	-	-
10	519384	111115	-	-	-

Table 8: Water Depths: Tidal Defended

	NGR		Modelled Flood Depths in Metres Defended Annual Exceedance Probability		
Node Ref	**Eastings**	**Northings**	**0.5%**	**0.5% (2067)***	**0.5% (2117)***
1	519300	111287	-	0.68	0.92
2	519388	111295	-	0.59	0.81
3	519337	111251	-	-	-
4	519300	111211	-	-	-
5	519354	111171	-	-	-
6	519450	111245	-	-	-
7	519555	111291	-	0.06	0.22
8	519522	111187	-	0.25	0.58
9	519418	111121	-	-	-
10	519384	111115	-	-	-

All levels taken from: River Adur Intertidal Model Updates (2022)

Produced on: 25/09/2025

*** The flood risk data provided is based on existing EA hydraulic models with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 27 July 2021.**

You should refer to 'Flood risk assessments: climate change allowances' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

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

Your Lead Local Flood Authority is West Sussex County.

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.

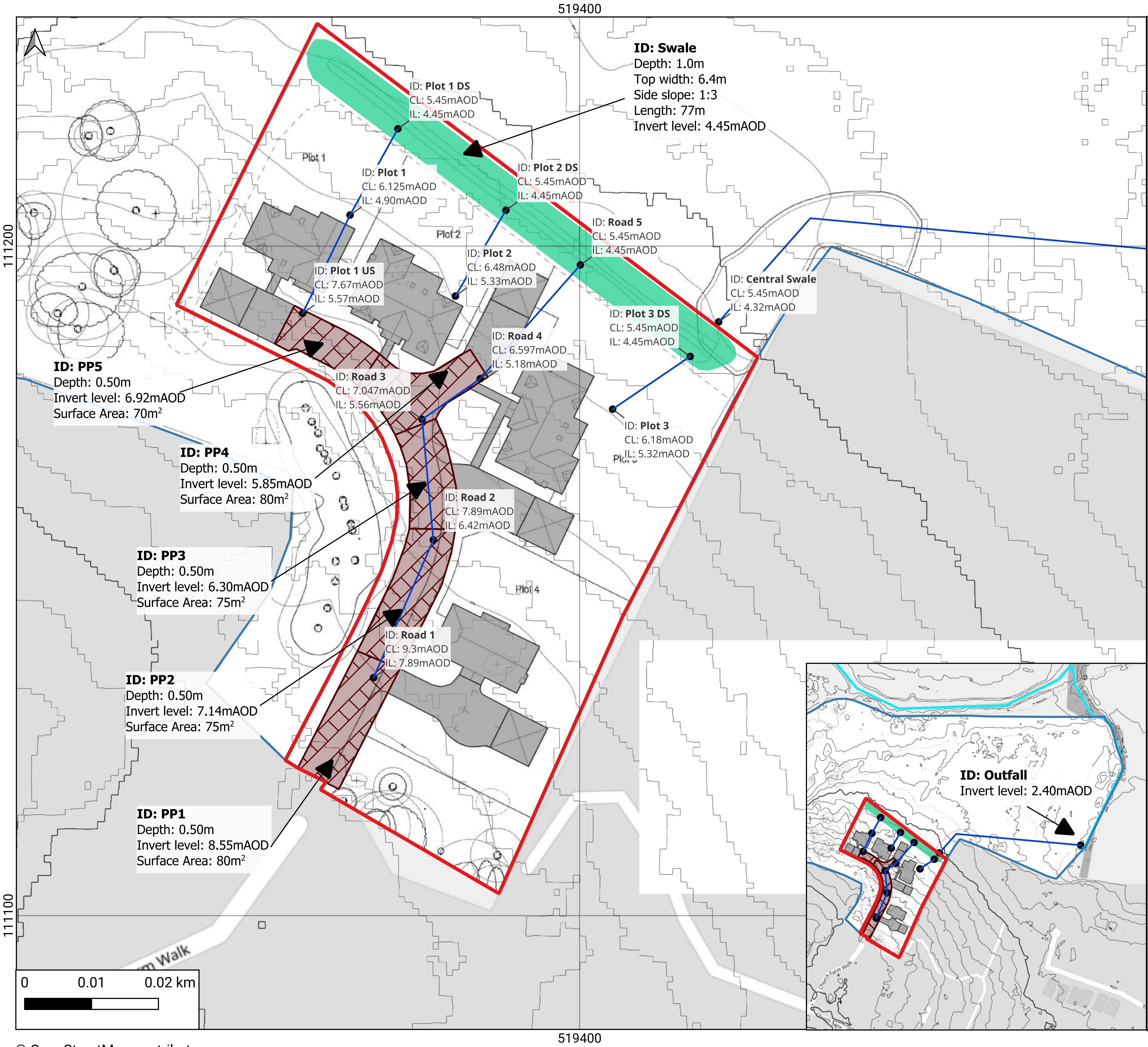
Find out more about flood risk activity permits

Help and advice

Contact the Solent and South Downs Environment Agency team at ssdenquiries@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

Appendix D Proposed Drainage Plan



Church Farm: Outline Drainage Study

P25083_R3_D01: Drainage Scheme

Legend

- Ownership Boundary
- Positively drained area
- Drains / Ditches

Surfaces

- Impermeable - Non Adoptable
- Porous Paving
- Swale
- Manholes
- Connections

AQUA TERRA CONSULTING

Appendix E Causeway Flow Report

Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓
Return Period (years)	30	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Adoptable Manhole Type

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

>900 Link+900 mm

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

Circular Link Type

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

Available Diameters (mm)

100	150

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
✓	Road 1			9.300	Manhole	Adoptable	1200	519369.210	111135.528	1.413	7.887
✓	Road 2			7.890	Manhole	Adoptable	1200	519378.146	111156.108	1.468	6.422
✓	Plot 3	0.021	5.00	6.180	Manhole	Adoptable	1200	519404.949	111175.646	0.855	5.325
✓	Road 3			7.047	Manhole	Adoptable	1200	519376.462	111174.111	1.482	5.565
✓	Road 4			6.597	Manhole	Adoptable	1200	519385.154	111180.191	1.416	5.181
✓	Plot 1 US			7.670	Manhole	Adoptable	1200	519358.613	111189.965	2.100	5.570
✓	Plot 3 DS	0.000		5.450	Manhole	Adoptable	1200	519414.811	111182.436	1.000	4.450
✓	Plot 1	0.014	5.00	6.125	Manhole	Adoptable	1200	519365.686	111204.634	1.226	4.899
✓	Plot 1 DS			5.450	Manhole	Adoptable	1200	519372.429	111214.356	1.000	4.450
✓	Road 5			5.450	Manhole	Adoptable	1200	519398.253	111194.713	1.000	4.450
✓	Plot 2	0.018	5.00	6.480	Manhole	Adoptable	1200	519381.454	111192.546	1.149	5.331
✓	Plot 2 DS	0.010		5.450	Manhole	Adoptable	1200	519388.094	111202.106	1.000	4.450
✓	Central Swale	0.050	5.00	5.450	Manhole	Adoptable	1200	519423.500	111185.042	1.130	4.320
✓	Outfall			2.300	Manhole	Adoptable	1200	519476.541	111217.478	1.300	1.000
✓	PP3	0.023	5.00	7.047	Junction			519375.966	111169.271	1.300	5.747
✓	PP4	0.012	5.00	6.597	Junction			519380.998	111180.334	1.246	5.351
✓	PP2	0.027	5.00	7.890	Junction			519374.526	111154.346	1.300	6.590
✓	PP1	0.029	5.00	9.300	Junction			519364.685	111130.624	1.300	8.000
✓	PP5	0.016	5.00	7.670	Junction			519360.455	111185.589	2.020	5.650

Links

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	Min DS IL (m)
✓	1.001	Road 1	Road 2	22.436	0.600	Colebrook-White	7.887	6.522	1.365	16.4	100	Circular	5.31	50.0	
✓	1.002	Road 2	Road 3	18.082	0.600	Colebrook-White	6.422	5.565	0.857	21.1	200	Circular	5.42	50.0	
?	7.000	Plot 3	Plot 3 DS	11.973	0.600	Colebrook-White	5.325	4.700	0.625	19.2	100	Circular	5.11	50.0	4.700
✓	1.003	Road 3	Road 4	10.607	0.600	Colebrook-White	5.565	5.181	0.384	27.6	200	Circular	5.50	50.0	
?	1.004	Road 4	Road 5	19.557	0.600	Colebrook-White	5.181	4.700	0.481	40.7	200	Circular	5.67	50.0	4.700
?	6.001	Plot 1 US	Plot 1	16.285	0.600	Colebrook-White	5.570	4.899	0.671	24.3	100	Circular	5.25	50.0	
?	6.002	Plot 1	Plot 1 DS	11.832	0.600	Colebrook-White	4.899	4.700	0.199	59.5	100	Circular	5.45	50.0	4.700
?	8.000	Plot 2	Plot 2 DS	11.640	0.600	Colebrook-White	5.331	4.700	0.631	18.4	100	Circular	5.11	50.0	4.700
?	5.000	Central Swale	Outfall	62.173	0.600	Colebrook-White	4.320	1.000	3.320	18.7	100	Circular	5.58	50.0	
✓	3.000	PP3	Road 3	4.865	0.600	Colebrook-White	5.747	5.665	0.082	59.3	100	Circular	5.08	50.0	
?	4.000	PP4	Road 4	4.158	0.600	Colebrook-White	5.351	5.281	0.070	59.4	100	Circular	5.07	50.0	
✓	2.000	PP2	Road 2	4.026	0.600	Colebrook-White	6.590	6.522	0.068	59.2	100	Circular	5.07	50.0	
✓	1.000	PP1	Road 1	6.673	0.600	Colebrook-White	8.000	7.887	0.113	59.1	100	Circular	5.11	50.0	
✓	6.000	PP5	Plot 1 US	4.748	0.600	Colebrook-White	5.650	5.570	0.080	59.3	100	Circular	5.08	50.0	

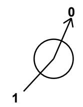
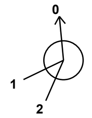
	Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
✓	1.001	Road 1	Road 2	1.914	15.0	5.2	1.313	1.268	1.268	1.313	0.029	0.0	41	1.750	Fall increased to remove backdrop
✓	1.002	Road 2	Road 3	2.652	83.3	10.2	1.268	1.282	1.268	1.282	0.056	0.0	47	1.816	Fall increased to remove backdrop
?	7.000	Plot 3	Plot 3 DS	1.772	13.9	3.8	0.755	0.650	0.650	0.755	0.021	0.0	36	1.507	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
✓	1.003	Road 3	Road 4	2.316	72.8	14.4	1.282	1.216	1.216	1.282	0.080	0.0	60	1.807	Fall increased to remove backdrop
?	1.004	Road 4	Road 5	1.907	59.9	16.5	1.216	0.550	0.550	1.216	0.092	0.0	71	1.633	Downstream Depth is less than the specified minimum
?	6.001	Plot 1 US	Plot 1	1.573	12.4	2.9	2.000	1.126	1.126	2.000	0.016	0.0	33	1.290	Downstream Depth is less than the specified minimum
?	6.002	Plot 1	Plot 1 DS	1.001	7.9	5.5	1.126	0.650	0.650	1.126	0.031	0.0	62	1.085	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
?	8.000	Plot 2	Plot 2 DS	1.806	14.2	3.2	1.049	0.650	0.650	1.049	0.018	0.0	32	1.463	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
?	5.000	Central Swale	Outfall	1.793	14.1	9.0	1.030	1.200	1.030	1.200	0.050	0.0	58	1.901	Upstream Depth is less than the specified minimum
✓	3.000	PP3	Road 3	1.002	7.9	4.2	1.200	1.282	1.200	1.282	0.023	0.0	52	1.018	
?	4.000	PP4	Road 4	1.001	7.9	2.2	1.146	1.216	1.146	1.216	0.012	0.0	36	0.850	Upstream Depth is less than the specified minimum
✓	2.000	PP2	Road 2	1.003	7.9	5.0	1.200	1.268	1.200	1.268	0.027	0.0	57	1.059	
✓	1.000	PP1	Road 1	1.004	7.9	5.2	1.200	1.313	1.200	1.313	0.029	0.0	60	1.075	
✓	6.000	PP5	Plot 1 US	1.001	7.9	2.9	1.920	2.000	1.920	2.000	0.016	0.0	43	0.931	

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	22.436	16.4	100	Circular	9.300	7.887	1.313	7.890	6.522	1.268
1.002	18.082	21.1	200	Circular	7.890	6.422	1.268	7.047	5.565	1.282
7.000	11.973	19.2	100	Circular	6.180	5.325	0.755	5.450	4.700	0.650
1.003	10.607	27.6	200	Circular	7.047	5.565	1.282	6.597	5.181	1.216
1.004	19.557	40.7	200	Circular	6.597	5.181	1.216	5.450	4.700	0.550
6.001	16.285	24.3	100	Circular	7.670	5.570	2.000	6.125	4.899	1.126
6.002	11.832	59.5	100	Circular	6.125	4.899	1.126	5.450	4.700	0.650
8.000	11.640	18.4	100	Circular	6.480	5.331	1.049	5.450	4.700	0.650
5.000	62.173	18.7	100	Circular	5.450	4.320	1.030	2.300	1.000	1.200
3.000	4.865	59.3	100	Circular	7.047	5.747	1.200	7.047	5.665	1.282
4.000	4.158	59.4	100	Circular	6.597	5.351	1.146	6.597	5.281	1.216
2.000	4.026	59.2	100	Circular	7.890	6.590	1.200	7.890	6.522	1.268
1.000	6.673	59.1	100	Circular	9.300	8.000	1.200	9.300	7.887	1.313
6.000	4.748	59.3	100	Circular	7.670	5.650	1.920	7.670	5.570	2.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	Road 1	1200	Manhole	Adoptable	Road 2	1200	Manhole	Adoptable
1.002	Road 2	1200	Manhole	Adoptable	Road 3	1200	Manhole	Adoptable
7.000	Plot 3	1200	Manhole	Adoptable	Plot 3 DS	1200	Manhole	Adoptable
1.003	Road 3	1200	Manhole	Adoptable	Road 4	1200	Manhole	Adoptable
1.004	Road 4	1200	Manhole	Adoptable	Road 5	1200	Manhole	Adoptable
6.001	Plot 1 US	1200	Manhole	Adoptable	Plot 1	1200	Manhole	Adoptable
6.002	Plot 1	1200	Manhole	Adoptable	Plot 1 DS	1200	Manhole	Adoptable
8.000	Plot 2	1200	Manhole	Adoptable	Plot 2 DS	1200	Manhole	Adoptable
5.000	Central Swale	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable
3.000	PP3		Junction		Road 3	1200	Manhole	Adoptable
4.000	PP4		Junction		Road 4	1200	Manhole	Adoptable
2.000	PP2		Junction		Road 2	1200	Manhole	Adoptable
1.000	PP1		Junction		Road 1	1200	Manhole	Adoptable
6.000	PP5		Junction		Plot 1 US	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
Road 1	519369.210	111135.528	9.300	1.413	1200	Manhole	Adoptable		1	1.000	7.887	100	Circular
									0	1.001	7.887	100	Circular
Road 2	519378.146	111156.108	7.890	1.468	1200	Manhole	Adoptable		1	2.000	6.522	100	Circular
									2	1.001	6.522	100	Circular
									0	1.002	6.422	200	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
Plot 3	519404.949	111175.646	6.180	0.855	1200	Manhole	Adoptable	0	7.000	5.325	100	Circular
Road 3	519376.462	111174.111	7.047	1.482	1200	Manhole	Adoptable	1	3.000	5.665	100	Circular
								2	1.002	5.565	200	Circular
								0	1.003	5.565	200	Circular
Road 4	519385.154	111180.191	6.597	1.416	1200	Manhole	Adoptable	1	4.000	5.281	100	Circular
								2	1.003	5.181	200	Circular
								0	1.004	5.181	200	Circular
Plot 1 US	519358.613	111189.965	7.670	2.100	1200	Manhole	Adoptable	1	6.000	5.570	100	Circular
								0	6.001	5.570	100	Circular
Plot 3 DS	519414.811	111182.436	5.450	1.000	1200	Manhole	Adoptable	1	7.000	4.700	100	Circular
Plot 1	519365.686	111204.634	6.125	1.226	1200	Manhole	Adoptable	1	6.001	4.899	100	Circular
								0	6.002	4.899	100	Circular
Plot 1 DS	519372.429	111214.356	5.450	1.000	1200	Manhole	Adoptable	1	6.002	4.700	100	Circular
Road 5	519398.253	111194.713	5.450	1.000	1200	Manhole	Adoptable	1	1.004	4.700	200	Circular
Plot 2	519381.454	111192.546	6.480	1.149	1200	Manhole	Adoptable	0	8.000	5.331	100	Circular
Plot 2 DS	519388.094	111202.106	5.450	1.000	1200	Manhole	Adoptable	1	8.000	4.700	100	Circular
Central Swale	519423.500	111185.042	5.450	1.130	1200	Manhole	Adoptable	0	5.000	4.320	100	Circular
Outfall	519476.541	111217.478	2.300	1.300	1200	Manhole	Adoptable	1	5.000	1.000	100	Circular
PP3	519375.966	111169.271	7.047	1.300		Junction		0	3.000	5.747	100	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
PP4	519380.998	111180.334	6.597	1.246		Junction		0	4.000	5.351	100	Circular
PP2	519374.526	111154.346	7.890	1.300		Junction		0	2.000	6.590	100	Circular
PP1	519364.685	111130.624	9.300	1.300		Junction		0	1.000	8.000	100	Circular
PP5	519360.455	111185.589	7.670	2.020		Junction		0	6.000	5.650	100	Circular

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Rate(s)	✓	100 year (l/s)	1.6
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m^3/ha)	20.0	2 year (l/s)	1.6	Check Discharge Volume	✓
Summer CV	1.000	Skip Steady State	x	Starting Level (m)		30 year (l/s)	1.6	100 year 360 minute (m^3)	28

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	30	40	10	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	England, Wales, NI	Positively Drained Area (ha)	0.530	Q 2 year (l/s)	0.7	Q 100 year (l/s)	2.3
Greenfield Method	ReFH2	Include Baseflow	x	Betterment (%)	0	Q 30 year (l/s)	1.8		

Pre-development Discharge Volume

Site Makeup	Greenfield	Region	England, Wales, NI	Positively Drained Area (ha)	0.530	Storm Duration (mins)	360	Runoff Volume (m^3)	28
Greenfield Method	ReFH2	Include Baseflow	x	Return Period (years)	100	Betterment (%)	0		

Node Central Swale ReFH2 Dynamic Hydrograph

Overrides Design Area	x	Depression Storage Area (m^2)	0	Evapo-transpiration (mm/day)	0	Region	England, Wales, NI
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0	Area (ha)	0.288	Include Baseflow	x

Applies to All storms

Node Central Swale Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	1.000	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	1.6	Product Number	CTL-SCL-0057-1600-1000-1600		
Invert Level (m)	4.450	Objective	(CL) Minimise blockage risk	Min Outlet Diameter (m)	0.075		

Node PP3 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Invert Level (m)	5.747	Diameter (m)	0.030	Discharge Coefficient	0.600

Node PP4 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Invert Level (m)	5.350	Diameter (m)	0.020	Discharge Coefficient	0.600

Node PP2 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Invert Level (m)	6.590	Diameter (m)	0.040	Discharge Coefficient	0.600

Node PP1 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Invert Level (m)	8.000	Diameter (m)	0.036	Discharge Coefficient	0.600

Node PP5 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	x	Invert Level (m)	5.650	Diameter (m)	0.020	Discharge Coefficient	0.600

Node Central Swale Pond Storage Structure

Invert Level (m)	4.450	Time to half empty (mins)		Analyse flow through structure	x

Inlets

Plot 1 DS	Plot 2 DS	Road 5	Plot 3 DS

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	38.5	1.000	500.5

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.297	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	56	Length (m)	15.000	Depth (m)	0.500		

Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.847	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	32	Length (m)	16.000	Depth (m)	0.500		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.140	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	35	Length (m)	19.000	Depth (m)	0.500		

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.550	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	50	Length (m)	19.000	Depth (m)	0.500		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.920	Width (m)	14.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	58	Length (m)	5.000	Depth (m)	0.500		

Other (defaults)

Entry Loss (manhole)	0.250	Exit Loss (manhole)	0.250	Entry Loss (junction)	0.000	Exit Loss (junction)	0.000	Apply Recommended Losses	x	Flood Risk (m)	0.300

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	Road 1	23	7.912	0.025	2.1	0.0288	0.0000	OK
15 minute summer	Road 2	14	6.454	0.032	4.6	0.0361	0.0000	OK
15 minute summer	Plot 3	10	5.365	0.040	4.4	0.0665	0.0000	OK
15 minute summer	Road 3	14	5.604	0.039	6.0	0.0443	0.0000	OK
30 minute summer	Road 4	23	5.227	0.046	6.6	0.0520	0.0000	OK
120 minute summer	Plot 1 US	74	5.588	0.018	0.9	0.0205	0.0000	OK
480 minute winter	Plot 3 DS	448	4.832	0.382	1.1	0.0000	0.0000	OK
15 minute summer	Plot 1	11	4.948	0.049	3.6	0.0682	0.0000	OK
480 minute winter	Plot 1 DS	448	4.832	0.382	1.1	0.0000	0.0000	OK
480 minute winter	Road 5	440	4.833	0.383	2.9	0.0000	0.0000	OK
15 minute summer	Plot 2	10	5.367	0.036	3.7	0.0526	0.0000	OK
480 minute winter	Plot 2 DS	448	4.832	0.382	1.1	0.0000	0.0000	OK
480 minute winter	Central Swale	448	4.831	0.511	3.5	51.3615	0.0000	SURCHARGED
60 minute summer	Outfall	49	1.022	0.022	1.5	0.0000	0.0000	OK
30 minute summer	PP3	23	6.369	0.622	4.3	0.9332	0.0000	SURCHARGED
30 minute summer	PP4	24	5.892	0.541	2.2	0.3818	0.0000	SURCHARGED
15 minute summer	PP2	13	7.202	0.612	5.8	0.7951	0.0000	SURCHARGED
30 minute summer	PP1	22	8.627	0.627	5.4	1.0946	0.0000	SURCHARGED
120 minute summer	PP5	74	6.779	1.129	1.8	0.1986	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Road 1	1.001	Road 2	2.1	1.334	0.138	0.0350	
15 minute summer	Road 2	1.002	Road 3	4.6	1.227	0.055	0.0680	
15 minute summer	Plot 3	7.000	Plot 3 DS	4.3	1.531	0.312	0.0340	
15 minute summer	Road 3	1.003	Road 4	6.0	1.243	0.083	0.0517	
30 minute summer	Road 4	1.004	Road 5	6.6	1.245	0.111	0.1044	
120 minute summer	Plot 1 US	6.001	Plot 1	0.9	0.654	0.071	0.0295	
15 minute summer	Plot 1	6.002	Plot 1 DS	3.5	0.954	0.452	0.0440	
15 minute summer	Plot 2	8.000	Plot 2 DS	3.6	1.482	0.257	0.0287	
480 minute winter	Central Swale	5.000	Outfall	1.5	1.167	0.107	0.0804	55.4
30 minute summer	PP3	3.000	Road 3	1.4	0.752	0.184	0.0094	
30 minute summer	PP4	4.000	Road 4	0.6	0.586	0.077	0.0043	
15 minute summer	PP2	2.000	Road 2	2.5	0.871	0.321	0.0117	
30 minute summer	PP1	1.000	Road 1	2.1	0.986	0.264	0.0142	
120 minute summer	PP5	6.000	Plot 1 US	0.9	0.739	0.112	0.0057	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Road 1	47	7.915	0.028	2.5	0.0314	0.0000	OK
60 minute summer	Road 2	46	6.457	0.035	5.4	0.0391	0.0000	OK
15 minute summer	Plot 3	11	5.551	0.226	15.8	0.3780	0.0000	SURCHARGED
60 minute summer	Road 3	46	5.608	0.043	7.1	0.0485	0.0000	OK
720 minute winter	Road 4	705	5.284	0.103	5.5	0.1160	0.0000	OK
120 minute summer	Plot 1 US	88	5.589	0.019	1.0	0.0219	0.0000	OK
720 minute winter	Plot 3 DS	720	5.281	0.831	2.5	0.0000	0.0000	OK
720 minute winter	Plot 1	705	5.282	0.383	1.8	0.5330	0.0000	SURCHARGED
720 minute winter	Plot 1 DS	705	5.282	0.832	2.5	0.0000	0.0000	OK
720 minute winter	Road 5	705	5.283	0.833	5.5	0.0000	0.0000	OK
15 minute summer	Plot 2	10	5.415	0.084	13.3	0.1238	0.0000	OK
720 minute winter	Plot 2 DS	705	5.282	0.832	2.5	0.0000	0.0000	OK
720 minute winter	Central Swale	705	5.281	0.961	6.7	197.8895	0.0000	FLOOD RISK
360 minute winter	Outfall	120	1.022	0.022	1.5	0.0000	0.0000	OK
60 minute winter	PP3	51	6.621	0.874	8.7	7.5437	0.0000	SURCHARGED
120 minute summer	PP4	90	6.046	0.695	4.1	4.2140	0.0000	SURCHARGED
60 minute summer	PP2	44	7.414	0.824	14.2	7.3989	0.0000	SURCHARGED
60 minute winter	PP1	49	8.866	0.866	10.8	8.8249	0.0000	SURCHARGED
120 minute summer	PP5	88	7.135	1.485	5.6	5.0949	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	Road 1	1.001	Road 2	2.5	1.399	0.163	0.0394	
60 minute summer	Road 2	1.002	Road 3	5.4	1.275	0.065	0.0769	
15 minute summer	Plot 3	7.000	Plot 3 DS	14.0	1.876	1.005	0.0937	
60 minute summer	Road 3	1.003	Road 4	7.1	1.322	0.098	0.0572	
720 minute winter	Road 4	1.004	Road 5	5.5	0.960	0.091	0.4640	
120 minute summer	Plot 1 US	6.001	Plot 1	1.0	0.453	0.082	0.0724	
720 minute winter	Plot 1	6.002	Plot 1 DS	1.8	0.661	0.224	0.0926	
15 minute summer	Plot 2	8.000	Plot 2 DS	13.1	1.952	0.923	0.0781	
720 minute winter	Central Swale	5.000	Outfall	1.5	1.167	0.107	0.0804	76.8
60 minute winter	PP3	3.000	Road 3	1.7	0.789	0.219	0.0106	
120 minute summer	PP4	4.000	Road 4	0.7	0.609	0.087	0.0047	
60 minute summer	PP2	2.000	Road 2	3.0	0.906	0.375	0.0131	
60 minute winter	PP1	1.000	Road 1	2.5	1.031	0.312	0.0160	
120 minute summer	PP5	6.000	Plot 1 US	1.0	0.770	0.128	0.0063	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.70%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	Road 1	53	7.916	0.029	2.6	0.0326	0.0000	OK
60 minute winter	Road 2	50	6.458	0.036	5.8	0.0404	0.0000	OK
15 minute summer	Plot 3	12	5.908	0.583	20.5	0.9745	0.0000	FLOOD RISK
60 minute winter	Road 3	51	5.609	0.044	7.6	0.0503	0.0000	OK
960 minute summer	Road 4	960	5.448	0.267	6.8	0.3015	0.0000	SURCHARGED
120 minute summer	Plot 1 US	94	5.590	0.020	1.0	0.0223	0.0000	OK
960 minute summer	Plot 3 DS	960	5.446	0.996	3.6	0.0000	0.0000	OK
960 minute summer	Plot 1	960	5.446	0.547	2.4	0.7609	0.0000	SURCHARGED
960 minute summer	Plot 1 DS	960	5.446	0.996	3.6	0.0000	0.0000	OK
960 minute summer	Road 5	960	5.448	0.998	6.8	0.0000	0.0000	OK
15 minute summer	Plot 2	11	5.668	0.337	17.4	0.4960	0.0000	SURCHARGED
960 minute summer	Plot 2 DS	960	5.446	0.996	3.6	0.0000	0.0000	OK
960 minute summer	Central Swale	960	5.445	1.125	8.8	274.6025	0.0000	FLOOD RISK
960 minute summer	Outfall	960	1.023	0.023	1.6	0.0000	0.0000	OK
60 minute winter	PP3	58	6.756	1.009	11.5	11.1264	0.0000	FLOOD RISK
120 minute summer	PP4	96	6.114	0.763	5.3	6.1323	0.0000	SURCHARGED
60 minute summer	PP2	47	7.524	0.934	18.8	11.0883	0.0000	SURCHARGED
60 minute winter	PP1	53	8.993	0.993	14.3	13.0959	0.0000	SURCHARGED
120 minute summer	PP5	94	7.241	1.591	7.2	7.6988	0.0000	SURCHARGED

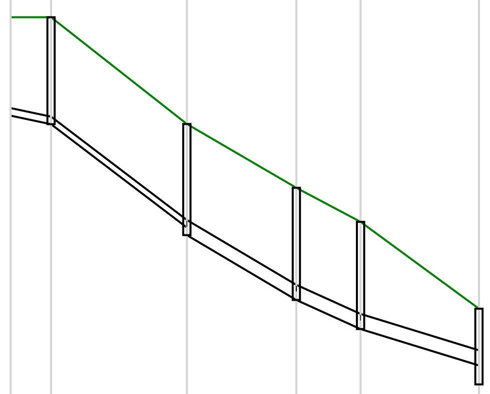
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	Road 1	1.001	Road 2	2.6	1.427	0.175	0.0415	
60 minute winter	Road 2	1.002	Road 3	5.8	1.298	0.069	0.0808	
15 minute summer	Plot 3	7.000	Plot 3 DS	17.2	2.193	1.233	0.0937	
60 minute winter	Road 3	1.003	Road 4	7.6	1.348	0.105	0.0601	
960 minute summer	Road 4	1.004	Road 5	6.8	0.901	0.113	0.6121	
120 minute summer	Plot 1 US	6.001	Plot 1	1.0	0.472	0.085	0.0726	
960 minute summer	Plot 1	6.002	Plot 1 DS	2.3	0.592	0.288	0.0926	
15 minute summer	Plot 2	8.000	Plot 2 DS	15.4	1.964	1.083	0.0911	
960 minute summer	Central Swale	5.000	Outfall	1.6	1.186	0.113	0.0837	102.8
60 minute winter	PP3	3.000	Road 3	1.9	0.805	0.236	0.0112	
120 minute summer	PP4	4.000	Road 4	0.7	0.617	0.091	0.0048	
60 minute summer	PP2	2.000	Road 2	3.1	0.921	0.400	0.0138	
60 minute winter	PP1	1.000	Road 1	2.6	1.051	0.334	0.0168	
120 minute summer	PP5	6.000	Plot 1 US	1.0	0.778	0.133	0.0064	

Water Quality

	Area (ha)	Intended Land Use	Entering via Node or Link	Name	SuDS Component	Pollution hazard indices TSS	Pollution hazard indices Metals	Pollution hazard indices Hydrocarbons	Pollution mitigation indices TSS	Pollution mitigation indices Metals	Pollution mitigation indices Hydrocarbons	Cumulative pollution hazard indices TSS	Cumulative pollution hazard indices Metals	Cumulative pollution hazard indices Hydrocarbons
✓	0.021	Residential roofing	Node	Plot 3		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.014	Low traffic roads	Node	PP1		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.011	Individual driveway	Node	PP1		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP1		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP1	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.015	Low traffic roads	Node	PP2		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.012	Residential roofing	Node	PP2		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP2	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.011	Low traffic roads	Node	PP3		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.008	Individual driveway	Node	PP3		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP3		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP3	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.012	Low traffic roads	Node	PP4		0.5	0.4	0.4				0.5	0.4	0.4
			Node	PP4	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.018	Residential roofing	Node	Plot 2		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.004	Residential roofing	Node	Plot 2 DS		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.006	Individual driveway	Node	Plot 2 DS		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.008	Low traffic roads	Node	PP5		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Individual driveway	Node	PP5		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP5		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP5	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.014	Residential roofing	Node	Plot 1		0.2	0.2	0.05				0.2	0.2	0.05
			Node	Central Swale	Detention Basin				0.25	0.25	0.3	0.25	0.15	0.1
			Node	Outfall								0.25	0.15	0.1
												Insufficient	Insufficient	Insufficient

Causeway	Aqua Terra Consultants Ltd	File: Church Farm_v7_Surcharged.pfd Network: Storm Network MJF 08/12/2025	Page 1

Node Name: PP1, Road 1, Road 2, Road 3, Road 4, Road 5



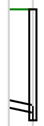
A3 drawing

Hor Scale 1250
Ver Scale 100

Datum (m) -3.000

Node Name	PP1	Road 1	Road 2	Road 3	Road 4	Road 5
Link Name	1.0(	1.001	1.002	1.003	1.004	
Section Type	100	100mm	200mm	200m	200mm	
Slope (1:X)	59.:	16.4	21.1	27.6	40.7	
Cover Level (m)	9.300	9.300	7.890	7.047	6.597	5.450
Invert Level (m)	[illegible] [illegible]	7.887 6.522	6.422 5.565	5.565 5.181	5.181 4.700	
Length (m)	6.67	22.436	18.082	10.60	19.557	

Node Name: PP2 Road 2

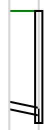


A3 drawing

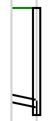
Hor Scale 1250
Ver Scale 100

Datum (m) -3.000

Link Name	2.	
Section Type	10	
Slope (1:X)	59	
Cover Level (m)	7.890	7.890
Invert Level (m)	6.532	6.526
Length (m)	4.	

Node Name	PP3	Road 3
A3 drawing Hor Scale 1250 Ver Scale 100 Datum (m) -4.000		
Link Name	3.(	
Section Type	10	
Slope (1:X)	59	
Cover Level (m)	7.047	7.047
Invert Level (m)	[illegible]	
Length (m)	4.8	

Node Name	PP4	Road 4



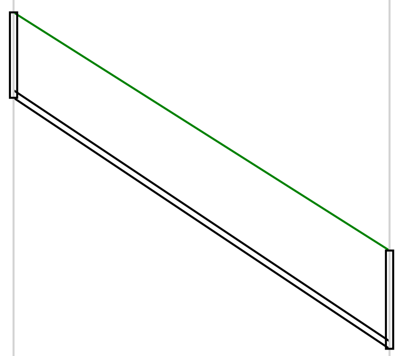
A3 drawing

Hor Scale 1250
Ver Scale 100

Datum (m) -4.000

Link Name	4.(	
Section Type	10	
Slope (1:X)	59	
Cover Level (m)	6.597	6.597
Invert Level (m)	5.381	[illegible]
Length (m)	4.:	

Node Name	Central Swale	Outfall



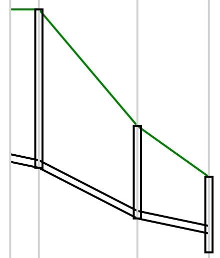
A3 drawing

Hor Scale 1250
Ver Scale 100

Datum (m) -7.000

Link Name	5.000	
Section Type	100mm	
Slope (1:X)	18.7	
Cover Level (m)	5.450	2.300
Invert Level (m)	4.320	1.000
Length (m)	62.173	

Node Name	PP	Plot 1 US	Plot 1	Plot 1 DS



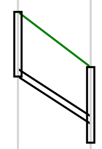
A3 drawing

Hor Scale 1250
Ver Scale 100

Datum (m) -4.000

Link Name	6.0	6.001	6.002
Section Type	10	100mm	100mr
Slope (1:X)	59	24.3	59.5
Cover Level (m)	7.670	7.670 6.125	5.450
Invert Level (m)	[illegible]	5.570 4.899	4.899 4.700
Length (m)	4.7	16.285	11.832

Node Name	Plot 3	Plot 3 DS

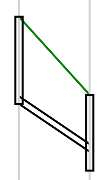


A3 drawing

Hor Scale 1250
Ver Scale 100

Datum (m) -5.000

Link Name	7.000	
Section Type	100mm	
Slope (1:X)	19.2	
Cover Level (m)	6.180	5.450
Invert Level (m)	5.325	4.700
Length (m)	11.973	

Node Name	Plot 2	Plot 2 DS
		
A3 drawing Hor Scale 1250 Ver Scale 100 Datum (m) -5.000		
Link Name	8.000	
Section Type	100mr	
Slope (1:X)	18.4	
Cover Level (m)	6.480	5.450
Invert Level (m)	5.331	4.700
Length (m)	11.640	

Appendix F Causeway Flow Report (Surcharged)

Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	✓
Return Period (years)	30	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Adoptable Manhole Type

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

>900 Link+900 mm

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

Circular Link Type

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

Available Diameters (mm)

100	150

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
✓	Road 1			9.300	Manhole	Adoptable	1200	519369.210	111135.528	1.413	7.887
✓	Road 2			7.890	Manhole	Adoptable	1200	519378.146	111156.108	1.468	6.422
✓	Plot 3	0.021	5.00	6.180	Manhole	Adoptable	1200	519404.949	111175.646	0.855	5.325
✓	Road 3			7.047	Manhole	Adoptable	1200	519376.462	111174.111	1.482	5.565
✓	Road 4			6.597	Manhole	Adoptable	1200	519385.154	111180.191	1.416	5.181
✓	Plot 1 US			7.670	Manhole	Adoptable	1200	519358.613	111189.965	2.100	5.570
✓	Plot 3 DS	0.000		5.450	Manhole	Adoptable	1200	519414.811	111182.436	1.000	4.450
✓	Plot 1	0.014	5.00	6.125	Manhole	Adoptable	1200	519365.686	111204.634	1.226	4.899
✓	Plot 1 DS			5.450	Manhole	Adoptable	1200	519372.429	111214.356	1.000	4.450
✓	Road 5			5.450	Manhole	Adoptable	1200	519398.253	111194.713	1.000	4.450
✓	Plot 2	0.018	5.00	6.480	Manhole	Adoptable	1200	519381.454	111192.546	1.149	5.331
✓	Plot 2 DS	0.010		5.450	Manhole	Adoptable	1200	519388.094	111202.106	1.000	4.450
✓	Central Swale	0.050	5.00	5.450	Manhole	Adoptable	1200	519423.500	111185.042	1.130	4.320
✓	Outfall			2.300	Manhole	Adoptable	1200	519476.541	111217.478	1.300	1.000
✓	PP3	0.023	5.00	7.047	Junction			519375.966	111169.271	1.300	5.747
✓	PP4	0.012	5.00	6.597	Junction			519380.998	111180.334	1.246	5.351
✓	PP2	0.027	5.00	7.890	Junction			519374.526	111154.346	1.300	6.590
✓	PP1	0.029	5.00	9.300	Junction			519364.685	111130.624	1.300	8.000
✓	PP5	0.016	5.00	7.670	Junction			519360.455	111185.589	2.020	5.650

Links

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	Min DS IL (m)
✓	1.001	Road 1	Road 2	22.436	0.600	Colebrook-White	7.887	6.522	1.365	16.4	100	Circular	5.31	50.0	
✓	1.002	Road 2	Road 3	18.082	0.600	Colebrook-White	6.422	5.565	0.857	21.1	200	Circular	5.42	50.0	
?	7.000	Plot 3	Plot 3 DS	11.973	0.600	Colebrook-White	5.325	4.700	0.625	19.2	100	Circular	5.11	50.0	4.700
✓	1.003	Road 3	Road 4	10.607	0.600	Colebrook-White	5.565	5.181	0.384	27.6	200	Circular	5.50	50.0	
?	1.004	Road 4	Road 5	19.557	0.600	Colebrook-White	5.181	4.700	0.481	40.7	200	Circular	5.67	50.0	4.700
?	6.001	Plot 1 US	Plot 1	16.285	0.600	Colebrook-White	5.570	4.899	0.671	24.3	100	Circular	5.25	50.0	
?	6.002	Plot 1	Plot 1 DS	11.832	0.600	Colebrook-White	4.899	4.700	0.199	59.5	100	Circular	5.45	50.0	4.700
?	8.000	Plot 2	Plot 2 DS	11.640	0.600	Colebrook-White	5.331	4.700	0.631	18.4	100	Circular	5.11	50.0	4.700
?	5.000	Central Swale	Outfall	62.173	0.600	Colebrook-White	4.320	1.000	3.320	18.7	100	Circular	5.58	50.0	
✓	3.000	PP3	Road 3	4.865	0.600	Colebrook-White	5.747	5.665	0.082	59.3	100	Circular	5.08	50.0	
?	4.000	PP4	Road 4	4.158	0.600	Colebrook-White	5.351	5.281	0.070	59.4	100	Circular	5.07	50.0	
✓	2.000	PP2	Road 2	4.026	0.600	Colebrook-White	6.590	6.522	0.068	59.2	100	Circular	5.07	50.0	
✓	1.000	PP1	Road 1	6.673	0.600	Colebrook-White	8.000	7.887	0.113	59.1	100	Circular	5.11	50.0	
✓	6.000	PP5	Plot 1 US	4.748	0.600	Colebrook-White	5.650	5.570	0.080	59.3	100	Circular	5.08	50.0	

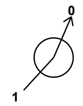
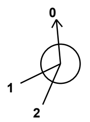
	Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
✓	1.001	Road 1	Road 2	1.914	15.0	5.2	1.313	1.268	1.268	1.313	0.029	0.0	41	1.750	Fall increased to remove backdrop
✓	1.002	Road 2	Road 3	2.652	83.3	10.2	1.268	1.282	1.268	1.282	0.056	0.0	47	1.816	Fall increased to remove backdrop
?	7.000	Plot 3	Plot 3 DS	1.772	13.9	3.8	0.755	0.650	0.650	0.755	0.021	0.0	36	1.507	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
✓	1.003	Road 3	Road 4	2.316	72.8	14.4	1.282	1.216	1.216	1.282	0.080	0.0	60	1.807	Fall increased to remove backdrop
?	1.004	Road 4	Road 5	1.907	59.9	16.5	1.216	0.550	0.550	1.216	0.092	0.0	71	1.633	Downstream Depth is less than the specified minimum
?	6.001	Plot 1 US	Plot 1	1.573	12.4	2.9	2.000	1.126	1.126	2.000	0.016	0.0	33	1.290	Downstream Depth is less than the specified minimum
?	6.002	Plot 1	Plot 1 DS	1.001	7.9	5.5	1.126	0.650	0.650	1.126	0.031	0.0	62	1.085	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
?	8.000	Plot 2	Plot 2 DS	1.806	14.2	3.2	1.049	0.650	0.650	1.049	0.018	0.0	32	1.463	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
?	5.000	Central Swale	Outfall	1.793	14.1	9.0	1.030	1.200	1.030	1.200	0.050	0.0	58	1.901	Upstream Depth is less than the specified minimum
✓	3.000	PP3	Road 3	1.002	7.9	4.2	1.200	1.282	1.200	1.282	0.023	0.0	52	1.018	
?	4.000	PP4	Road 4	1.001	7.9	2.2	1.146	1.216	1.146	1.216	0.012	0.0	36	0.850	Upstream Depth is less than the specified minimum
✓	2.000	PP2	Road 2	1.003	7.9	5.0	1.200	1.268	1.200	1.268	0.027	0.0	57	1.059	
✓	1.000	PP1	Road 1	1.004	7.9	5.2	1.200	1.313	1.200	1.313	0.029	0.0	60	1.075	
✓	6.000	PP5	Plot 1 US	1.001	7.9	2.9	1.920	2.000	1.920	2.000	0.016	0.0	43	0.931	

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	22.436	16.4	100	Circular	9.300	7.887	1.313	7.890	6.522	1.268
1.002	18.082	21.1	200	Circular	7.890	6.422	1.268	7.047	5.565	1.282
7.000	11.973	19.2	100	Circular	6.180	5.325	0.755	5.450	4.700	0.650
1.003	10.607	27.6	200	Circular	7.047	5.565	1.282	6.597	5.181	1.216
1.004	19.557	40.7	200	Circular	6.597	5.181	1.216	5.450	4.700	0.550
6.001	16.285	24.3	100	Circular	7.670	5.570	2.000	6.125	4.899	1.126
6.002	11.832	59.5	100	Circular	6.125	4.899	1.126	5.450	4.700	0.650
8.000	11.640	18.4	100	Circular	6.480	5.331	1.049	5.450	4.700	0.650
5.000	62.173	18.7	100	Circular	5.450	4.320	1.030	2.300	1.000	1.200
3.000	4.865	59.3	100	Circular	7.047	5.747	1.200	7.047	5.665	1.282
4.000	4.158	59.4	100	Circular	6.597	5.351	1.146	6.597	5.281	1.216
2.000	4.026	59.2	100	Circular	7.890	6.590	1.200	7.890	6.522	1.268
1.000	6.673	59.1	100	Circular	9.300	8.000	1.200	9.300	7.887	1.313
6.000	4.748	59.3	100	Circular	7.670	5.650	1.920	7.670	5.570	2.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	Road 1	1200	Manhole	Adoptable	Road 2	1200	Manhole	Adoptable
1.002	Road 2	1200	Manhole	Adoptable	Road 3	1200	Manhole	Adoptable
7.000	Plot 3	1200	Manhole	Adoptable	Plot 3 DS	1200	Manhole	Adoptable
1.003	Road 3	1200	Manhole	Adoptable	Road 4	1200	Manhole	Adoptable
1.004	Road 4	1200	Manhole	Adoptable	Road 5	1200	Manhole	Adoptable
6.001	Plot 1 US	1200	Manhole	Adoptable	Plot 1	1200	Manhole	Adoptable
6.002	Plot 1	1200	Manhole	Adoptable	Plot 1 DS	1200	Manhole	Adoptable
8.000	Plot 2	1200	Manhole	Adoptable	Plot 2 DS	1200	Manhole	Adoptable
5.000	Central Swale	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable
3.000	PP3		Junction		Road 3	1200	Manhole	Adoptable
4.000	PP4		Junction		Road 4	1200	Manhole	Adoptable
2.000	PP2		Junction		Road 2	1200	Manhole	Adoptable
1.000	PP1		Junction		Road 1	1200	Manhole	Adoptable
6.000	PP5		Junction		Plot 1 US	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
Road 1	519369.210	111135.528	9.300	1.413	1200	Manhole	Adoptable		1	1.000	7.887	100	Circular
									0	1.001	7.887	100	Circular
Road 2	519378.146	111156.108	7.890	1.468	1200	Manhole	Adoptable		1	2.000	6.522	100	Circular
									2	1.001	6.522	100	Circular
									0	1.002	6.422	200	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
Plot 3	519404.949	111175.646	6.180	0.855	1200	Manhole	Adoptable	0	7.000	5.325	100	Circular
Road 3	519376.462	111174.111	7.047	1.482	1200	Manhole	Adoptable	1	3.000	5.665	100	Circular
								2	1.002	5.565	200	Circular
								0	1.003	5.565	200	Circular
Road 4	519385.154	111180.191	6.597	1.416	1200	Manhole	Adoptable	1	4.000	5.281	100	Circular
								2	1.003	5.181	200	Circular
								0	1.004	5.181	200	Circular
Plot 1 US	519358.613	111189.965	7.670	2.100	1200	Manhole	Adoptable	1	6.000	5.570	100	Circular
								0	6.001	5.570	100	Circular
Plot 3 DS	519414.811	111182.436	5.450	1.000	1200	Manhole	Adoptable	1	7.000	4.700	100	Circular
Plot 1	519365.686	111204.634	6.125	1.226	1200	Manhole	Adoptable	1	6.001	4.899	100	Circular
								0	6.002	4.899	100	Circular
Plot 1 DS	519372.429	111214.356	5.450	1.000	1200	Manhole	Adoptable	1	6.002	4.700	100	Circular
Road 5	519398.253	111194.713	5.450	1.000	1200	Manhole	Adoptable	1	1.004	4.700	200	Circular
Plot 2	519381.454	111192.546	6.480	1.149	1200	Manhole	Adoptable	0	8.000	5.331	100	Circular
Plot 2 DS	519388.094	111202.106	5.450	1.000	1200	Manhole	Adoptable	1	8.000	4.700	100	Circular
Central Swale	519423.500	111185.042	5.450	1.130	1200	Manhole	Adoptable	0	5.000	4.320	100	Circular
Outfall	519476.541	111217.478	2.300	1.300	1200	Manhole	Adoptable	1	5.000	1.000	100	Circular
PP3	519375.966	111169.271	7.047	1.300		Junction		0	3.000	5.747	100	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
PP4	519380.998	111180.334	6.597	1.246		Junction		0	4.000	5.351	100	Circular
PP2	519374.526	111154.346	7.890	1.300		Junction		0	2.000	6.590	100	Circular
PP1	519364.685	111130.624	9.300	1.300		Junction		0	1.000	8.000	100	Circular
PP5	519360.455	111185.589	7.670	2.020		Junction		0	6.000	5.650	100	Circular

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Rate(s)	✓	100 year (l/s)	1.6
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	2 year (l/s)	1.6	Check Discharge Volume	✓
Summer CV	1.000	Skip Steady State	x	Starting Level (m)		30 year (l/s)	1.6	100 year 360 minute (m³)	28

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	30	40	10	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	England, Wales, NI	Positively Drained Area (ha)	0.530	Q 2 year (l/s)	0.7	Q 100 year (l/s)	2.3
Greenfield Method	ReFH2	Include Baseflow	x	Betterment (%)	0	Q 30 year (l/s)	1.8		

Pre-development Discharge Volume

Site Makeup	Greenfield	Region	England, Wales, NI	Positively Drained Area (ha)	0.530	Storm Duration (mins)	360	Runoff Volume (m³)	28
Greenfield Method	ReFH2	Include Baseflow	x	Return Period (years)	100	Betterment (%)	0		

Node Central Swale ReFH2 Dynamic Hydrograph

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0	Region	England, Wales, NI
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0	Area (ha)	0.288	Include Baseflow	x

Applies to All storms

Node Outfall Surcharged Outfall

Overrides Design Area	x	Overrides Design Additional Inflow	x	Depression Storage Area (m²)	0	Depression Storage Depth (mm)	0	Evapo-transpiration (mm/day)	0

Applies to All storms

Time (mins)	Level (m)	Time (mins)	Level (m)
0	4.760	1440	4.760

Node Central Swale Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	1.000	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	x	Design Flow (l/s)	1.6	Product Number	CTL-SCL-0057-1600-1000-1600		
Invert Level (m)	4.450	Objective	(CL) Minimise blockage risk	Min Outlet Diameter (m)	0.075		

Node PP3 Online Orifice Control

Flap Valve x | Replaces Downstream Link x | Invert Level (m) 5.747 | Diameter (m) 0.030 | Discharge Coefficient 0.600

Node PP4 Online Orifice Control

Flap Valve x | Replaces Downstream Link x | Invert Level (m) 5.350 | Diameter (m) 0.020 | Discharge Coefficient 0.600

Node PP2 Online Orifice Control

Flap Valve x | Replaces Downstream Link x | Invert Level (m) 6.590 | Diameter (m) 0.040 | Discharge Coefficient 0.600

Node PP1 Online Orifice Control

Flap Valve x | Replaces Downstream Link x | Invert Level (m) 8.000 | Diameter (m) 0.036 | Discharge Coefficient 0.600

Node PP5 Online Orifice Control

Flap Valve x | Replaces Downstream Link x | Invert Level (m) 5.650 | Diameter (m) 0.020 | Discharge Coefficient 0.600

Node Central Swale Pond Storage Structure

Invert Level (m) 4.450 | Time to half empty (mins) | Analyse flow through structure x

Inlets

Plot 1 DS | Plot 2 DS | Road 5 | Plot 3 DS

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	38.5	1.000	500.5

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.297	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	56	Length (m)	15.000	Depth (m)	0.500	

Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.847	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	32	Length (m)	16.000	Depth (m)	0.500	

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.140	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	35	Length (m)	19.000	Depth (m)	0.500	

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.550	Width (m)	5.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	50	Length (m)	19.000	Depth (m)	0.500		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.920	Width (m)	14.000	Slope (1:X)	150.0	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	58	Length (m)	5.000	Depth (m)	0.500		

Other (defaults)

Entry Loss (manhole)	0.250	Exit Loss (manhole)	0.250	Entry Loss (junction)	0.000	Exit Loss (junction)	0.000	Apply Recommended Losses	x	Flood Risk (m)	0.300

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 98.70%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	Road 1	23	7.912	0.025	2.1	0.0288	0.0000	OK
15 minute summer	Road 2	14	6.454	0.032	4.6	0.0361	0.0000	OK
15 minute summer	Plot 3	10	5.365	0.040	4.4	0.0665	0.0000	OK
15 minute summer	Road 3	14	5.604	0.039	6.0	0.0443	0.0000	OK
30 minute summer	Road 4	23	5.227	0.046	6.6	0.0520	0.0000	OK
120 minute summer	Plot 1 US	74	5.588	0.018	0.9	0.0205	0.0000	OK
960 minute winter	Plot 3 DS	720	4.910	0.460	0.8	0.0000	0.0000	OK
15 minute summer	Plot 1	11	4.948	0.049	3.6	0.0682	0.0000	OK
960 minute winter	Plot 1 DS	720	4.911	0.461	0.8	0.0000	0.0000	OK
960 minute winter	Road 5	720	4.911	0.461	1.6	0.0000	0.0000	OK
15 minute summer	Plot 2	10	5.367	0.036	3.7	0.0526	0.0000	OK
960 minute winter	Plot 2 DS	720	4.911	0.461	0.8	0.0000	0.0000	OK
960 minute winter	Central Swale	720	4.909	0.589	2.1	70.1095	0.0000	SURCHARGED
15 minute summer	Outfall	1	4.760	3.760	0.0	0.0000	0.0000	OK
30 minute summer	PP3	23	6.369	0.622	4.3	0.9332	0.0000	SURCHARGED
30 minute summer	PP4	24	5.892	0.541	2.2	0.3818	0.0000	SURCHARGED
15 minute summer	PP2	13	7.202	0.612	5.8	0.7951	0.0000	SURCHARGED
30 minute summer	PP1	22	8.627	0.627	5.4	1.0946	0.0000	SURCHARGED
120 minute summer	PP5	74	6.779	1.129	1.8	0.1986	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	Road 1	1.001	Road 2	2.1	1.334	0.138	0.0350	
15 minute summer	Road 2	1.002	Road 3	4.6	1.227	0.055	0.0680	
15 minute summer	Plot 3	7.000	Plot 3 DS	4.3	1.531	0.312	0.0340	
15 minute summer	Road 3	1.003	Road 4	6.0	1.243	0.083	0.0517	
30 minute summer	Road 4	1.004	Road 5	6.6	1.245	0.111	0.1044	
120 minute summer	Plot 1 US	6.001	Plot 1	0.9	0.654	0.071	0.0295	
15 minute summer	Plot 1	6.002	Plot 1 DS	3.5	0.954	0.452	0.0440	
15 minute summer	Plot 2	8.000	Plot 2 DS	3.6	1.482	0.257	0.0287	
960 minute winter	Central Swale	5.000	Outfall	1.4	0.177	0.098	0.4865	51.9
30 minute summer	PP3	3.000	Road 3	1.4	0.752	0.184	0.0094	
30 minute summer	PP4	4.000	Road 4	0.6	0.586	0.077	0.0043	
15 minute summer	PP2	2.000	Road 2	2.5	0.871	0.321	0.0117	
30 minute summer	PP1	1.000	Road 1	2.1	0.986	0.264	0.0142	
120 minute summer	PP5	6.000	Plot 1 US	0.9	0.739	0.112	0.0057	

Results for 30 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.43%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Road 1	47	7.915	0.028	2.5	0.0314	0.0000	OK
60 minute summer	Road 2	46	6.457	0.035	5.4	0.0391	0.0000	OK
15 minute summer	Plot 3	11	5.551	0.226	15.8	0.3780	0.0000	SURCHARGED
60 minute summer	Road 3	46	5.608	0.043	7.1	0.0485	0.0000	OK
960 minute summer	Road 4	960	5.339	0.158	6.0	0.1789	0.0000	OK
120 minute summer	Plot 1 US	88	5.589	0.019	1.0	0.0219	0.0000	OK
960 minute summer	Plot 3 DS	975	5.337	0.887	2.9	0.0000	0.0000	OK
960 minute summer	Plot 1	960	5.338	0.439	2.0	0.6107	0.0000	SURCHARGED
960 minute summer	Plot 1 DS	960	5.338	0.888	2.9	0.0000	0.0000	OK
960 minute summer	Road 5	960	5.339	0.889	6.0	0.0000	0.0000	OK
15 minute summer	Plot 2	10	5.415	0.084	13.3	0.1238	0.0000	OK
960 minute summer	Plot 2 DS	960	5.338	0.888	2.9	0.0000	0.0000	OK
960 minute summer	Central Swale	960	5.337	1.017	7.5	222.5625	0.0000	FLOOD RISK
15 minute summer	Outfall	1	4.760	3.760	1.4	0.0000	0.0000	OK
60 minute winter	PP3	51	6.621	0.874	8.7	7.5437	0.0000	SURCHARGED
120 minute summer	PP4	90	6.046	0.695	4.1	4.2140	0.0000	SURCHARGED
60 minute summer	PP2	44	7.414	0.824	14.2	7.3989	0.0000	SURCHARGED
60 minute winter	PP1	49	8.866	0.866	10.8	8.8249	0.0000	SURCHARGED
120 minute summer	PP5	88	7.135	1.485	5.6	5.0949	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	Road 1	1.001	Road 2	2.5	1.399	0.163	0.0394	
60 minute summer	Road 2	1.002	Road 3	5.4	1.275	0.065	0.0769	
15 minute summer	Plot 3	7.000	Plot 3 DS	14.0	1.876	1.005	0.0937	
60 minute summer	Road 3	1.003	Road 4	7.1	1.322	0.098	0.0572	
960 minute summer	Road 4	1.004	Road 5	6.0	0.711	0.101	0.5658	
120 minute summer	Plot 1 US	6.001	Plot 1	1.0	0.453	0.082	0.0724	
960 minute summer	Plot 1	6.002	Plot 1 DS	2.0	0.522	0.250	0.0926	
15 minute summer	Plot 2	8.000	Plot 2 DS	13.1	1.952	0.923	0.0781	
960 minute summer	Central Swale	5.000	Outfall	1.5	0.193	0.107	0.4865	63.4
60 minute winter	PP3	3.000	Road 3	1.7	0.789	0.219	0.0106	
120 minute summer	PP4	4.000	Road 4	0.7	0.609	0.087	0.0047	
60 minute summer	PP2	2.000	Road 2	3.0	0.906	0.375	0.0131	
60 minute winter	PP1	1.000	Road 1	2.5	1.031	0.312	0.0160	
120 minute summer	PP5	6.000	Plot 1 US	1.0	0.770	0.128	0.0063	

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.37%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	Road 1	53	7.916	0.029	2.6	0.0326	0.0000	OK
60 minute winter	Road 2	50	6.458	0.036	5.8	0.0404	0.0000	OK
15 minute summer	Plot 3	12	5.908	0.583	20.5	0.9745	0.0000	FLOOD RISK
60 minute winter	Road 3	51	5.609	0.044	7.6	0.0503	0.0000	OK
600 minute summer	Road 4	540	5.450	0.269	7.3	0.3048	0.0000	SURCHARGED
120 minute summer	Plot 1 US	94	5.590	0.020	1.0	0.0223	0.0000	OK
1440 minute summer	Plot 3 DS	990	5.450	1.000	2.8	0.0000	2.6945	FLOOD
600 minute summer	Plot 1	540	5.451	0.552	2.9	0.7683	0.0000	SURCHARGED
1440 minute summer	Plot 1 DS	990	5.450	1.000	2.8	0.0000	4.0854	FLOOD
1440 minute summer	Road 5	960	5.450	1.000	5.9	0.0000	21.7688	FLOOD
15 minute summer	Plot 2	11	5.668	0.337	17.4	0.4960	0.0000	SURCHARGED
1440 minute summer	Plot 2 DS	990	5.450	1.000	2.8	0.0000	3.5886	FLOOD
960 minute summer	Central Swale	720	5.450	1.130	8.8	276.6304	1.1999	FLOOD
15 minute summer	Outfall	1	4.760	3.760	1.5	0.0000	0.0000	OK
60 minute winter	PP3	58	6.756	1.009	11.5	11.1264	0.0000	FLOOD RISK
120 minute summer	PP4	96	6.114	0.763	5.3	6.1323	0.0000	SURCHARGED
60 minute summer	PP2	47	7.524	0.934	18.8	11.0881	0.0000	SURCHARGED
60 minute winter	PP1	53	8.993	0.993	14.3	13.0959	0.0000	SURCHARGED
120 minute summer	PP5	94	7.241	1.591	7.2	7.6988	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	Road 1	1.001	Road 2	2.6	1.427	0.175	0.0415	
60 minute winter	Road 2	1.002	Road 3	5.8	1.298	0.069	0.0808	
15 minute summer	Plot 3	7.000	Plot 3 DS	17.2	2.193	1.233	0.0937	
60 minute winter	Road 3	1.003	Road 4	7.6	1.348	0.105	0.0601	
600 minute summer	Road 4	1.004	Road 5	7.3	0.854	0.121	0.6121	
120 minute summer	Plot 1 US	6.001	Plot 1	1.0	0.472	0.085	0.0726	
600 minute summer	Plot 1	6.002	Plot 1 DS	2.8	0.587	0.351	0.0926	
15 minute summer	Plot 2	8.000	Plot 2 DS	15.4	1.964	1.083	0.0911	
960 minute summer	Central Swale	5.000	Outfall	1.5	0.193	0.107	0.4865	69.7
60 minute winter	PP3	3.000	Road 3	1.9	0.805	0.236	0.0112	
120 minute summer	PP4	4.000	Road 4	0.7	0.617	0.091	0.0048	
60 minute summer	PP2	2.000	Road 2	3.1	0.921	0.400	0.0138	
60 minute winter	PP1	1.000	Road 1	2.6	1.051	0.334	0.0168	
120 minute summer	PP5	6.000	Plot 1 US	1.0	0.778	0.133	0.0064	

Water Quality

	Area (ha)	Intended Land Use	Entering via Node or Link	Name	SuDS Component	Pollution hazard indices TSS	Pollution hazard indices Metals	Pollution hazard indices Hydrocarbons	Pollution mitigation indices TSS	Pollution mitigation indices Metals	Pollution mitigation indices Hydrocarbons	Cumulative pollution hazard indices TSS	Cumulative pollution hazard indices Metals	Cumulative pollution hazard indices Hydrocarbons
✓	0.021	Residential roofing	Node	Plot 3		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.014	Low traffic roads	Node	PP1		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.011	Individual driveway	Node	PP1		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP1		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP1	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.015	Low traffic roads	Node	PP2		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.012	Residential roofing	Node	PP2		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP2	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.011	Low traffic roads	Node	PP3		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.008	Individual driveway	Node	PP3		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP3		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP3	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.012	Low traffic roads	Node	PP4		0.5	0.4	0.4				0.5	0.4	0.4
			Node	PP4	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.018	Residential roofing	Node	Plot 2		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.004	Residential roofing	Node	Plot 2 DS		0.2	0.2	0.05				0.2	0.2	0.05
✓	0.006	Individual driveway	Node	Plot 2 DS		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.008	Low traffic roads	Node	PP5		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Individual driveway	Node	PP5		0.5	0.4	0.4				0.5	0.4	0.4
✓	0.004	Residential roofing	Node	PP5		0.2	0.2	0.05				0.2	0.2	0.05
			Node	PP5	Permeable Surface				0.7	0.6	0.7	0	0	0
✓	0.014	Residential roofing	Node	Plot 1		0.2	0.2	0.05				0.2	0.2	0.05
			Node	Central Swale	Detention Basin				0.25	0.25	0.3	0.25	0.15	0.1
			Node	Outfall								0.25	0.15	0.1
												Insufficient	Insufficient	Insufficient