

Chapel Road, Barns Green Horsham, West Sussex

P25-1183

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Flood Risk Assessment & Drainage Strategy Report

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Author	Gareth Crowther
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Henley On Thames

8 Friday Street
Henley on Thames
Oxfordshire
RG9 1AH

+44(0)1491 576 221

Gloucester

Unit B10
Elmbridge Court
Business Park
Gloucester
GL3 1JZ

+44(0)1452 309 727

London

4th Floor
Devonshire House
60 Goswell Road
London
EC1M 7AD

+44 (0)207 253 2626

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1 Introduction

1.1 Background

1.1.1 This report has been prepared on behalf of Shanly Homes to accompany an application seeking full planning permission for a proposed residential development on land west of Chapel Road in Barns Green near Horsham in West Sussex.

1.2 Objectives

1.2.1 The report assesses flood risk associated with the development proposals and outlines a strategy for the disposal of surface water and foul water runoff from the development, following guidance set out in the following local & national planning policy documents:

- The National Planning Policy Framework (NPPF) & associated Planning Practice Guidance (PPG)
- Horsham District Planning Framework (HDPF)
- West Sussex County Council (WSCC) Local Flood Risk Management Strategy (LFRMS)
- Horsham District Council (HDC) District Level 1 Strategic Flood Risk Assessment (SFRA)
- New National Standards for Sustainable Drainage Systems (SuDS)
- WSCC SuDS Policy
- HDC SuDS Policy

1.2.2 Pre-application discussions were held with West Sussex County Council in their role as the Lead Local flood Authority (LLFA). The purpose of the discussion was to agree the scope, extent and key principles of any Flood Risk Assessment (FRA) and Drainage Scheme required to accompany a full planning application for the proposed development. *Appendix A* includes the scoping note prepared for the pre-application discussions and the LLFA's consultation response. *Appendix A* also includes a further technical note setting out how this FRA addresses the requirements of the LLFA's consultation response.

2 Site Location & Characteristics

2.1 Site Location

2.1.1. The site is located in Barns Green, west of Chapel Road, between Muntham Drive and Smugglers Lane. *Figure 2.1*, below shows the site location outlined in red.



Figure 2.1.1 Site Location

2.1.2. The site is centred on Ordnance Survey grid reference TQ 12533 27135 and co-ordinates X: 512533; Y: 127135. The nearby post code is RH13 0PS.

2.2 Site Description

2.2.1. The site is presently an undeveloped green field used for pasture, approximately 1.88 Ha in area.

2.3 Topography

2.3.1. The site falls in a south-easterly direction, from a level of approximately 43.50 mAOD at the north-western boundary to approximately 32.50 mAOD at the south-eastern boundary.

2.3.2. A copy of the topographical survey of the site is included in *Appendix B*.

2.4 Existing Ground Conditions

2.4.1. A Phase 2 Geo-Environmental Site Investigation (ref. 25-129.02) was carried out by Aviron Associates in June 2025. *Appendix B* includes extracts from the report, including investigation location plans, exploratory hole logs and monitoring data sheets.

2.4.2. The investigation established ground conditions at the site to comprise a 0.3-0.6m thick layer of topsoil overlaying cohesive Weald Clay deposits comprising soft, soft to firm and firm, becoming stiff and very stiff Clay to a depth of 2.7-4.7m bgl. Bedrock of mudstone was encountered below the Weald Clay deposits.

2.4.3. Dry conditions were encountered in nine out of eleven exploratory holes carried out as part of the investigation up to 4.7m in depth. Two boreholes (WS2 and WS9) encountered groundwater at depths of 2.5m to 3.9m bgl with groundwater rising to 2.4m to 3.85m bgl by the completion of investigations.

- 2.4.4. Groundwater monitoring was carried out in late June 2025, which recorded groundwater depths of 1.36m to 1.98m bgl in exploratory holes WS1, WS2 and WS5.
- 2.4.5. Winter groundwater monitoring was carried out from early February 2026 to late April 2026, which showed groundwater levels to rise to depths of 0.0 to 0.8m bgl in February before dropping to 0.67m to 1.02m bgl in late April.
- 2.4.6. The Geo-Environmental assessment considers the groundwater encountered to be representative of perched water within the Weald Clay Formation. It is likely that the observed conditions were exacerbated by a prolonged period of consistent rainfall across the UK in early 2026, during which many areas experienced over 40 consecutive days of rain between late December 2025 and mid-February 2026. The subsequent lowering of groundwater levels is likely to be associated with reduced rainfall and comparatively drier conditions since that period
- 2.4.7. A Tier 1 Preliminary Risk Assessment desk study and Tier 2 Generic Quantitative Risk Assessment undertaken as part of the report did not identify any ground contamination that would warrant remediation.
- 2.4.8. The Geo-Environmental Assessment comprised a Phase 1 environmental desk study and Phase 2 intrusive investigation consisting of six light percussion boreholes. Copies of the borehole records are included in *Appendix B*.

2.5 Hydrology and Hydrogeology

2.5.1. The Phase 2 Geo-Environmental Site Investigation (ref. 25-129.02) identifies the following:

- The hydrogeology of the site is determined by the solid geology of the Weald Clay Formation, which is classified by the Environment Agency as unproductive strata. Unproductive strata comprise rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
- The combined classification groundwater vulnerability beneath the site is noted as 'unproductive aquifer'.
- The site is not located within an Environment Agency source protection zone (SPZ)

2.5.2. Figure 2.5.1 below shows an extract from Ordnance Survey watercourse mapping, which identifies the nearest watercourse to be the Muntham Gill, an ordinary watercourse and tributary of the Parsons Brook, which is also an ordinary watercourse.

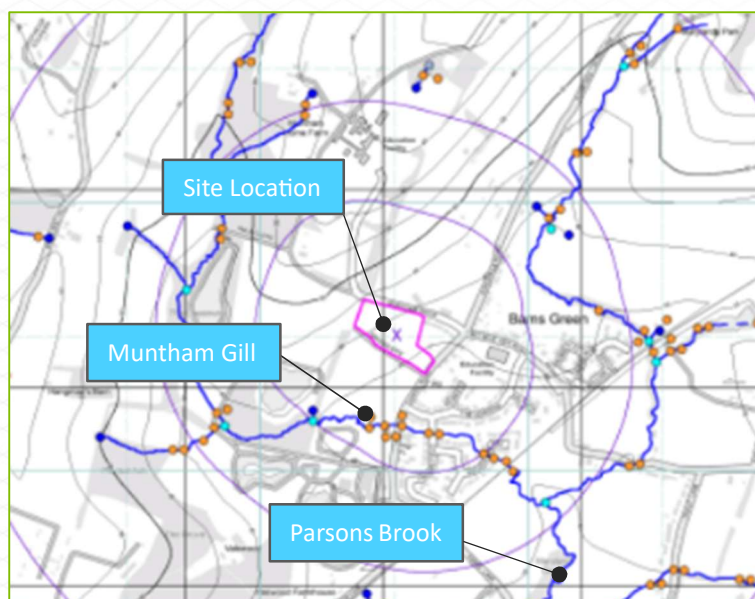


Figure 2.5.1: OS Watercourse Map

2.5.3. An extract from the DEFRA climate change allowance map is shown in *Figure 2.5.2* below, which identifies the site to be in the Adur and Ouse Catchment.

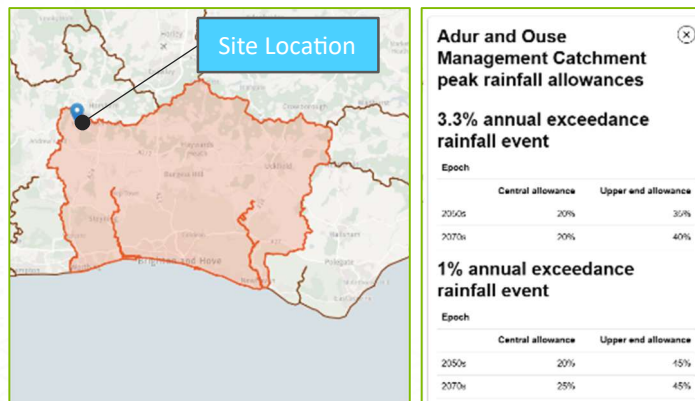


Figure 2.5.2: DEFRA Climate Change Allowance map (<https://environment.data.gov.uk/hydrology/climate-change-allowances>)

2.5.4. The extract from the FEH Webservice map shown in *Figure 2.5.3* below identifies the site to form part of a 1.87km² drainage catchment associated with the Muntham Gill.

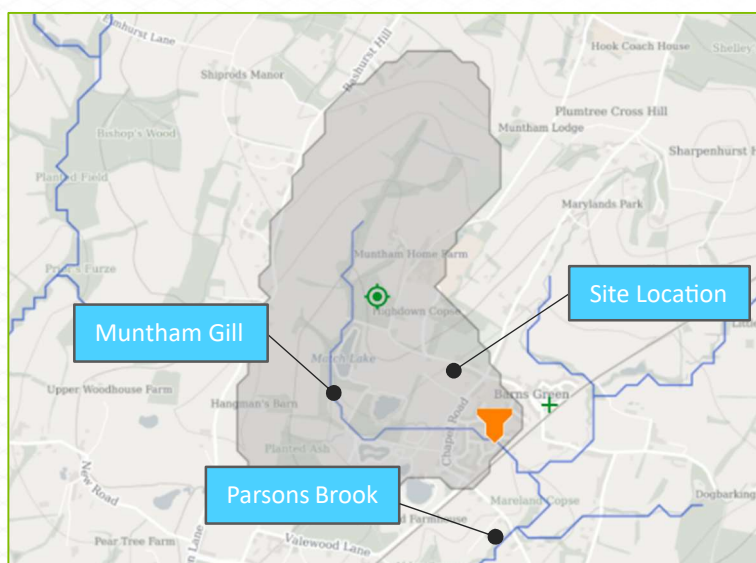


Figure 2.5.3: FEH Webservice Map (<https://fehweb.ceh.ac.uk/Map>)

2.6 Existing Drainage Arrangements

- 2.6.1. There are no existing watercourses on the site. An existing drainage characteristics plan is included in *Appendix C*. The plan shows fall arrows generated by a digital terrain model created from a topographical survey of the site. The fall arrows show that overland surface water runoff flows from the site would discharge in a south-easterly direction to an existing drainage ditch located outside the site, along the sites southern boundary.
- 2.6.2. A drainage survey has established that the drainage ditch discharges to a 600mm Ø culvert located along the western edge of Chapel Road, which is also identified on the existing drainage characteristics plan. The drainage survey established that the culvert continues in a south-westerly direction along the western edge of Chapel Road, where it eventually connects to the Muntham Gill to the south-west as indicatively identified on the existing drainage characteristics plan.
- 2.6.3. Southern water sewer records show their sewer network to be present in Chapel Road to the north of the site and to the south of the site. The location of their sewer network is shown indicatively identified on the existing drainage characteristics plan.

3 Proposed Scheme

3.1 Development Details

3.1.1. The proposed development comprises approximately 31 No. residential units with associated gardens, driveways, garages, parking spaces, estate roads, estate landscaping and open space.

3.2 Development Layout

3.2.1. A plan showing the development layout is included in *Appendix D*.

4 Flood Risk Planning Policy & Guidance

4.1 National Planning Policy Framework (NPPF) & Planning Practice Guidance (PPG)

4.1.1. At a national level, the NPPF and the Planning Practice Guidance (PPG) to the NPPF seek to ensure flood risk is considered at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development towards areas at lowest flood risk. The NPPF retains a risk-based approach to the planning process and uses the Flood Zones as the basis for applying the sequential test, as well as flood risk vulnerability classifications, which define the type of development that is considered appropriate within each zone. It advises local planning authorities to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

4.1.2. The NPPF establishes the Flood Zones as the starting point for assessment with the overarching aim to steer new development to areas with the lowest probability of flooding. Flood Zone maps are available on the GOV.UK website and the definitions of the Flood Zones extracted from the National Planning Policy Framework (NPPF) are described below:

- Flood Zone 1 – Low probability. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
- Flood Zone 2 – Medium probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%) in any year.
- Flood Zone 3a – High probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Flood Zone 3b – The functional floodplain. This zone comprises land where water must flow or be stored in times of flood. Typically, land which would flood with an annual probability of 1 in 20 (0.5%) or greater in any year or is designed to flood in an extreme (0.1%) flood.

4.1.3. In areas at risk of river flooding, the NPPF advises that preference be given to new development in Flood Zone 1. If there are no reasonably available sites in Flood Zone 1 the flood vulnerability of the development can be considered in locating development in Flood Zone 2 and then Flood Zone 3. Within each flood zone new development should be directed to sites at the lowest probability of flooding from all sources.

4.1.4. The NPPF advises that when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment with development only to be allowed in areas at risk of flooding where, in the light of the assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- within the site, the most vulnerable development is in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.
- the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.
- it incorporates Sustainable Drainage Systems (SuDS), unless there is clear evidence that this would be inappropriate.
- any residual risk can be safely managed; and
- safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

4.2 Horsham District Planning Framework (HDPF)

4.2.1. The HDPF is the overarching planning document for HDC outside the South Downs National Park (SDNP) and replaces the Core Strategy and General Development Control Policies documents which were adopted in 2007. Policy 38 (Flooding) of the HDPF states:

- *“Development proposals will follow a sequential approach to flood risk management, giving priority to development sites with the lowest risk of flooding and making required development safe without increasing flood risk elsewhere. Development proposals will;*
 - *take a sequential approach to ensure most vulnerable uses are placed in the lowest risk areas.*
 - *avoid the functional floodplain (Flood zone 3b) except for water-compatible uses and essential infrastructure.*
 - *only be acceptable in Flood Zone 2 and 3 following completion of a sequential test and exceptions test if necessary.*
 - *require a site-specific Flood Risk Assessments for all developments over 1 hectare in Flood Zone 1 and all proposals in Flood Zone 2 and 3.*
- *Comply with the tests and recommendations set out in the Horsham District Strategic Flood Risk Assessment (SFRA).*
- *Where there is the potential to increase flood risk, proposals must incorporate the use of sustainable drainage systems (SuDS) where technically feasible, or incorporate water management measures which reduce the risk of flooding and ensure flood risk is not increased elsewhere.*
- *Consider the vulnerability and importance of local ecological resources such as water quality and biodiversity when determining the suitability of SuDS. New development should undertake more detailed assessments to consider the most appropriate SuDS methods for each site. Consideration should also be given to amenity value and green infrastructure.*
- *Utilise drainage techniques that mimic natural drainage patterns and manage surface water as close to its source as possible will be required where technically feasible.*
- *Be in accordance with the objective of the Water Framework Directive, and accord with the findings of the Gatwick Sub Region Water Cycle Study in order to maintain water quality and water availability in rivers and wetlands and wastewater treatment requirements.”*

4.3 West Sussex County Council (WSCC) Local Flood Risk Management Strategy (LFRMS)

4.3.1. As the Lead Local Flood Authority (LLFA), WSCC are responsible for creating and maintaining a strategy to manage local flood risk, in line with the national strategy.

4.3.2. The 2025 strategy outlines how WSCC plan to manage and reduce flood risk across West Sussex. The strategy seeks to:

- *understand flood risk by using a catchment-based approach to assess and manage flood risk across West Sussex*
- *plan for resilience by ensuring new developments are sustainable and built to handle flooding, using better planning and drainage*
- *work together by collaborating with partners to manage flood assets and promote nature-based solutions*
- *support communities by helping residents prepare for and respond to flooding through awareness campaigns, community engagement and local action*

4.3.3. The Strategy Action Plan is actively monitored and maintained as a live document by WSCC to ensure it remains responsive and delivers successful outcomes.

4.3.4. Horsham District Council (HDC) Level 1 Strategic Flood Risk Assessment (SFRA)

4.3.5. The SFRA provides details of sources of flood risk within the local area. The following section of this report reviews flood risk associated with sources of flooding identified by the SFRA and by flood maps produced by the Environment Agency (EA) available on the ‘gov.uk’ website.

5 Sources of Flooding

5.1 Historic Flooding

5.1.1. Figure 5.1.1 below shows an EA historical flood map from a flood risk screening report obtained for the site. The map identifies that the site has not been affected by incidents of flooding recorded by the EA in the past.

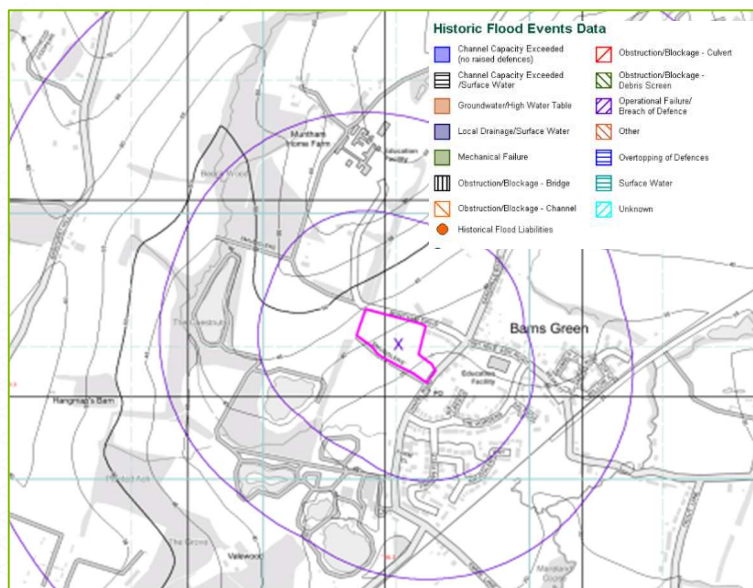


Figure 5.1.1: SFRA Historic Flood Map

5.1.2. Figure 5.1.2 below shows mapping extracted from the Level 1 SFRA, which does not show Barns Green to have been affected by past incidents of flooding recorded by WSCC.

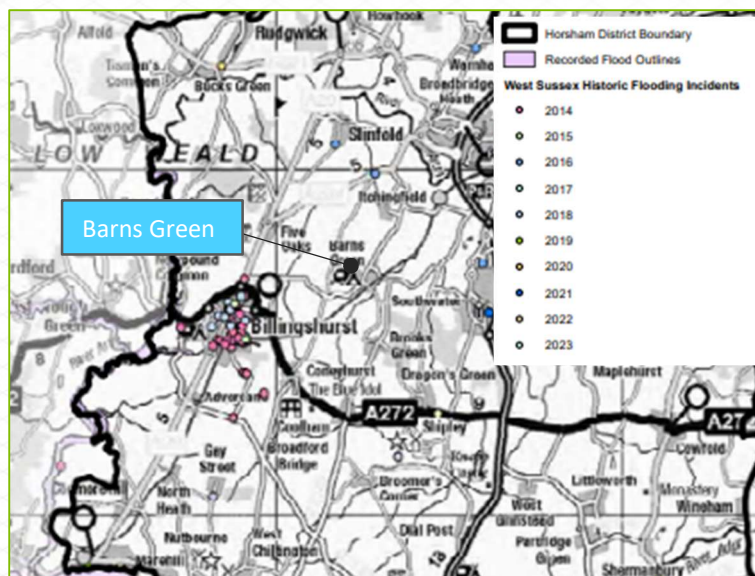


Figure 5.1.2: SFRA Historic Flood Map

5.2 Fluvial Flooding

- 5.2.1. The Level 1 SFRA advises that flooding from rivers occurs when water levels rise higher than bank levels, causing floodwater to spill across adjacent land (floodplain)
- 5.2.2. The EA's Flood Map for Planning is the initial dataset used for identifying the location and extent of fluvial and tidal flooding. *Figure 5.2.1* below shows the flood map, which identifies the site to be in Flood Zone 1. Flood Zone 1 would be representative of land at low probability of fluvial flooding, with less than 1 in 1,000 annual probability of river flooding (<0.1%).

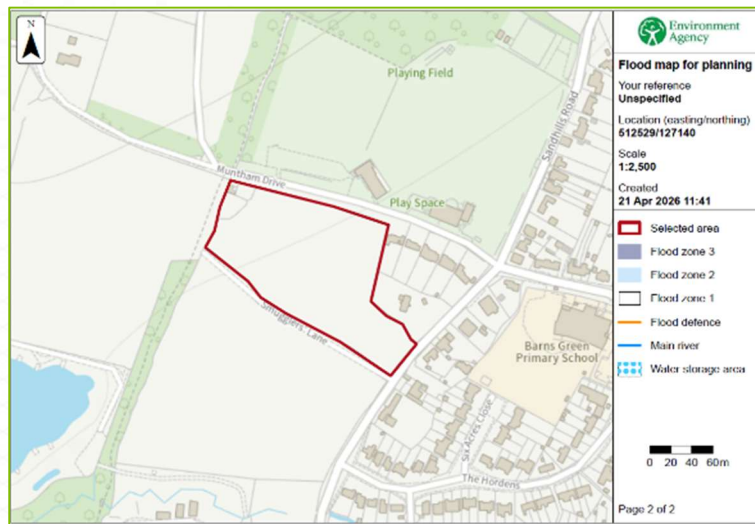


Figure 5.2.1: EA Flood Zone Map

- 5.2.3. In August 2025, the EA made changes to the FMfP service which included the removal of the existing rivers/sea with and without defences layers and added a layer called 'Flood Zones plus climate change' which shows how the combined extent of Flood Zones 2 and 3 could increase with climate change over the next century. *Figure 5.2.2* below, shows an extract from the mapping, which shows the site and surrounding areas to remain as Flood Zone 1 when allowing for climate change.

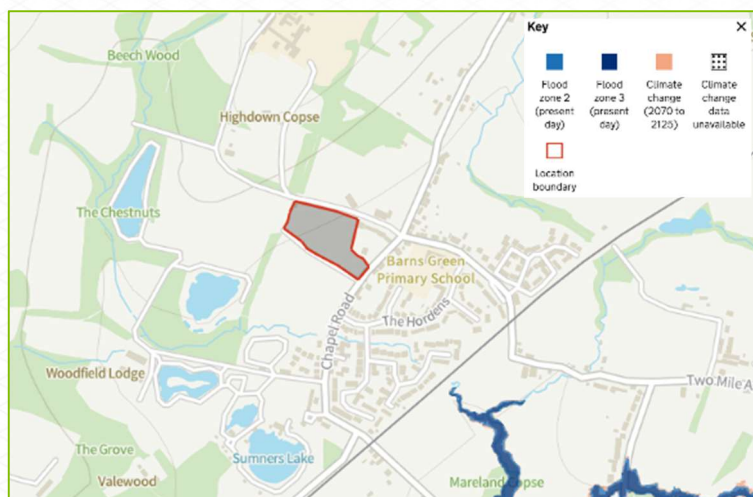


Figure 5.2.2: EA Flood Map for Planning including Climate Change

- 5.2.4. Based on EA flood mapping, the site is assessed to be in Flood Zone 1. Flood Zone 1 is deemed to be land at lowest probability of fluvial flooding. Therefore, no further assessment of flood risk is required in relation to fluvial flooding and no measures are deemed necessary to manage flood risk from this source.

5.3 Surface Water Flooding

5.3.1. The Level 1 SFRA advises that overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, which is unable to soak into the ground or enter drainage systems.

5.3.2. The EA's long term flood risk mapping provides an understanding of the areas, which may be at risk from surface water flooding, with the maps indicating critical flow paths and areas situated in topographic depressions that could flood following an extreme rainfall event. The mapping shows the predicted extents of surface water flooding for 1 in 30, 1 in 100 and 1 in 1000 annual likelihood events. In a similar manner to fluvial flooding, the 1 in 100 year extents represents Flood Zone 3 and the 1 in 1000 year extents represent Flood Zone 2. It is generally accepted that the 1 in 1000 year extent is representative of the Flood Zone 3 extents allowing for the impact of future climate change. *Figure 5.3.1* below shows an extract from the mapping, which shows surface water flooding to affect the south-eastern edge of the site, with areas of low to high flood risk identified in Chapel Road and residential properties to the north-east.

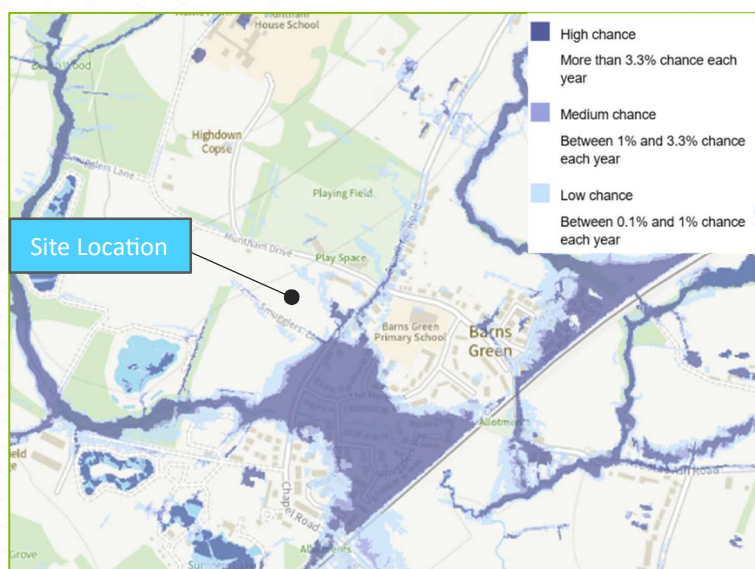


Figure 5.3.1: EA Surface Water Flood Risk Map)

5.3.3. *Figure 5.3.2* shows an extract from hazard modelling carried out as part of the flood risk assessment submitted for residential development on land immediately to the south of the site (Horsham District Council Ref. DC/25/2057). The mapping identifies the hazard rating of flooding for a 1% Annual Event Probability (AEP) plus climate change to be low hazard that would be conditions deemed suitable for safe access or egress for all users.

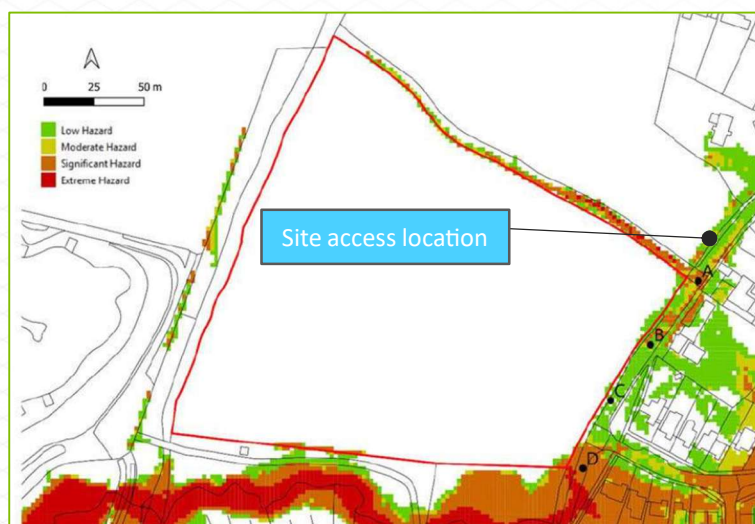


Figure 5.3.2: Surface Water Flood Hazard Modelling for Application DC/25/2057)

- 5.3.4. Given modelling for the adjacent site identifies risk of surface water flooding to be low in hazard, no further assessment of flood risk is considered necessary in relation to surface water flooding and no measures are deemed necessary to manage flood risk from this source. It should also be noted that secondary pedestrian access and egress is available via Muntham Drive, which long term flood risk mapping identifies to not be at very low risk of surface water flooding.
- 5.3.5. Development can cause increases in surface water runoff rates and volumes, which can increase the risk of surface water flooding on site and elsewhere. However, the risk of the development increasing surface water flood risk could be managed using Sustainable Drainage Systems (SuDS), which are able to minimise the rate of discharge, volume, and environmental impact of surface water runoff.

5.4 Groundwater Flooding

- 5.4.1. The Level 1 SFRA advises that groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.
- 5.4.2. The British Geological Survey (BGS) has produced a national dataset on the susceptibility of groundwater flooding, covering England, Wales and Scotland. The dataset is based on geological and hydrogeological information and can be used to identify areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface. *Figure 5.4.1 below* shows an extract from the BGS groundwater susceptibility map, which does not identify the site to be in an area where there is potential for groundwater flooding.

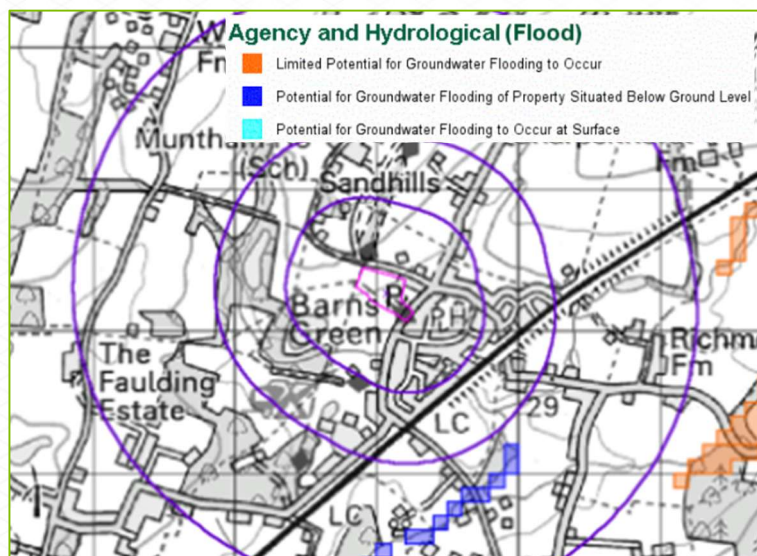


Figure 5.4.1: BGS Groundwater Susceptibility Map

- 5.4.3. GeoSmart information have developed algorithms and calibrated predictions of the risk of groundwater flooding occurring in Great Britain. The resulting map, classifies groundwater flood risk for each 5m x 5m into four categories, negligible, low, moderate and high. These classifications are based on the level of risk, combining severity and uncertainty that a site will suffer groundwater flooding within a return period of about 200 years. *Figure 5.4.2 below* shows the GeoSmart Information Groundwater Flood Map, which identifies the site to be at negligible risk of groundwater flooding.

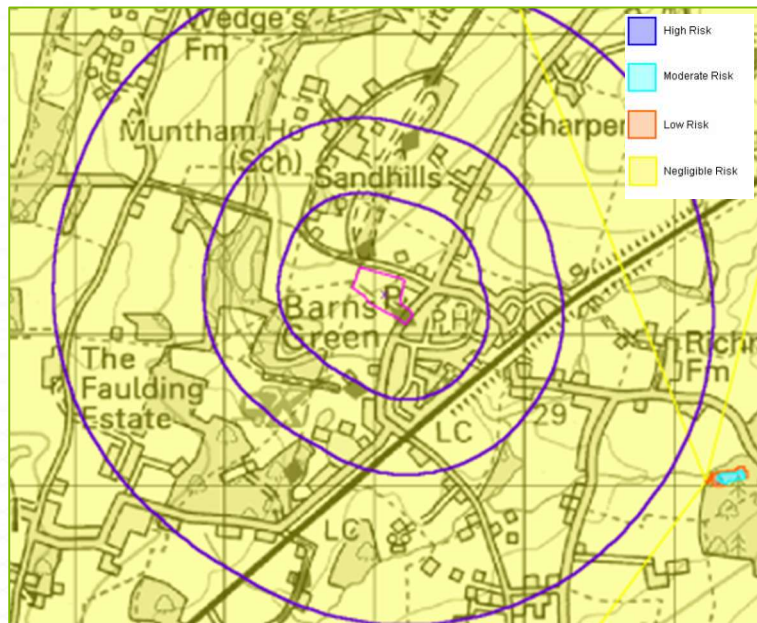


Figure 5.4.2: GeoSmart Information Groundwater Flood Map

5.4.4. Based on the BGS and GeoSmart groundwater flood maps, the site is considered to be at low risk of flooding from this source.

5.4.5. In Section 2.4 it was noted that winter groundwater monitoring recorded groundwater levels at shallow depths of 0.0 to 0.8m bgl in February 2026. The ground investigation considered that the groundwater recorded is perched water within the Weald Clay Formation and so it is considered unlikely to be a potential flood risk, although the potential for encountering groundwater would need to be considered during construction when carrying out excavations, whilst sealing of surface water attenuation measures using impermeable membranes is also likely to be required to prevent groundwater from entering systems and reducing capacity.

5.4.6. It is considered that rises in groundwater levels would be significantly reduced once a surface water drainage system is provided as part of the development, as rainfall that previously fell on the site would largely be intercepted and redirected into the drainage system rather than oversaturating the ground, which comprises of relatively impermeable soils that have limited ability permit infiltration.

5.5 Sewer Flooding

5.5.1. The Level 1 SFRA advises that sewer flooding often occurs during heavy rainfall if:

- Rainfall event exceeds the capacity of the sewer system/drainage system.
- The system becomes blocked by debris or sediment
- The system surcharges due to high water levels in receiving waterbodies

5.5.2. The Level 1 SFRA includes mapping showing the number of sewer flooding incidents reported by Southern Water over the last 10 years in each four-digit postcode in the HDC study area based on their DG5 Flood Register. Figure 5.5.1 below shows an extract from the mapping, which identifies Barns Green to lie on the edge of areas that have been affected by 21 to 30 and 41 to 120 flooding incidents over the period.

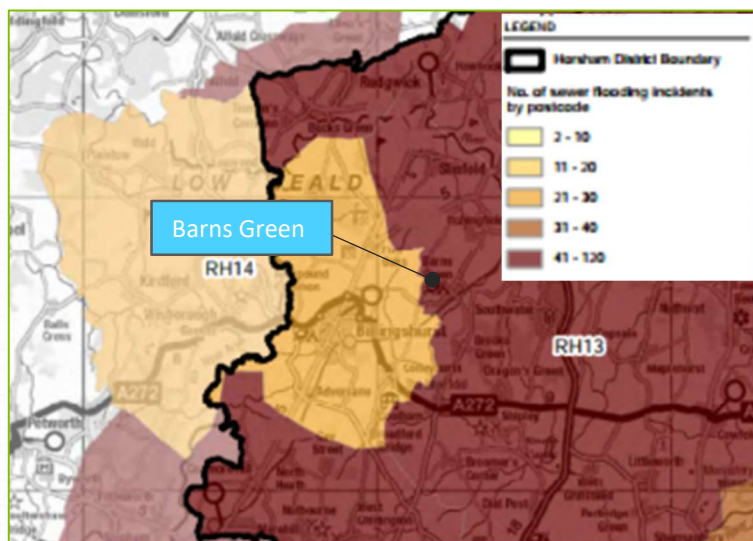


Figure 5.5.1: SFRA Map of Sewer Flooding Incidents by Postcode Area

- 5.5.3. In Section 2.6 it was identified that there are no public sewer on the site or near to the site so it can be reasonably concluded that there is no risk of sewer flooding in the existing situation.
- 5.5.4. A development would introduce new foul water flows to the public sewer network, which could increase sewer flood risk. However, Southern Water have confirmed that the local sewerage network could accommodate foul flows from the development. Southern Water's consultation response is included in *Appendix E*.
- 5.5.5. Based on consultation that has taken place with Southern Water, it is considered that no further assessment of flood risk is required in relation to existing sewer flooding issues, and no measures are deemed necessary to manage flood risk from this source.

5.6 Flooding from Artificial Sources

- 5.6.1. Flooding from artificial sources, is most likely to result from burst water mains or from infrastructure failure in an artificial watercourse or water body, i.e., canals or other water features such as reservoirs. These systems are maintained, improved, and regularly inspected by relevant authorities so flood risk from these sources is generally considered to be low.
- 5.6.2. Flood maps associated with large reservoirs that hold over 25,000 cubic meters of water are available on the EA website. The maps help to identify areas that could potentially be affected by reservoir flooding and display a realistic worst-case scenario of the largest area that may be flooded if a reservoir were to fail and release the water it holds. *Figure 5.6.1* below shows a Reservoir Flood Map taken from the EA's website. The map shows the Barns Green to not be at risk of reservoir flooding.

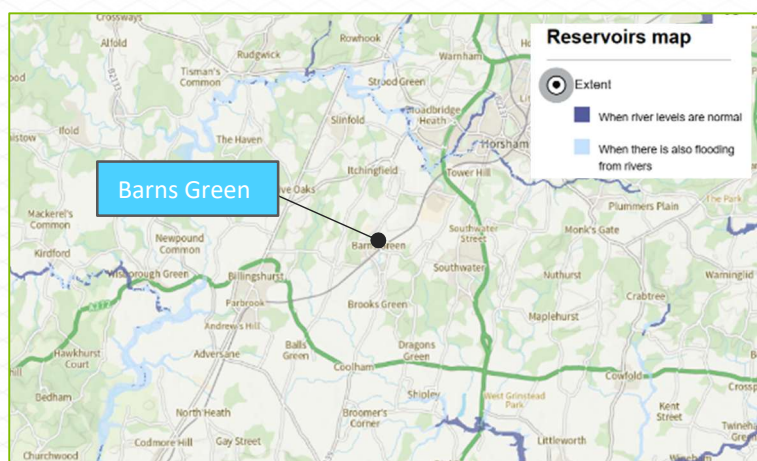


Figure 5.6.1: EA Reservoir Flood Risk Map

5.6.3. Figure 5.6.2 below shows an extract from a flood screening reports canal failure map. The map shows the site to not be in an area that could be affected by canal flooding.



Figure 5.6.2: Canal Reference Map (Canal & River Trust)

5.6.4. No watermain infrastructure crosses the site, with Figure 5.6.2 below showing Southern Water's nearest watermain infrastructure to be located on eastern edge of Chapel Road.

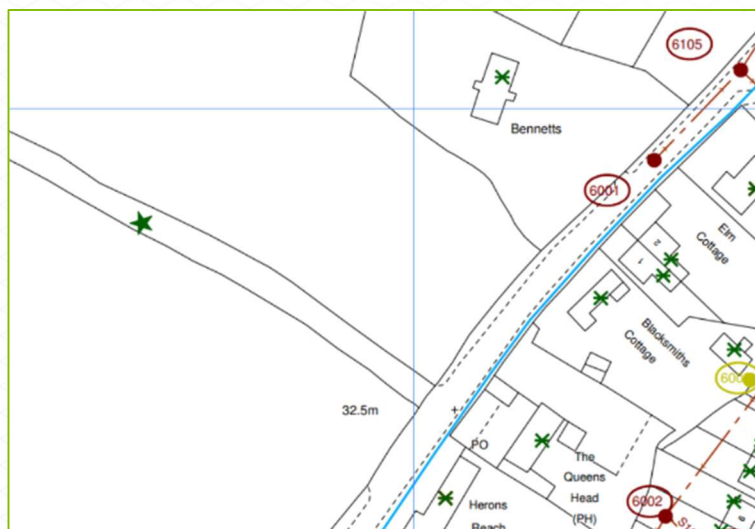


Figure 5.6.3: Thames Water Watermain Records

- 5.6.5. Flood patterns associated with burst water mains would typically be limited to existing roads where watermain infrastructure is normally located. On this basis, the flow path of flooding from a burst watermain would likely be similar to the flow path of surface water flooding, which was identified to be low in hazard in Section 5.3.
- 5.6.6. Based on the review of flooding from various artificial sources it is considered that no further assessment of flood risk is required in relation to existing sewer flooding issues, and no measures are deemed necessary to manage flood risk from this source.

6 Managing the Risk of Flooding

6.1 The National Planning Policy Framework (NPPF)

6.1.1. The National Planning Policy Framework (NPPF) Planning Practice Guidance for Flood risk and Coastal Change National Planning Policy Framework (NPPF) advises that the objectives of a site-specific flood risk assessment are to establish whether:

- a proposed development is likely to be affected by current or future flooding from any source.
- it will increase flood risk elsewhere.
- the measures proposed to deal with these effects and risks are appropriate.
- the evidence for the local planning authority to apply (if necessary) the Sequential Test.
- the development will be safe and pass the Exception Test, if applicable.

6.1.2. Table 6.1.1 below provides a summary of the probability of flooding from each assessed source in Section 5, along with proposed measures to deal with the effects and risks posed by the development.

Table 6.1.1: Summary of Sources of Flooding and recommended Management Measures

Source	Probability	Management Measures
Fluvial Flooding	Low	• Not applicable
Surface Water Flooding	Low	• SuDS would be used to minimise the rate of discharge, volume, and environmental impact of surface water runoff from the development. • Floor levels of dwellings would be set above road and surrounding landscaping levels for protection from overland surface water flooding, whilst road and paved areas would be designed with falls to direct overland flows away from dwellings.
Groundwater Flooding	Low	• Groundworks and excavations would ideally be carried out in the summer when groundwater levels are at their lowest. Dewatering of excavations may also be an option during winter periods but trialing would be carried out to confirm the feasibility. • Surface water storage measures would be sealed using impermeable membranes to prevent groundwater from entering systems and reducing capacity. • Surface water storage measures would be checked for vulnerability to flotation with sufficient weight from soil provided, or other covering placed over systems to counter any buoyancy uplift force from the rising groundwater. • The finished level of development would be set at or above existing ground level.
Sewer Flooding	Low	• The development would be provided with a new foul water drainage system, which would comprise of a network foul sewers located in the development's road network that would discharge to the existing foul sewer system, which has capacity for foul water flows from the development.
Reservoir Flooding	Low	• Not applicable.
Canal Flooding	Low	• Not applicable.

**Watermain
Flooding**

Low

- Floor levels of buildings would be set above road and surrounding landscaping levels, whilst the access road and paved areas would be designed with falls to direct flows away from buildings as shown on the finished levels plan in *Appendix E*.

6.1.3. In *Section 5* it was established that the site lies in Flood Zone 1. The NPPF and Local Policy of HDC advise that all land uses are appropriate in Flood Zone 1. Therefore, the proposed development is considered appropriate in terms of the sequential test, with it not necessary to apply the exception test.

6.1.4. The provision of a surface water drainage system as part of the proposed development would reduce the risk of surface water flooding in comparison to the existing situation, whilst the inclusion of Sustainable Drainage System's (SuDS) as part of a surface water drainage strategy would further reduce surface water flood risk to the site and surrounding area as they could be designed to minimise the rate of discharge, volume, and environmental impact of surface water runoff in comparison to the existing situation. The following section of this report outlines an approach for the disposal and management of surface water runoff from the development using SuDS.

7 Surface Water Management & Drainage Strategy

7.1 Introduction

7.1.1. This section of the report identifies the approach for the disposal and management of surface water runoff from the development using SuDS.

7.2 Surface Water Drainage Policy & Guidance

7.2.1. At a national level, the Flood and Water Management Act 2010 (FWMA) was introduced with the specific aim of reducing the risk of flooding in England and Wales and improving water management. The Act states that Lead Local Flood Authorities (LLFA's), must act within the Environment Agency's (EA) national strategy and co-operate with neighbouring authorities to address flood risk in their area and contribute towards the achievement of sustainable development.

7.2.2. The FWMA states that Sustainable Drainage Systems (SuDS) should manage rainwater with the following aims:

- reducing damage from flooding
- improving water quality
- protecting and improving the environment
- protecting health and safety
- ensuring the stability and durability of drainage systems

7.2.3. This has been incorporated into the NPPF and associated PPG, which recommends SuDS are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible to provide opportunities to:

- reduce the causes and impacts of flooding
- remove pollutants from urban run-off at source
- combine water management with green space with benefits for amenity, recreation, and wildlife

7.2.4. SuDS encompass a wide range of drainage techniques intended to minimise the rate of discharge, volume, and environmental impact of runoff and include; blue / green roofs; rainwater harvesting; soakaways / infiltration systems / infiltration trenches / permeable paving; swales / basins / ponds / wetlands / below ground attenuation tanks.

7.2.5. The PPG goes on to advise that generally, the aim should be to discharge surface run off as high up the as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration)
- to a surface water body
- to a surface water sewer, highway drain, or another drainage system
- to a combined sewer

7.2.6. Policy 38 (Flooding) of the HDPF states *"Development can have on flood risk as a result of increased run-off or changing drainage patterns must also be considered. To ensure development does not increase flood risk, developments will also be required to incorporate measures such as Sustainable Drainage Systems (SuDS) to help manage flood risk. SuDS manage surface water and groundwater sustainably and help to reduce flood risk, minimise diffuse pollution, maintain or restore natural flow regimes, improves water resources and enhances amenity. It is important SuDS are appropriate in scale and location. They should be incorporated in to the Council's Green Infrastructure network where appropriate."*

7.2.7. In July 2025 DEFRA released a new National Standards for Sustainable Drainage Systems (SuDS) as an addendum to the March 2015 DEFRA report "Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems" which sets out the generic requirements for design of SuDS. It sets out seven standards which are intended for application in the design of surface water drainage systems for new infrastructure and development, whether on greenfield or brownfield sites.

7.2.8. West Sussex County Council as the Lead Local Flood Authority (LLFA) are developing guidance based on the New National Standards but in the meantime recommend addressing each standard in a drainage strategy.

7.2.9. The following sections of this report set out a drainage strategy for the development in line with policy requirements and individual standards of the new National Standards for SuDS.

7.3 Surface Water Disposal

7.3.1. Standard 1 sets out a hierarchy of drainage disposal destinations. *Table 7.3.1* below provides an assessment of each destinations suitability.

Table 7.3.1: Surface Water Runoff Destinations Assessment

Destination	Assessment	Suitability
Priority 1: Collected for non-potable use.	Roof water runoff from dwellings could be captured by traditional rainwater gutters and downpipes that would discharge to rainwater harvesting units located in rear gardens for the purposes of irrigation and cleaning of external areas. However, rainwater harvesting alone would not be adequate to deal with all surface water runoff from the development and further options for will need to considered for surface water diposal.	✓
Priority 2: Infiltrated to ground	Section 2.4 and 5.4 identified that the site is affected by perched groundwater that rises near to surface levels in winter periods. Therefore, ground conditions at the site are not considered suitable for disposal of surface water to ground by infiltration.	✗
Priority 3: Discharged to an above ground surface water body	Section 2.5 established that there are no surface water bodies in close enough proximity to the site to dispose of surface water via this method.	✗
Priority 4: Discharged to a surface water sewer, or another piped surface water drainage system	In Section 2.6 it was identified that surface water flows from the site discharge overland to an existing surface water culvert in Chapel Road via an existing drainage ditch located outside the site, along the sites southern boundary. The controlled discharge of surface water runoff to the existing surface water drainage culvert in Chapel Road would closely mimic the sites existing drainage characteristics. Therefore, the disposal of surface water runoff via this option is considered appropriate, as options above would not be suitable. A connection could only be made to the culvert along the western edge of the Chapel Road where it is within public highway as land ownership issues would prevent a connection to the existing drainage ditch along the southern boundary. To provide capacity for surface water flows from the development in this location it woul be proposed to upgrade a short section of the culvert from 300mm Ø to 600mm Ø, between the point of connection and where the existing drainage ditch connects to the culvert. The upgrade works would be located entirely in public highway.	✓
Priority 5: discharged to a combined sewer.	It would not be appropriate to discharge surface water runoff to a combined sewer as options are available that must be prioritised in the hierarchy of runoff destinations.	✗

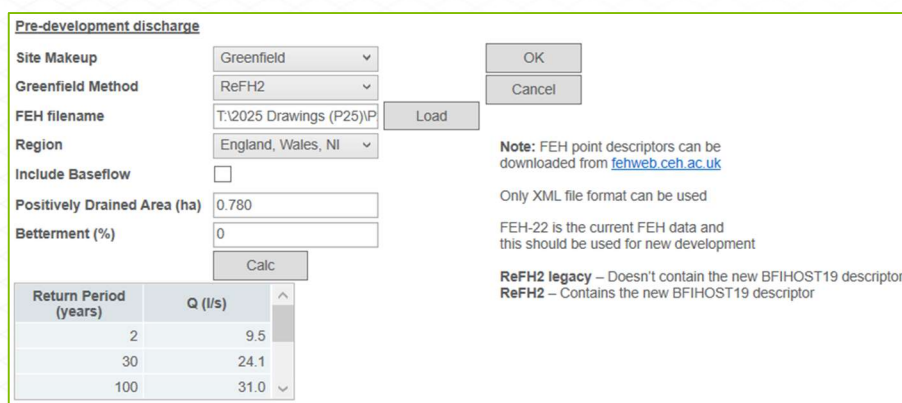
7.3.2. Based on the assessment in *Table 7.3.1*, it is considered appropriate to base the developments surface water drainage strategy on disposal via rainwater harvesting and discharge at controlled rates to the surface water culvert in Chapel Road.

7.4 Drained Area

- 7.4.1. Standard 3 requires an urban creep uplift factor to be applied by adding a percentage increase to the calculated area of the impermeable area within the property curtilages.
- 7.4.2. The developments measured drained area is shown on the drained area plan included in *Appendix F*. The plan identifies the developments measured drained area to be 0.78 Ha, which includes a 10% allowance for creep for future increases in the roof area of houses.

7.5 Runoff Management

- 7.5.1. Standard 3 sets out requirements for managing surface water runoff. The standard requires the most up to date guidance on climate change allowances to be used for the 1 in 30 year and 1 in 100-year design event, with the Upper End Allowance to be used for the relevant epoch based on the design lifetime of the proposed development. The relevant climate change allowances for the 1 in 30 year and 1 in 100-year design events would be 40% and 45% based on climate change guidance reviewed in Section 2.5.
- 7.5.2. Standard 3 requires the peak allowable discharge rate from development for the 1 in 2-year event to be limited to the equivalent 1 in 2 year greenfield runoff rate, or 3 l/s/ha, whichever is the greater. The 1 in 2-year greenfield runoff rate for the developments drained area has been established to be 9.5 l/s using the ReFH2 FEH method as shown in *Figure 7.5.1* below.



Return Period (years)	Q (l/s)
2	9.5
30	24.1
100	31.0

Figure 7.4.1: ReFH2 FEH Runoff Results

- 7.5.3. The rate of 9.5 l/s is equivalent to a greenfield runoff rate of 12.1 l/s/ha for a 1 in 2-year event, which is greater than a runoff rate of 3 l/s/ha. Therefore, it would be considered appropriate to restrict surface water runoff from the development for the 1 in 2-year event to 9.5 l/s.
- 7.5.4. Where the volume of runoff discharged from development for the 1 in 100 year 6-hour rainfall event is greater than the volume of greenfield runoff for the same rainfall event, Standard S3 requires the peak allowable discharge rate from the development for the 1 in 100 year event to be limited to the 1 in 2 year greenfield runoff rate or 3 l/s/ha, whichever is the greater.
- 7.5.5. Greenfield runoff volumes for the 1 in 100-year return period have been estimated using the ReFH2 method, while post development runoff volumes for the same event plus a 45% allowance for climate change have been estimated using the Modified Rational Method Formula based on 6-hour rainfall profiles generated using FEH rainfall data. The results are included in *Appendix F* and shown in Table 7.5.1 below.

Table 7.5.1 Runoff Volume Assessment

Return Period	Greenfield Runoff Volumes (m ³)	Post Development Runoff Volume plus 45% allowance for climate change (m ³)
100	337	1384.8

- 7.5.6. The assessment identifies that post development runoff volumes for the 1 in 100 year 6-hour rainfall event would be greater than the volume of greenfield runoff for the same rainfall event. Therefore, it would be appropriate to restrict surface water runoff from the development for the 1 in 2-year event to 9.5 l/s.

7.6 SuDS Assessment

7.6.1. SuDS should be used across the development to control surface water flows to required levels and to address other aims of surface water management, which are water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants) and amenity. *Table 7.6.1* below provides an assessment of a range of SuDS techniques that can be used to minimise the rate of discharge, volume and environmental impact of runoff.

Table 7.6.1: SuDS Assessment

System	Assessment	Suitability
Rainwater Harvesting	Rainwater harvesting is the collection of rainwater runoff for use. Runoff could be collected from roofs and then used in place of mains water for certain applications. However, rainwater harvesting alone would not be adequate to deal with all surface water runoff from the development and further approaches will be required.	✓
Infiltration Systems	Infiltration systems collect and store surface water runoff, while it is allowed to gradually infiltrate into underlying soils at the soils natural infiltration rate. Systems include soakaways, infiltration trenches, infiltration blankets and infiltration basins. Bioretention systems and pervious pavement can also be designed to allow infiltration. In Section 2.4 and 5.4 it was identified that the site is affected by perched groundwater that rises near to the surface in winter periods. Therefore, infiltration would not be possible and ground conditions at the site are not considered suitable for infiltration systems.	✗
Blue / Green Roofs	Green roofs are areas of living vegetation, installed on the top of buildings, for a range of reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff. They can be adapted to incorporate blue roof systems beneath, which comprise of a cellular system used to provide further attenuation and storage of surface water. The extent of flat roofs is limited due to the nature of the development comprising of residential buildings, which would normally have traditional pitched roof profiles. Therefore, blue / green roof systems are not appropriate for the development.	✗
Filter Strips	Filter strips are uniformly graded and gently sloping strips of grass or other dense vegetation that are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration, and infiltration. They are often used as a pre-treatment facility before swales, bioretention systems and trenches and are generally located in landscaping and open space alongside roads and parking areas. They tend to demand significant land-take, which restricts their use and would make them impractical for incorporation into the development.	✗
Filter Drains	Filter drains are shallow trenches filled with stone / gravel that create temporary subsurface storage for the attenuation, conveyance, and filtration of surface water runoff. Generally, these systems are located alongside roads and parking areas and used in conjunction with other systems. Filter drains could be used for the collection and conveyance of surface water, as well as in combination with other SuDS systems such as permeable paving systems.	✓
Bioretention Systems	Bioretention systems (including rain gardens / tree pits) are shallow landscaped depressions that can reduce runoff rates / volumes, and treat pollution using engineered soils and vegetation. Generally, these systems are provided in small shared public areas, on car park islands, roundabouts, footpaths, traffic calming and pedestrian zones (streetscapes). Systems could be provided in the form of bioretention swales and tree pits located alongside roads and other paved areas for the collection, treatment and conveyance of surface water runoff.	✓

Permeable Pavements	Permeable pavements provide a pavement suitable for pedestrian and / or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before it soaks into the ground or is collected by a filter drain where ground conditions do not permit infiltration and systems are lined with an impermeable geomembrane. Permeable paving could be used to intercept and treat surface water runoff from private drives, driveways and parking bays.	✓
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat, and store runoff. They are generally suited for managing runoff from roads because they are a linear feature and easily incorporated into the roadside space. They are also suitable for managing runoff from car parks and other impermeable and permeable areas. Swales are normally incorporated into landscape and public open spaces, as they tend to demand significant land-take due to their shallow side slopes. This normally restricts their use in a residential estate environment, with it also not desirable for these systems to be located in areas where trees or structures will cause shade conditions that limit grass growth. However, swales could be provided in areas of open space alongside the developments roads network for the collection, treatment and conveyance of surface water runoff from roads. The systems would also provide amenity and biodiversity benefits by providing a habitat for local plants and wildlife.	✓
Basins / Ponds	Basins are large, landscaped depressions that are normally dry except during and immediately following storm events, while ponds are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff. The systems are generally strategically located in areas of open space and are designed to temporarily store runoff associated with extreme rainfall events while it is released at controlled rates. A combination of site and development constraints impacts the ability to use basins / ponds, with the main issue linked to the perched groundwater that rises near to the surface in winter periods, as identified in Section 2.4 and 5.4. It is generally not possible to prevent groundwater from rising into these systems and reducing their storage capacity. Therefore, basins / ponds are not considered to be appropriate.	✗
Attenuation Tanks	Attenuation tanks comprise below ground storage systems that temporarily store runoff associated with extreme rainfall events while it is released at controlled rates. It would normally only be appropriate to consider their use where site constraints preclude the use of other methods or where they offer specific benefits in facilitating the delivery of SuDS design criteria for a site. Tanks could be used beneath roads and open space to provide supplementary storage for the attenuation of surface water if required. The systems can be surrounded with impermeable geomembranes to prevent groundwater entering, while soil cover can be designed to counter any buoyancy uplift force from the rising groundwater.	✓
Proprietary Treatment Systems	Proprietary treatment systems are manufactured products that remove specified pollutants from surface water runoff. It would normally only be appropriate to consider their use where site constraints preclude the use of other methods or where they offer specific benefits in facilitating the delivery of SuDS design criteria for a site. Instances where this would be the case are likely to be limited and so such systems should not be required.	✗

7.7 Surface Water Drainage Strategy

7.7.1. A surface water drainage strategy has been developed for the site based on the assessments carried out in Sections 7.3 to 7.6. A drawing showing the proposed surface water drainage strategy is included in *Appendix G*. The strategy has been developed with the aim of being sympathetic to a combination of site and development constraints, which include:

- High groundwater levels in winter periods, which prevents the attenuation of surface water runoff using open surface water attenuation features.
- The required location of the developments access, which is situated at the base of the sites natural slope.
- The linear nature of the site and the sites steep slope from west to east.

7.7.2. The strategy also aims to form an effective surface water management train that collectively captures, conveys, and stores surface water runoff from development, whilst also delivering interception and pollution risk management. Other environmental objectives of the development would be promoted as the selected SuDS would provide a habitat for local plants and wildlife.

7.7.3. The surface water drainage approach is outlined below.

- Surface water runoff from the development is initially intercepted and treated as close to source as possible by the following SuDS.
 - Roof water runoff from dwellings will be captured by traditional rainwater gutters and downpipes that would discharge to 1500 litre rainwater harvesting units located in rear gardens for the purposes of irrigation and cleaning of external areas.
 - Permeable paving is to be used for the interception and treatment of surface water runoff from private drives and parking areas. Permeable paving will allow surface water runoff to filter through a block paved surface into a filter zone of sub-base beneath the bedding layer. As ground conditions will not permit infiltration a perforated collector pipe would be provided at the base of the system for conveyance of surface water downstream.
 - Overflow pipework from rainwater harvesting units and any roof water not discharged to rainwater harvesting units is to be discharged to the filter zone of sub-base beneath areas of nearby permeable paving for treatment.
 - A combination of swales and bioretention systems will be used alongside the road network and paved areas for interception, treatment and conveyance of road runoff.
- The source control systems will discharge to a traditional below ground surface water drainage system located in the developments estate roads. A series of narrow below ground attenuation tanks and flow controls form part of the network, which have been hydraulically designed using a cascading approach, whereby the development is split up into 5 catchments, with the overall restricted rate of discharge distributed as evenly as possible between the catchments based on the proportion of overall drained area served. Each catchment attenuates runoff to its proportional discharge rate, before discharging into the next catchment with the attenuation designed to store all runoff for up to and including a 1 in 100 year including 45% allowance for climate change. The network finally connects to the upgraded 600mm Ø surface water culvert in Chapel Road with the final control chamber upstream of the connection restricting surface water flows from the development to a maximum allowable discharge rate of 9.5 l/s.

7.8 Interception

7.8.1. Standard 2 requires a 'SuDS approach' to be applied so that at least the first 5mm of rainfall for the majority of rainfall events does not leave site. *Table 7.8.1* below and the Surface Water Interception Plan in *Appendix G*, demonstrate that the SuDS components would fulfil interception requirements.

Figure 7.8.1: Interception Assessment

Component	Total Drained Area (m ²)	Total Surface Area (m ²)	Ratio of Surface Area to Drained Area	Compliance
Rainwater Harvesting	2,490.8	N/A	N/A	46500 litre capacity provided through 1500 litre unit / plot,

which exceeds requirement of 12,454 litres.

Permeable paving	3407.7	2508.0	1.4	Drained areas is less than 5 times the surface area.
Bioretention Systems	1019.7	204.2	4.99	Drained areas is less than 5 times the vegetated surface area.
Swales	791.6	351.2	2.3	Drained areas is less than 5 times the vegetated base surface area.

7.9 Hydraulic Analysis

7.9.1. Standard S3 requires the surface water drainage system to be designed so that, unless an area is designated to hold or convey water as part of the design, flooding does not occur on any part of the development for rainfall events up to the 1 in 30 year plus climate change event. The surface water drainage system shall also be designed so that flooding does not occur during rainfall events up to a 1 in 100 year plus climate change event in any part of: a building (including a basement); any utility plant susceptible to water (for example, pumping station or electricity substation) within the development; or any route designed to provide safe access and escape during flooding.

7.9.2. The Causeway Flow storage estimate tool was used to initially estimate the required storage volumes for the development and provisionally size strategic attenuation features. The estimate indicated an attenuation volume of between 600m³ to 805m³ would be required for a 1 in 100-year event including for 45% climate change allowance using the following parameters:

- FEH 2022 data
- CV's of 1.0 (winter & summer)
- Maximum allowable discharge rate of 9.5 l/s
- Measured drained area of 0.78 Ha.

7.9.3. *Table 7.9.1* below provides a summary of the storage volumes provided by the surface water drainage strategies below ground attenuation tanks and shows that the total storage volume would be within the range of the storage estimate for the 1 in 100-year event including for 45% climate change allowance.

Table 7.9.1: Storage Volume Summary

Element	Drained Catchment Area (Ha)	Max. Discharge Rate (l/s)	Storage Volume (m ³)	1 in 100 + 45% Storage Estimate (m ³)
Attenuation Tanks	0.78	9.5	638.4	600 to 805

7.9.4. The simulation facility in the Flow Causeway software package has been used to analyse the capacity and hydraulic characteristics of the surface water drainage strategy in more detail for the following rainfall events.

- 1 in 2-year event
- 1 in 30-year event and 1 in 30-year event including 40% allowance for climate change
- 1 in 100-year event and 1 in 100-year event including 45% allowance for climate change

7.9.5. The results of the analysis are included in *Appendix H*. The results should be read in conjunction with pipe numbering shown on the drainage scheme included in *Appendix G* and the drained area plan included in *Appendix F*.

7.9.6. The results show that the system would control and store surface water runoff from the development to the proposed restricted rate of discharge of 9.5 l/s for all analysed storm return periods up to and including 1 in 100-year event with 40% allowance for climate change.

7.10 Exceedance

- 7.10.1. Standard 3 requires overland surface water flows resulting from exceedance of the drainage system's capacity or resulting from a blockage should be managed in a manner that minimises the risks to people and the property.
- 7.10.2. Finished levels for the scheme have been designed with this in mind and are shown on the finished level strategy drawing included in *Appendix I*. The drawing shows proposed levels to be generally set at or above existing ground levels, with floor levels of dwellings raised above road and surrounding landscaping levels. Road design contours and exceedance arrows on the drawing show that overland exceedance surface water flood flows would be directed in an easterly direction towards the swales located in this part of the site.
- 7.10.3. The finished level design would ensure that people and property would remain protected from flooding in the event of exceedance of the surface water drainage systems capacity. Furthermore, 10% allowance has been made for additional roof area in calculations and finished levels are set over 300mm above the level of immediately adjacent surface level SuDS.

7.11 Water Quality

- 7.11.1. Standard 4 requires a SuDS management train to be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance or other quantitative assessment as agreed with the approving body and permitting requirement
- 7.11.2. The CIRIA C753 SuDS Manual 2015 sets out requirements for delivering appropriate levels of treatment to surface water runoff using SuDS. *Table 7.11.1* below identifies that the SuDS systems proposed as part of the drainage strategy would have a total pollution mitigation index matching or exceeding the recommended pollution hazard index for sources of surface water runoff on the development, thus confirming the SuDS components would provide suitable treatment of surface water runoff.

Table 7.11.1: Pollution Mitigation Assessment

Runoff Source	Pollution Hazard Index			SUDS Component	Mitigation Index		
	TSS	Metals	TPH		TSS	Metals	TPH
Roof	0.2	0.2	0.05	Permeable paving sub-base	0.4	0.4	0.4
Private drives & parking	0.5	0.4	0.4	Permeable paving	0.7	0.6	0.7
Road	0.5	0.4	0.4	Bioretention system	0.8	0.8	0.8
Road	0.5	0.4	0.4	Swale	0.5	0.6	0.6

7.12 Amenity / Biodiversity

- 7.12.1. Standard 5 and 6 require a SuDS approach to maximise benefits for amenity and biodiversity. The development proposals fulfil this aim through the inclusion of vegetated SuDS features for the management of surface water runoff, including swales and bioretention systems, which in conjunction with a habitat and landscaping enhancement scheme would maximise amenity and biodiversity compared to the existing situation.

7.13 Construction, Operation, Maintenance & Structural Integrity

- 7.13.1. Standard 7 requires drainage systems to be designed so that they can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.
- 7.13.2. Construction details for the surface water drainage scheme are included in *Appendix J*, while a construction surface water management plan is included in *Appendix K*, which details measures and methods that will be implemented during the construction period to ensure surface water is managed suitability, with the site and areas downstream protected. It also provides measures and good practice which will ensure that the

constructed drainage network and SuDS features will be fully operational on completion of construction and handover, with the aim of reducing any necessary remedial works.

- 7.13.3. The surface water drainage system would be private and would be maintained by a management company funded by a service charge. A drainage maintenance and management plan has been prepared for the development and is included in *Appendix L*. The plan would be incorporated into the developments Operation and Maintenance Manual. Thereafter, the as-built drainage system will be operated and maintained by the management company in accordance with the regime set out in the plan.

8 Foul Water Drainage Strategy

- 8.1.1. This section of the report identifies the approach for the disposal and management of foul water runoff from the development.
- 8.1.2. Southern Water have been consulted regarding the existing foul sewer system's ability to accommodate additional foul water flows from the development. A response was received confirming the sewer network would have capacity for the development, which is included in *Appendix E*.
- 8.1.3. The development will be provided with a new foul water drainage system comprising of a traditional gravity network of below ground pipework that would discharge to the existing foul sewer located to the south of the site in Chapel Road. The foul water drainage strategy approach for the development, based on the above principles, is shown on the drainage strategy drawing included in *Appendix G*.
- 8.1.4. On a similar basis to the surface water network, a management company would be appointed to maintain the foul water drainage system serving the development, although the offsite connection within Chapel Road will be subject to adoption by Southern Water.

9 Summary & Conclusions

9.1 Site Characteristics & Development

- 9.1.1. The site is presently an undeveloped green field used for pasture, approximately 1.88 Ha in area.
- 9.1.2. The development proposals seek full planning permission for a proposed residential comprising of approximately 31 No. residential units with associated gardens, driveways, garages, parking spaces, estate roads, estate landscaping and open space

9.2 Flood Risk

- 9.2.1. The site has been identified to be in Flood Zone 1, which is land assessed to not be at risk of tidal / fluvial flooding.
- 9.2.2. The site has also been identified to be at a low risk from all other sources of flood risk considered in the Strategic Flood Risk Assessment.
- 9.2.3. The NPPF and Local Plan advises that all land uses are appropriate in Flood Zone 1 with it not necessary to pass the exception test. On this basis the development is considered appropriate in terms of national and local planning policy on flood risk.
- 9.2.4. It has been established that the development would not cause an increase in flood risk to the site or surrounding area as the measures will be incorporated into the design of the development to manage the effects and risks posed by the development. Measures will include:
- A new surface water drainage system that would use SuDS to minimise the rate of discharge, volume, and environmental impact of surface water runoff from the development.
 - Setting of dwelling floor levels above road and surrounding landscaping levels, whilst road and paved areas are designed with falls to direct overland flows away from dwellings.
 - Setting floor levels of buildings above road, hardstanding, and surrounding landscaping levels, with the hardstanding areas also designed with falls to direct overland flows away from buildings.
 - Restricting major groundworks and excavations to the summer when groundwater levels are at their lowest or use of dewatering techniques subject to trialing.
 - Impermeable membranes to prevent groundwater from entering surface water storage systems and reducing their capacity.
 - Sufficient weight cover over surface water storage systems to counter any buoyancy uplift force from the rising groundwater.
 - A new foul water drainage system that would discharge to the existing foul sewer network, which has capacity for foul water flows from the development.

9.3 Surface Water Disposal & Management

- 9.3.1. The discharge of surface water to an existing surface water culvert in Chapel Road at a peak rate of 9.5 l/s is the most appropriate method for disposal of surface water runoff from the development and would closely mimic the sites existing drainage characteristics.
- 9.3.2. A connection could only be made to the culvert along the western edge of the Chapel Road where it is within public highway as land ownership issues would prevent a connection to an existing drainage ditch along the southern boundary that intercepts runoff from the site in the existing situation. To provide capacity for surface water flows from the development in this location it is proposed to upgrade a short section of the culvert from 300mm Ø to 600mm Ø, between the point of connection and where the existing drainage ditch connects to the culvert. The upgrade works would be located entirely in public highway.
- 9.3.3. The development will be provided with a new surface water drainage system that will discharge surface water to the culvert. Flows from drained areas will be restricted to the peak rate of 9.5 l/s, while the surface water drainage system is designed to attenuate excess runoff on site and provide protection from surface water flood risk for all rainfall events up to and including a 1 in 100-year event with 45% allowance for climate change.

9.3.4. A variety of SuDS will be used to manage surface water runoff from the development, with the systems arranged in series to form an effective surface water management train that collectively captures, conveys, and stores surface water runoff from the development whilst also delivering interception and pollution risk management. The systems in conjunction with retained open space would also promote other environmental objectives of the development by providing a habitat for local plants and wildlife. The main components would include:

- Rainwater harvesting units located in rear gardens for the purposes of irrigation and cleaning of external areas.
- Permeable paving for interception and treatment of surface water runoff from private drives and parking areas.
- A combination of swales and bioretention systems for interception, treatment and conveyance of road runoff.
- A traditional below ground surface water drainage system located in the developments estate roads with narrow below ground attenuation tanks and flow controls, which control and store all runoff to a peak rate of 9.5 l/s for up to and including a 1 in 100 year including 45% allowance for climate change using a cascading approach.

9.3.5. The SuDS components would fulfil interception requirements and suitably protect the development from surface water flooding, whilst also reducing surface water flood risk to the surrounding area through a reduction in greenfield runoff rates in comparison to the existing situation.

9.3.6. Detailed hydraulic analysis has been carried out, which confirms the SuDS systems would store and attenuate surface water runoff from the development for all rainfall events up to and including the 1 in 100-year storm return period with 45% allowance for climate change.

9.4 Foul Water Disposal & Management

9.4.1. Southern Water have confirmed that the foul sewer network would have capacity for foul water flows from the development.

9.4.2. The development will be provided with a new foul water drainage system comprising of a traditional gravity network of below ground pipework that would discharge to the existing foul sewer located to the south of the site in Chapel Road.

9.5 Drainage Construction, Operation, Maintenance & Structural Integrity

9.5.1. Construction details and a construction surface water management plan have been developed, which demonstrate that the surface water drainage scheme has been designed so that it can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.

9.5.2. The drainage systems will be private and will be maintained by a management company funded by a service charge. However, the offsite foul water drainage connection within Chapel Road will be subject to adoption by Southern Water.

9.5.3. A maintenance plan has been developed for the drainage scheme that would be incorporated into the developments Operation and Maintenance Manual. Thereafter, the as-built drainage system would be operated and maintained by the management company in accordance with the regime set out in the plan on occupation of the development.

9.6 Conclusion

9.6.1. In terms of flood risk and drainage, it is concluded that the development can be safely occupied and operated, with no increase in flood risk to the site or neighbouring properties as a result of the proposed development. On this basis, the scheme is considered to accord with national and local planning policy relating to flood risk and drainage.

Appendices

Appendix A	Pre-application information
Appendix B	Topographical Survey and Ground investigation information
Appendix C	Existing drainage characteristics plan
Appendix D	Development layout
Appendix E	Southern Water correspondence
Appendix F	Drained Area Plan and Runoff Calculations
Appendix G	Surface Water Drainage Strategy & Surface Water Interception Plan
Appendix H	Drainage Network Simulation Results
Appendix I	Finished Level Scheme
Appendix J	Drainage Construction Details
Appendix K	Construction Surface Water Management Plan
Appendix L	Drainage Management & Maintenance Plan

Appendix A

Pre-application Information

Technical Note to Accompany Flood Risk / Surface Water Drainage Pre-application Submission

Project: Chapel Road, Barns Green, Horsham, West Sussex
Project No: P25-1183
Date: 12th March 2026
Author: JH
Reviewed by: GC
Issue: 2

Introduction

This technical note has been prepared by Simpson TWS, on behalf of Shanly Group to accompany a pre-planning application for the proposed residential development on land west of Chapel Road, Barns Green, Horsham, West Sussex. The site is approximately 1.88 Ha in area and is bounded by Muntham Drive to the north, Chapel Road and residential dwellings to the east, Smuggler's Lane to the south and farmland to the west. The site is outlined in red on the location plan below.



The proposed development comprises approximately 31 No. residential units with associated gardens, driveways, garages, parking spaces, estate roads, estate landscaping and open space. A plan showing the development layout is included in *Appendix A*.

The purpose of this technical note is to provide the Lead Local Flood Authority (LLFA) with sufficient information to advise on the scope, extent and key principles of any Flood Risk Assessment (FRA) and Drainage Scheme that may be required to accompany a full planning application for the proposed development.

Site Characteristics

The site is greenfield in nature and slopes generally in a south-easterly direction, falling from approximately 43.50 mAOD at the north-western boundary to approximately 32.50 mAOD at the south-eastern boundary.

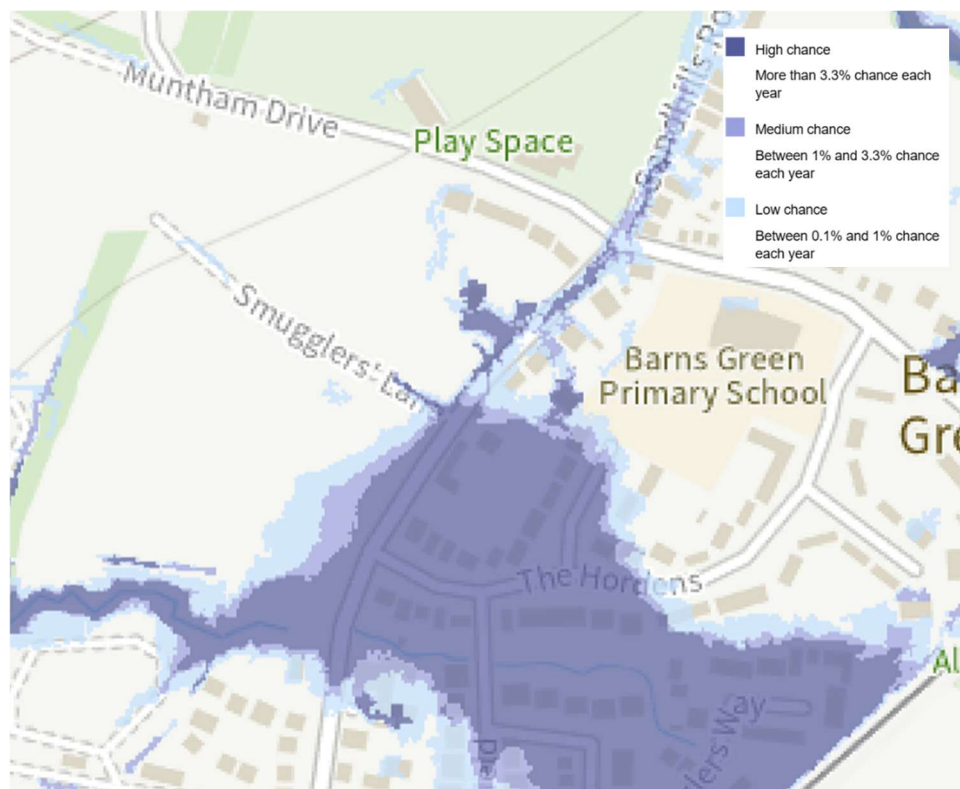
A ground investigation (ref. 25-129.02) by Aviron Associates carried out in June 2025 established ground conditions at the site to comprise a 0.3-0.6m thick layer of topsoil overlaying cohesive Weald Clay deposits comprising soft, soft to firm and firm, becoming stiff and very stiff Clay to a depth of 2.7-4.7m bgl. Bedrock of mudstone was encountered below the Weald Clay deposits. Groundwater was encountered during site

investigations at depths of 1.36m to 1.98m bgl, which was considered to represent perched water within the Weald Clay Formation. Winter monitoring carried out in February 2026 recorded groundwater at depths of 0.0 to 0.8m bgl.

A drainage ditch is present along the site's southern boundary, which intercepts surface water runoff from the site due to the prevailing slope. The ditch discharges into a culvert that follows a southward route along Chapel Road, where it ultimately connects to the ordinary watercourse known as Muntham Gill.

Flood Risk

National flood risk mapping produced by the Environment Agency (EA) indicates that the site is located within Flood Zone 1. A flood risk screening study undertaken for the site identifies it as being at low risk from all sources of flooding, with the exception of surface water flooding. The EA's national surface water flood map shows that predicted surface water flooding is limited to the south-eastern edge of the site, where areas of low to high risk affect Chapel Road and residential properties to the north-east.



Flood Risk Management

Due to the site being at low risk of flooding from the majority of sources, the majority of the proposed development would be located outside areas identified as being at potential risk of flooding. The only element of the development located within an area of potential flood risk is the vehicular access onto Chapel Road, where national mapping indicates that flood risk varies from low to high. Hazard modelling carried out as part of the flood risk assessment submitted for residential development on land immediately to the south of the site (Horsham District Council Ref. DC/25/2057) shows the hazard rating of flooding for a 1% Annual Event Probability (AEP) plus climate change to be low hazard that would be conditions deemed to suitable for safe access or egress for all users.



Should flooding conditions ever exceed those indicated by hazard mapping, safe access and egress would still be available via a proposed pedestrian link to Muntham Drive along the northern site boundary, which is not identified as being at risk of surface water flooding.

Given modelling for the adjacent site identifies risk of surface water flooding to be low in hazard and given the availability of secondary flood-free access and egress via Muntham Drive, it is not considered necessary to undertake further assessment or analysis of surface water flood risk associated with Chapel Road as part of the Flood Risk Assessment.

New development has the potential to increase flood risk on site and to the surrounding area through the introduction of new impermeable surfaces, which could increase the volume and velocity of runoff leaving the site in comparison to the existing greenfield situation. However, a surface water drainage scheme would be implemented to ensure that the development would not cause an increase in surface water flood risk, which is described further below. On-site surface water flood risk would be further managed through a finished level scheme, which would be designed to be sympathetic to the existing topography, however floor levels of dwellings would be set above surrounding road and landscaping levels to direct potential overland exceedance flows away from dwellings and towards strategic attenuation features proposed as part of the surface water drainage scheme.

Surface Water Drainage Scheme

The surface water drainage scheme would be developed in accordance with the approach set out in the New National Standards for SuDS (June 2025).

It would not be possible to collect all surface water runoff for reuse, and ground conditions comprise impermeable Clay that would not permit infiltration. Therefore, it is proposed to discharge surface water runoff an existing culverted watercourse in Chapel Road, which would mimic the sites existing runoff characteristics as closely as possible.

It is proposed to control surface water runoff from development to the equivalent greenfield runoff rate for a 1 in 2-year event or to a rate of 3 l/s/ha, whichever is greater.

Greenfield runoff rates have been estimated using the ReFH2 FEH method and the results are shown below based on the sites area of 1.88 Ha.

Pre-development discharge

Site Makeup: Greenfield

Greenfield Method: ReFH2

FEH filename: S:\2025 Design (P25)\P25

Region: England, Wales, NI

Include Baseflow: ☐

Positively Drained Area (ha): 1.880

Betterment (%): 0

Return Period (years)	Q (l/s)
2	22.8
30	57.9
100	74.6

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

The 1 in 2 year runoff rate of 22.8 l/s is equivalent to a runoff rate of 12.1 l/s/ha, which is greater than a runoff rate of 3 l/s/ha, therefore it would be proposed to restrict runoff from the development to this rate, with the rate adjusted for the developments impermeable area once this has been determined.

Excess runoff would be attenuated on-site for all storm events up to and including the 1 in 100-year event, with a 45% allowance for climate change.

The combination of a steep site slope and high groundwater levels, recorded by winter monitoring carried out in February 2026, largely prevent the attenuation of surface water runoff using shallow SuDS facilities or large SuDS basins. Therefore, it is proposed to use a series of narrow below ground attenuation tanks that would follow the route of a traditional surface water drainage network in the estate road to store surface water runoff. The attenuation tanks would be wrapped in an impermeable membrane to prevent groundwater from entering and cover depths over the tanks would be designed to counteract buoyancy.

The network of attenuation tanks and surface water drainage system in the road would be hydraulically designed using a cascading design approach, with the development split into catchments. The overall restricted rate of discharge would be distributed as evenly as possible between the catchments based on the proportion of overall drained area and each catchment would attenuate runoff to its proportional discharge rate, before discharging into the next catchment.

Hydraulic simulation modelling would adopt the following parameters and variables

- FEH 2022 data
- CV's of 1.0 (winter & summer)
- 10% creep allowance for roof areas.

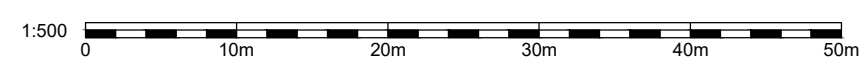
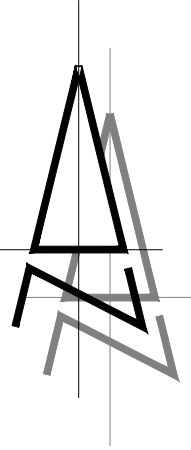
Runoff from the development would be intercepted and collected using a combination of source control SuDS before discharging to the surface water drainage network in the road. Anticipated source control measures include:

- Permeable paving to intercept runoff from driveways, parking areas, roads and roofs.
- Bioretention systems in the form of rain gardens to intercept runoff from roads, paved areas and roofs where feasible.
- Grassed swales to intercept runoff from roads.

The drainage scheme would provide a management train that collectively captures, conveys, and stores surface water runoff while mitigating pollution risks. In combination with retained open space, the system would also support environmental objectives by providing habitat for local plants and wildlife.

An indicative scheme based on the above principles is included in *Appendix B*, along with a typical construction details drawing.

Appendix A
Site Plan



Rev			Date			Description		
SHANLY — HOMES —								
Project								
Chapel Road Barns Green								
Pre Planning								
Drawing								
Site Layout								
Date			Scale @ A1			Drawn		
02.12.25			1:500			CE		
Drawing number						Revision		
1425/Pre/001						E		

Appendix B

Indicative Drainage Scheme & SuDS Constructions Details



DRAINAGE SCHEME LEGEND

- SITE BOUNDARY
- ROOT PROTECTION ZONE
- EXISTING CULVERTED WATERCOURSE
- EXISTING DRAINAGE DITCH
- EXISTING FOUL SEWER
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER CATCHPIT
- PROPOSED SURFACE WATER FLOW CONTROL CHAMBER
- PROPOSED FOUL WATER MANHOLE
- PROPOSED SURFACE WATER ATTENUATION TANK WITH COLLECTOR DRAIN BENEATH
- PROPOSED DOMESTIC RAINGARDEN FOR ROOFWATER RUNOFF INTERCEPTION
- PROPOSED RAINGARDEN FOR ROAD RUNOFF INTERCEPTION
- PROPOSED SWALE FOR ROAD RUNOFF INTERCEPTION
- PROPOSED PERMEABLE PAVING FOR ROAD RUNOFF INTERCEPTION
- PROPOSED PERMEABLE PAVING FOR DRIVEWAY & ROOF RUNOFF INTERCEPTION



W.I.P
12/03/26

P1	REVISION	BY	DATE
MK			

DRAWING STATUS
WORK IN PROGRESS

DRAWING TITLE
DRAINAGE SCHEME

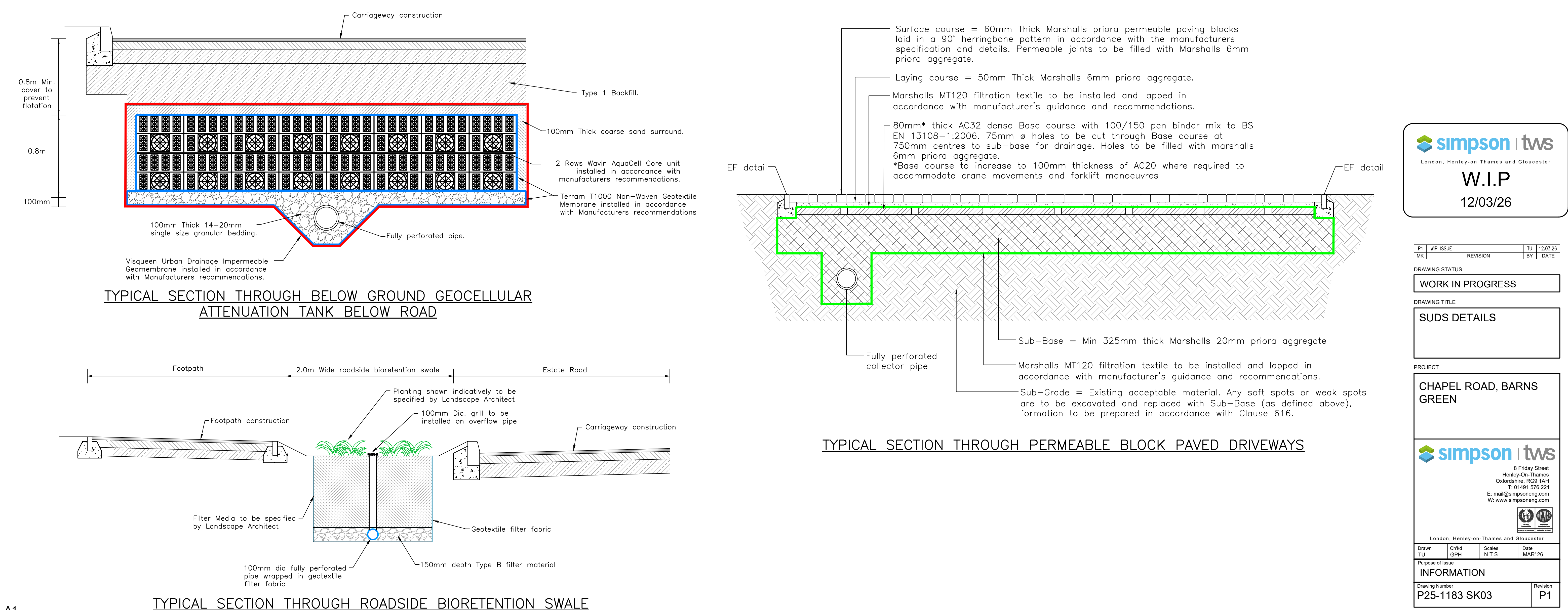
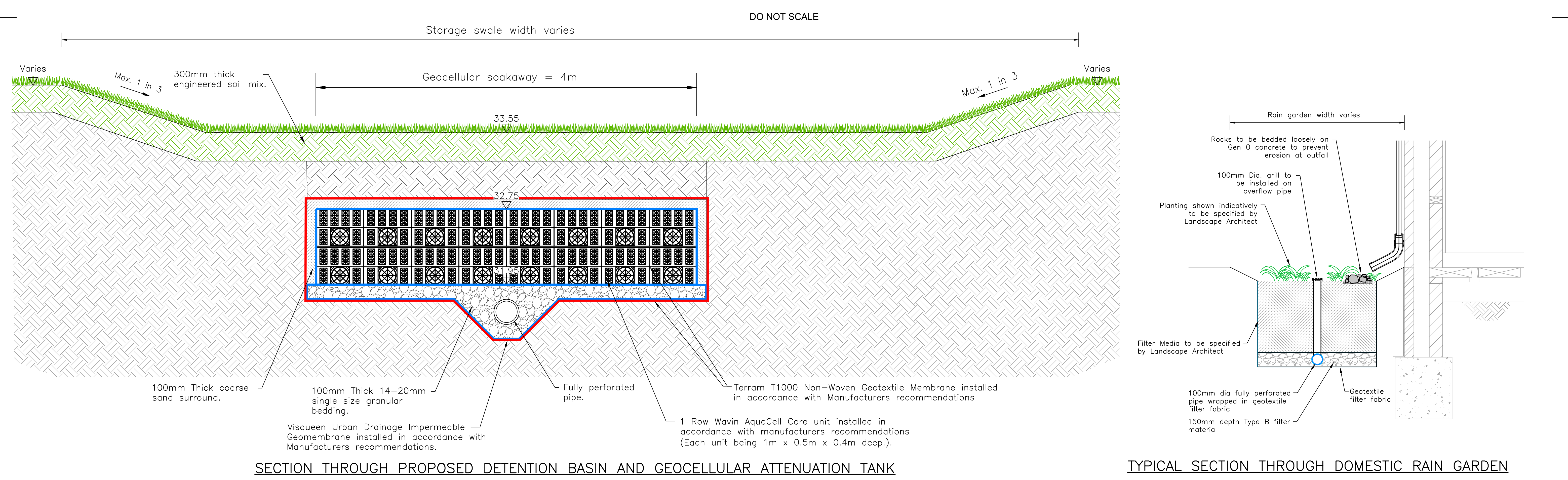
PROJECT
CHAPEL ROAD, BARNs GREEN

8 Friday Street
Henley-On-Thames
Oxfordshire, RG9 1AH
T: 01491 576 221
E: mail@simpsoneng.com
W: www.simpsoneng.com

London, Henley-on-Thames and Gloucester

Drawn	Ch'kd	Scales	Date
		1:500@A1	FEB' 26

INFORMATION	
Drawing Number	Revision
P25-1183 SK02	P1



Eleanor Read

Flood Risk Management Officer
Highways, Transport and Planning,
Place Services

Eleanor.Read@westsussex.gov.uk

www.westsussex.gov.uk

Ground Floor
Northleigh
County Hall
Chichester
PO19 1RH
03302 227048



Jaden Burden
Shanly Homes
24-26 Aylesbury End
Beaconsfield
Buckinghamshire
HP9 1LW

BY EMAIL ONLY

8th April 2026

Dear Jaden,

WSSC-789632190 – Land South of Muntham Drive, Muntham Drive, Barns Green, West Sussex, RH13 0PS

WSSC Flood Risk Management Team Level 2 Pre-Application Advice has been sought for a 1.88 ha site in Barns Green, Horsham District. The application will be a full planning application for 31 dwellings with associated works. It is noted that the site is allocated in the draft HDC Local Plan.

Following a meeting on 3rd February 2026 and review of the additional information received following the meeting, we have the following initial comments to make:

Standard 1: Runoff destinations

As West Sussex is seriously water stressed, rainwater harvesting shall be considered. Some examples we have seen recently have been from [Rainwater Harvesting Limited](#) and [Stormsaver](#). We have no professional relationship with either organisation and are not affiliated with them in any capacity. As we have not worked with these companies, we are unable to provide any assessment regarding the quality or suitability of their services. Any decisions or actions taken on the basis of this information are made entirely at your own discretion and risk, and we accept no liability for any outcomes arising from such decisions.

Any overflow discharge rates from the rainwater harvesting must not exceed greenfield runoff rates for the whole site. For example, if the greenfield runoff rate is 10 l/s, the combined discharge rate from the rainwater harvesting and any attenuation features must not exceed 10 l/s. This is to ensure surface water flood risk does not increase elsewhere. The overflow must connect to a suitable discharge location. Rainwater harvesting systems should be designed in accordance with BS EN 16941 and Chapter 11 of the SuDS Manual.

Ground investigations demonstrated that the underlying geology for the site is clay, with groundwater levels in February 2026 recorded at depths of 0.0 to 0.8mbgl. This means infiltration is not a viable method of drainage the site. The winter groundwater levels shall be considered in the detailed drainage design. The site investigations will need to be submitted as part of the formal planning application to the LPA.

In line with the National Standards for SuDS (NSfS), it is proposed to discharge surface water into a culverted watercourse beneath Chapel Road. This connects into Muntham Gill, an ordinary watercourse. This is Priority 3 in the NSfS. We will require evidence that the receiving system, has capacity for additional flows. A map showing the route of the watercourse and its' onwards connectivity will be required, including details of any culverts. A CCTV/topographical survey of the watercourse may be useful to ascertain any missing information.

Any watercourses/ditches within the red line must be retained, with a 3m maintenance easement from the top of both banks required (this includes culverted watercourses). These must be clearly shown on drawings, to ensure that as the application progresses, easements are retained.

Standard 2: Management of everyday rainfall (interception)

Please note water butts do not count as rainwater harvesting, in line with the NSfS.

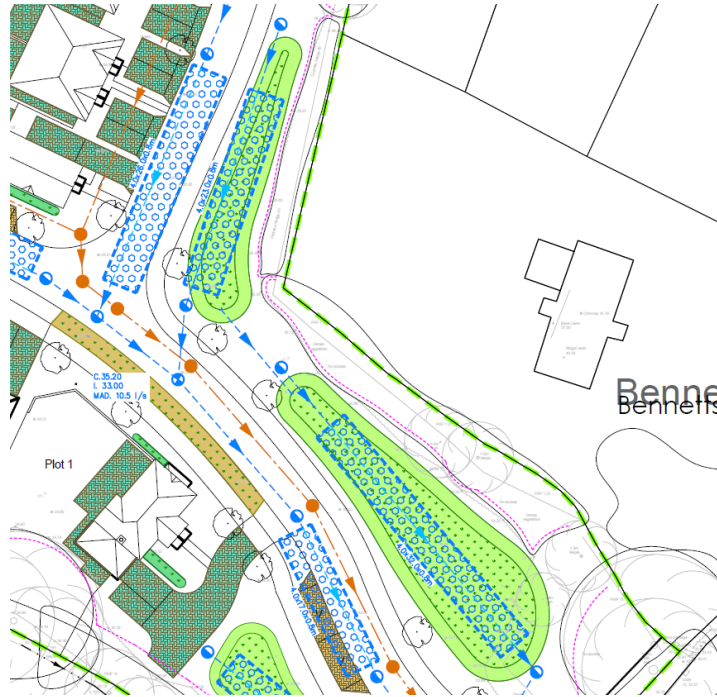
Permeable paving and bioretention swales/raingardens are proposed as interception.

It is suggested that a drawing showing the interception features and the contributing areas is submitted to support the calculations.

Standard 3: Management of extreme rainfall and flooding

While we are aware the design of the surface water drainage is not final, the function of the storage swales and tanks in the eastern area by the access road is not clearly explained. At present, it appears that the sales would be connected with a pipe, and that the swales are not connected to the wider drainage network. The tanks underneath them would be connected to the main piped surface water network. It is also unclear which impermeable areas are intended to drain into which tank. A catchment plan is likely to help clarify this.

As stated in the NSfS, surface water drainage systems shall avoid traditional, underground attenuation systems, such as tanks. Therefore, it is our preference that open attenuation is used.



For a full application, hydraulic calculations and construction drawings shall be submitted, as these can both affect the layout of the site. The hydraulic calculations should include:

- Design criteria and input variables (this includes using up to date parameters. This is often known as Simulation Criteria in calculation outputs)
- Drainage network details
- Manhole schedule (must match the drainage strategy)
- Area summaries
- Outfall details
- Modelled storm details and simulation criteria
- Flow control structure details (online and any offline)
- Summary of results for critical storms. Results should be provided for the 2 year, 30 year plus climate change and 100 year plus climate change storms.
- Greenfield runoff rate calculations
- Storage calculations
- Storage feature details
- Surcharged outfall
- Drainage layout with clearly labelled pipe and manhole numbers to allow for cross-referencing with the calculation outputs. The location and details of all attenuation features must be clearly shown.

The construction drawings should include all key features of the drainage strategy including:

- Attenuation features such as attenuation basins and tanks (including cross-sections with maximum water level for any open attenuation features)
- Conveyance features such as swales
- Permeable paving
- Headwalls, including inlet and outlet ones (please note, if the headwall is set back/flush with the existing bank profile of an ordinary watercourse, Ordinary Watercourse Consent will not be required)

- Flow control features
- Rain gardens/bioretention areas
- Green roofs
- Gullies and inspection chambers
- Details of any mitigation required for sites with high groundwater levels

Standard 4: Water quality, Standard 5: Amenity and Standard 6: Biodiversity

The current layout suggests that the swales will not have a water quality function, as the surface water does not appear to pass through them.

The CIRIA SuDS Manual Simple Index Approach shall be used to demonstrate that a suitable water management train is provided.

The surface water drainage system shall be multifunctional and have amenity and biodiversity benefits. As LLFA we will not comment on this in detail, and instead expect the LPA to seek input from others with greater expertise in this area.

It is worth noting that when habitat is created through SuDS, there can be BNG gains.

Standard 7: Construction, Operation, Maintenance, Decommissioning and Structural Integrity

A maintenance and management plan, construction phasing plan and post construction verification report will be required, however we can condition these.

Other:

The effects of climate change on surface water flood risk need to be considered. It is suggested to use the HDC SFRA, which should cover it while we await the EA's release of surface water plus climate change modelling that is appropriate for use for planning purposes.

The Flood Map for Planning shall be used in the FRA.

To demonstrate safe access is provided, [Flood risk assessment guidance for new development - GOV.UK](#) should be used. The Technical report provides the most detailed guidance. An emergency plan may be required, however the Local Planning Authority are responsible for this, along with Sequential Test.

The application will need to be in accordance with:

- NPPF
- PPG Flood risk and coastal change
- [National standards for sustainable drainage systems \(SuDS\)](#) (July 2025)
- Strategic Policy 10: Flooding in Reg 19 HDC Local Plan

We are happy to review any amended documents prior to formal submission to the LPA. We will require 10 working days for this.

We will share this letter with the LPA, so they are aware of our discussions. Any queries, please contact us.

Yours sincerely,

Eleanor Read

Eleanor.read@westsussex.gov.uk

Flood Risk Management Team

Documents reviewed:

Technical Note by Simpson Consulting Engineers, 12th March 2026, Issue 2

Technical Note: Flood Risk Assessment & Drainage Strategy

Chapel Road, Barns Green

Project Address	Chapel Road, Barns Green
Project Reference	P25-1183
Issue	01
Author	Gareth Crowther CEng MICE
Reviewed By	Gareth Crowther CEng MICE
Office	Henley
Date	15/05/2026

Introduction

This technical note has been prepared by Simpson TWS to set out how the Flood Risk Assessment and Drainage Strategy fulfils the pre-application advice of West Sussex County Council referenced in their correspondence **WSCC-789632190**.

The following sections of this technical note confirm how the individual elements of the LLFA observations have been addressed in the design together with references to the appropriate appended documents.

Standard 1: Runoff Destinations

- Section 7.7 and the Interception and Drainage Strategy Drawings in Appendix G identify that roof water runoff from all dwellings will be discharged to rainwater harvesting units located in rear gardens for irrigation and cleaning of external areas. The development's surface water network has been designed on the assumption that the harvesting units will be full during a rainfall event. Accordingly, the network design capacity accounts for the control and attenuation of all drained areas associated with the units, with overflow pipework discharging to the surface water network.
- Winter groundwater levels have been considered in the detailed drainage design. The construction depths to the base of proposed unlined SuDS features, including permeable paving, swales and bioretention systems, would be at or above recorded winter groundwater levels. Construction details included in Appendix J show that SuDS features with construction depths below recorded winter groundwater levels, including below-ground geocellular storage systems, would be lined with an appropriately sealed impermeable geomembrane to prevent groundwater ingress and consequent reduction in storage capacity. The details also demonstrate that sufficient soil cover would be provided over these systems to prevent flotation.
- Section 2.6 identifies that surface water flows from the existing greenfield site currently discharge overland to the existing surface water culvert in Chapel Road via an existing drainage ditch located outside the site along the site's southern boundary. Therefore, it is considered that the culvert would have sufficient capacity to accommodate surface water runoff from the proposed development at the 1 in 2 year greenfield runoff rate. Due to land ownership constraints, a connection to the existing drainage ditch along the southern boundary is not feasible. As such, the proposed connection to the surface water culvert in Chapel Road could only be made along the western edge of Chapel Road, where the culvert lies within the public highway. To provide sufficient capacity for surface water flows from the development at this location, the Drainage Strategy drawing in Appendix G shows that the section of culvert between the proposed point of connection and the existing drainage ditch outfall would be upgraded from 300 mm diameter to 600 mm diameter.

- A drainage survey confirmed that the surface water culvert within Chapel Road continues in a south-westerly direction along the western edge of Chapel Road before ultimately connecting to Muntham Gill to the south-west. The route of the culvert is shown on the Existing Drainage Characteristics Plan in Appendix C.
- Section 2.6 and the Existing Drainage Characteristics Plan in Appendix C confirms that there are no existing watercourses on the site and thus there is no impact on maintenance easements or requirements for easements to be maintained.

Standard 2: Management of everyday rainfall (interception)

- Section 7.8 and the Interception drawing in Appendix G show that a combination of SuDS components will be provided that will fulfil interception requirements. Components include rainwater harvesting, permeable paving, bioretention systems and swales.

Standard 3: Management of Extreme Rainfall & Flooding

- A detailed drainage scheme is included in Appendix G, which shows connectivity of all SuDS across the surface water network. The strategy is described in Section 7.7 and construction details are included in Appendix J. Network simulation results are included in Appendix H, which can be read in conjunction with pipe numbering shown on the detailed drainage scheme drawing and the drained area plan included in Appendix F. The drained area plan breaks down all drained areas by pipe numbers shown on the detailed drainage scheme drawing.
- Section 7.7 explains that the strategy has been developed with the aim of being sympathetic to a combination of site and development constraints. The detailed drainage scheme maintains a preference for open surface water SuDS in the form of large shallow swales and bioretention systems but these systems have limited storage capacity because of their shallow nature and because of steep surface gradients linked to the sites existing slope. Therefore, it has been necessary to supplement the surface water network with a series of narrow cascading below ground attenuation tanks that allow surface water runoff from the development to be restricted to the 1 in 2 year greenfield rate, with all excess runoff stored on site for up to and including a 1 in 100 year including 45% allowance for climate change.
- Network simulation results included in Appendix H and construction details included in Appendix J contain all required information.

Standard 4: Water quality, Standard 5: Amenity and Standard 6: Biodiversity

- Section 7.11 includes a pollution mitigation assessment that identifies the SuDS systems would have a total pollution mitigation index matching or exceeding the recommended pollution hazard index for sources of surface water runoff on the development, thus confirming the SuDS components would provide suitable treatment of surface water runoff.
- Section 7.12 identifies that the development fulfils aims to maximise benefits for amenity and biodiversity through the inclusion of vegetated SuDS features for the management of surface water runoff, including swales and bioretention systems, which in conjunction with a habitat and landscaping enhancement scheme would maximise amenity and biodiversity compared to the existing situation.

Standard 7: Construction, Operation, Maintenance, Decommissioning and Structural Integrity

- A drainage maintenance and management plan has been prepared for the development and is included in Appendix L.
- A construction surface water management plan has been prepared for the development and is included in Appendix K.

Other

- The effects of climate change on surface water flood risk have been considered in section 5.3, which identify that predicted surface water flooding conditions at the site access would be low in hazard and thus deemed suitable for safe access or egress for all users. Secondary pedestrian access and egress is also available via Muntham Drive, which long term flood risk mapping identify to not be at risk of surface water flooding.

- Paragraph 175 of the NPPF advises that a proportionate approach should be used in application of the Sequential Test. In line with this guidance, it is considered that the Sequential Test is not applicable to the development as the flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future fluvial and surface water flood risk for the lifetime of the development and the development would not adversely affect flood risk elsewhere.

