



PENN FARM, CALNE
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

CASTLEWOOD PROPERTIES VENTURES LTD

18 NOVEMBER 2025





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1.0 Introduction

1.1 Context

- 1.1.1 This Flood Risk Assessment (FRA) has been prepared by Abley Letchford, on behalf of Castlewood Properties Ventures Ltd to support an Outline planning application seeking planning permission for approximately 210 residential dwellings, alongside 0.75 hectare of commercial use. The site is located at Penn Hill Farm, Calne in Wiltshire.

1.2 Development Proposals

- 1.2.1 The proposals are for 210 residential dwellings, alongside 1 hectare of commercial use as depicted on the Framework Masterplan within **Appendix A**.

1.3 Requirement for a Flood Risk Assessment

- 1.3.1 The requirement for an FRA is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in December 2024.
- 1.3.2 The footnote accompanying Paragraph 181 states:
- 1.3.3 'A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'
- 1.3.4 The site is a greenfield site that comprises of agricultural fields primarily used for grazing with established hedges and tree lined boundaries. The area of the site is approximately 15 hectares. As the site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

1.4 Report Aim and Formation

- 1.4.1 The principal aims of this report are to demonstrate that the proposed development complies with national and local planning policy in respect to flood risk and to demonstrate that a suitable drainage strategy can be provided as part of development.
- 1.4.2 This report will also summarise the impacts the development could have on flood risk to the surrounding area and outlines the mitigation strategies that will be implemented to minimise this risk.
- 1.4.3 The drainage design embraces the guiding principles of Sustainable Drainage Systems (SuDS) which are central to the design of the surface water drainage strategy for the proposed development.

1.5 Report Structure

- 1.5.1 This report addresses the requirements of the revised NPPF and considers the following aspects:
- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information used to inform the assessment.
 - Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
 - Section 4: Overview of Flood Risk – a review of data for flooding from all sources to determine the baseline flood risk to the site and an assessment of the impacts of the development on flood risk.
 - Section 5: Sequential Test and Exception Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test and Exception Test.
 - Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the potential flood risk to the development.



- Sections 7 and 8: Drainage Strategy – a summary of appropriate strategies to manage the surface water and foul water from the site in the post development scenario.
- Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.



2.0 Policy and Sources of Information

2.1 Introduction

- 2.1.1 This chapter provides a review of policy relevant to the assessment and the available information on all sources of flood risk.

2.2 National Planning Policy

- 2.2.1 National Policy in relation to flood risk is set out in Section 14 of the National Planning Policy Framework, Dec 2024 (NPPF) and Planning Practice Guidance ID:7 for Flood Risk and Coastal Change, Aug 2022 (PPG). Flood Risk is discussed at Paragraphs 170 to 182 of the NPPF.

- 2.2.2 Paragraphs 173 to 176 discuss the sequential approach with respect to individual applications. Paragraph 174 refers to the Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate developments, whilst Paragraphs 177-179 relate to Exception Tests.

- 2.2.3 Paragraph 181 discusses the determination of planning applications stating:

- 2.2.4 *'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. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

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

The 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, 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.'

- 2.2.5 The proposed development is for 210 residential dwellings, alongside 0.75 hectare of commercial use at the site which covers approximately 15 hectares and would, therefore, be classed as a Major development because the site is greater than 0.5 hectares. Paragraph 182 states:

- 'Sustainable drainage systems provided as part of proposals for major development should:
- Take account of advice from the lead local flood authority.
- Have appropriate proposed minimum operational standards; and
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.'

- 2.2.6 The PPG sets out more specific guidance on how to apply and implement the NPPF policies. This includes guidance on when a Sequential Test is required and considerations on how to apply the test. In paragraph 023 of the PPG the aim of the sequential approach is clarified and includes the following:

'The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk.'

- 2.2.7 In applying the Sequential Test to planning applications, NPPF paragraph 175 confirms specific development cases when the test is not applicable:



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

2.3 Environment Agency

- 2.3.1 The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.
- 2.3.2 The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk extents and sources.

2.4 Local Authorities

- 2.4.1 The site lies within the administrative area of Calne Town Council (CTC) and Wiltshire Council (WC). WC is the Local Planning Authority (LPA) and Lead Local Flood Authority (LLFA).
- 2.4.2 Planning guidance published by CTC and WC regarding the flood risk was referred to in order to assess the methodology best suited to suit the local area. The following key documents were reviewed:
- Calne Community Neighbourhood Plan 2023 – 2038 (dated March 2025)
 - Wiltshire Core Strategy, Core Policy 67: Flood Risk (adopted January 2015),
 - Wiltshire Local Flood Risk Management Strategy (dated April 2015),
 - Wiltshire Council Preliminary Flood Risk Assessment (PFRA) (dated June 2011) and PFRA addendum (dated 2017),
 - Wiltshire Council Level 1 Strategic Flood Risk Assessment (SFRA) (dated November 2024) and
 - Wiltshire Council Level 2 Strategic Flood Risk Assessment (SFRA) (dated February 2025).
- 2.4.3 WC became the LLFA under the Flood and Water Management Act 2010. WC provide guidance to assess, manage and inform flood risk.
- 2.4.4 Wessex Water (WW) has permissive rights over any Ordinary Watercourses including land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Flood and Water Management Act 1991.

2.5 Local Water Authority

- 2.5.1 WW is responsible for the supply of clean water and disposal of wastewater in the Calne area.
- 2.5.2 Information with regards to sewer and water main flooding contained within the SFRA has been reviewed as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

2.6 Other Sources of Information

- 2.6.1 A desktop study of the site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:
- DEFRA's Magic Map portal.
 - British Geological Survey (BGS) 'Geology of Britain' online viewer; and
 - Cranfield University 'Soilscapes' portal.
- 2.6.2 A site walkover was carried out in October 2025 which allowed observations of the ditches within the site boundary.



- 2.6.3 Guidance with respect to Sustainable Drainage Systems (SuDS) is contained within DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, CIRIA C753 The SuDS Manual and within the NPPF Planning Practice Guidance (PPG) – ‘Flood Risk and Coastal Change’.
- 2.6.4 Additional guidance on development and flood risk is contained within CIRIA C624 Development and Flood Risk – Guidance for the Construction Industry which identifies several key aims for a development to ensure it is sustainable in flood risk terms.

3.0 Site Setting

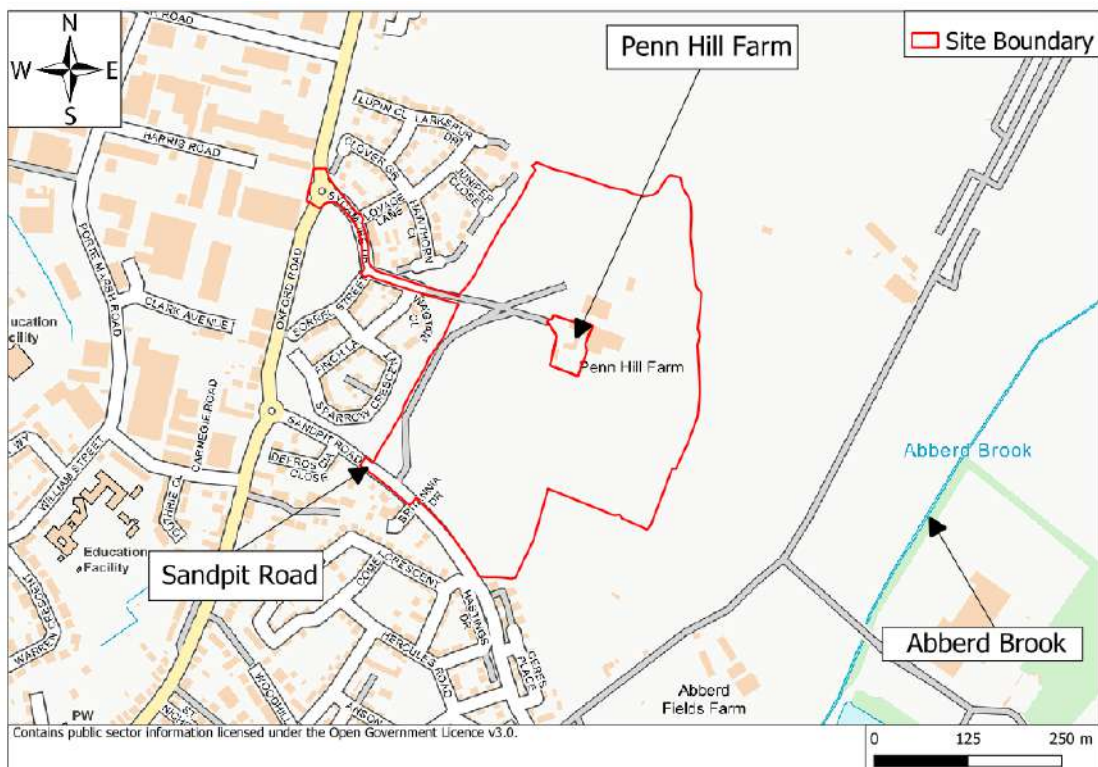
3.1 Introduction

- 3.1.1 This chapter provides a description of the site location, its topography, hydrological context, geology and hydrogeology.

3.2 Site Location

- 3.2.1 The site is located at land to the Penn Hill Farm, located approximately 1.4km to the northeast of Calne in Wiltshire. The nearest postcode is SN11 8RR. The site centre grid reference is 400810E, 17250N. The site location is shown in **Figure 3.1**.

Figure 3.1: Site Location

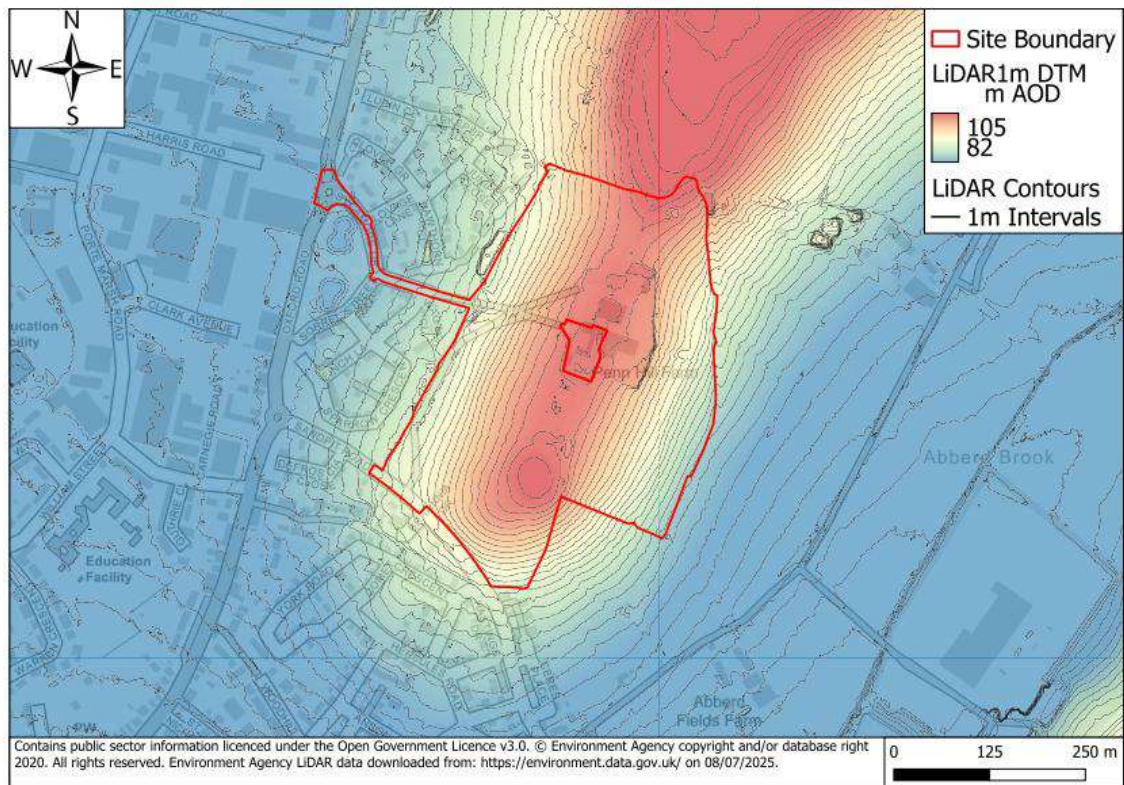


- 3.2.2 The site is bounded to the south by Sandpit Road. A residential area is located to the northwest of the site. Agricultural land is located to the north and east of the site. The site is located to the east of a new residential development by Hills Homes and to the north of a new residential development by Backhouse. The site shares common boundary features with these two developments.
- 3.2.3 The site consists predominantly of large agricultural fields, enclosed by mature hedgerow and tree boundaries. Penn Hill Farm and industrial estate are located at the centre of the site.
- 3.3 The site covers an area of approximately 15 hectares.

3.4 Topography

3.4.1 The ground levels across the site are shown by LiDAR in **Figure 3.2**.

Figure 3.2: Site Topography



3.4.2 There is a ridge which runs from northeast to southwest through the site, as shown in **Figure 3.2**. The site and surrounding land slopes away to the west and to the east.

3.4.3 The LiDAR indicates that the ridge is at an elevation of between 104m AOD and 105m AOD. The lowest point of the site is along the site's eastern boundary. Elevations along the site's eastern boundary are approximately 84.4m AOD.

3.4.4 A topographic survey was carried out by JOMAS Environmental Engineering in August 2022. A copy of the topographic survey has been included in **Appendix A**. The topographic survey confirms the levels within the LiDAR data. Elevations along the low point of the site, along the eastern boundary are between 84.7m AOD and 87.8m AOD. The ridge through the centre of the site is shown in the topographic survey to have an elevation of between 103.6m AOD and 105.7m AOD.

3.5 Watercourses and Ditches

3.5.1 There are no watercourses within the site boundary.

3.5.2 **Figure 3.3** shows a photograph of a ditch on the northwestern boundary taken during the site walkover which was carried out in October 2025.

Figure 3.3: Photograph of ditch





3.5.3 **Figure 3.3** shows the ditch that is along the northwestern boundary of the site. This ditch slopes down from the site, rises in the centre and then further slopes but remains lower than the public footpath running parallel to the site. It could be considered for water conveyance from the site.

3.6 Surface and Foul Water Sewers

3.6.1 Sewer Asset Records obtained from Wessex Water do not indicate the presence of any surface or foul water sewers within the site. The nearest public asset is a foul sewer located within Sandpit Road which runs along the southern frontage of the site.

3.7 A copy of Wessex Waters Asset Record is included within **Appendix A**.

3.8 Geology and Hydrogeology

3.8.1 British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the Site predominantly Kimmeridge Clay Formation. There is some Lower Greensand Group (sandstone) in the centre of the site.

3.8.2 There are no records of superficial deposits across the site. The Cranfield University 'Soilscapes' online viewer indicates the site overlies slowly permeable seasonally wet slightly acidic but base rich loamy and clayey soils.

3.8.3 The DEFRA Magic Map online viewer indicates that the majority of the site lies outside of a Groundwater Source Protection Zone (SPZ) and Principal Aquifer designation. The area immediately to the south of Penn Hill Farm is shown to be a Secondary A bedrock aquifer. The rest of the site is shown to be unproductive.

3.8.4 Minor secondary aquifers are associated with the underlying bedrock and superficial drift layers. These rocks can provide modest amounts of water, but the nature of the rock or the aquifer's structure limits their use. They support water supplies at local rather than strategic scale.

3.8.5 The DEFRA Magic Map indicates that the site does not lie within a Drinking Water Safeguard Zone for surface water or groundwater.

4.0 Overview of Flood Risk

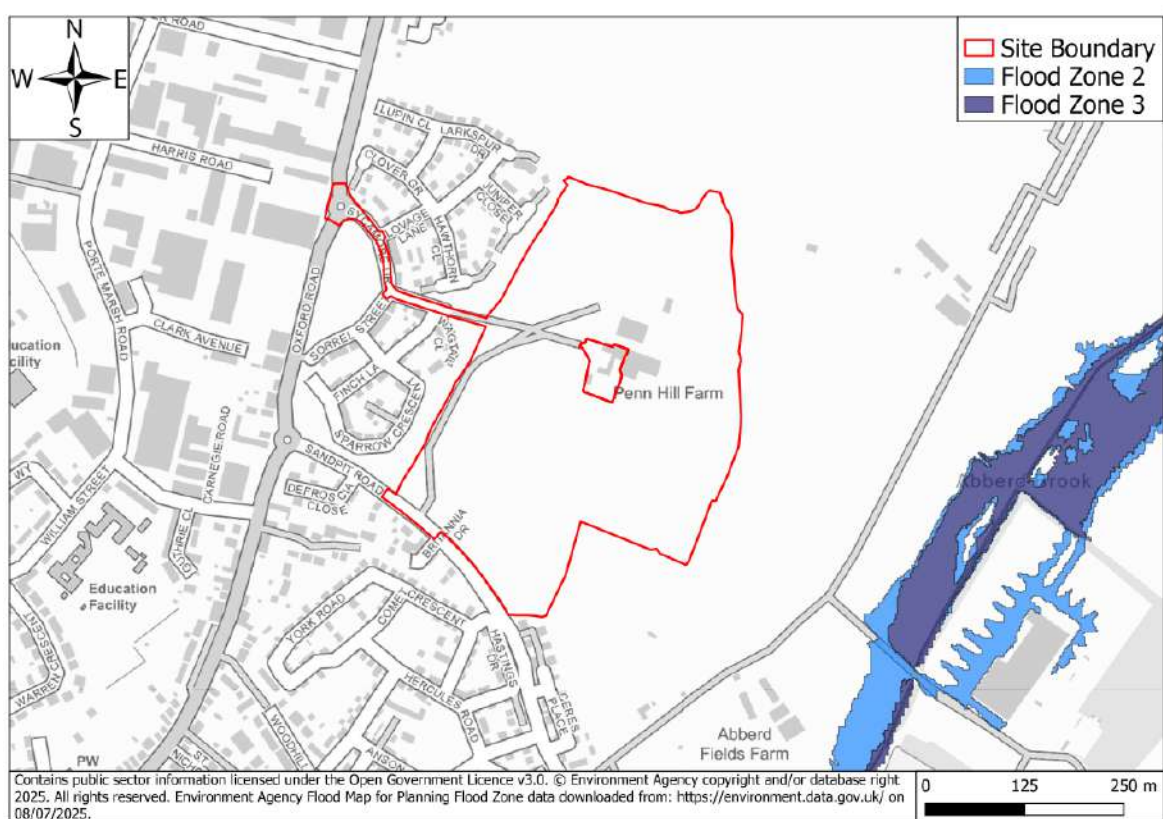
4.1 EA Flood Zone Map

4.1.1 The EA Flood Map for Planning provides an initial indication of the extent of Flood Zones. In the NPPF, Flood Zones are defined as follows:

- Flood Zone 1 'Low Probability' – Land less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.1.2 **Figure 4.1** shows the EA Flood Zone mapping.

Figure 4.1: EA Flood Zone Map



4.1.3 **Figure 4.1** shows the entirety of the site lies within Flood Zone 1.

4.1.4 Therefore, the overall risk of flooding from rivers and sea is low.

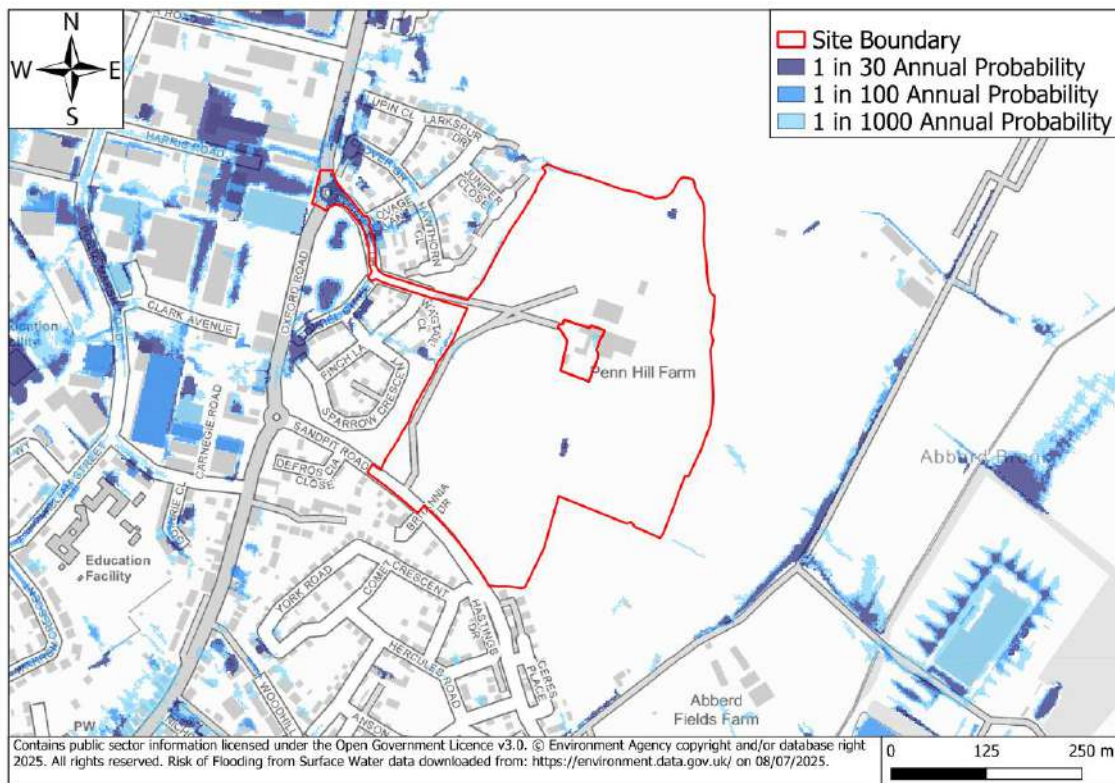
4.2 Flood Risk from Surface Water

4.2.1 The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:

- 1 in 30 (3.3%) annual probability 'High Risk'
- 1 in 100 (1%) annual probability 'Medium Risk'
- 1 in 1,000 (0.1%) annual probability 'Low Risk'

- Lower than 1 in 1,000 (0.1%) annual probability 'Very Low Risk'.
- 4.2.2 The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood (including climate change) within the definition of the design flood event to be used to inform an FRA.
- 4.2.3 **Figure 4.2** shows the potential flood risk from surface water.

Figure 4.2: EA Flood Risk from Surface Water



- 4.2.4 The EA Flood Risk from Surface Water mapping shows there is limited risk of flooding from surface water. There are two areas within the site boundary wherein there appears to be ponding, in the northeastern corner of the site and in the lower central south of the site. Both these areas are classed as 1 in 30 Annual Probability of Flooding from Surface Water.
- 4.2.5 Overall, there does not appear to be any surface water flow pathways and limited surface water ponding, therefore the risk of flooding from surface water is deemed to be low.

4.3 Flood Risk from Groundwater

- 4.3.1 Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.
- 4.3.2 The JBA groundwater emergence mapping within the WC Level 1 SFRA shows that none of the site is within the highest risk category therefore the risk of flooding is considered to be low. This mapping is shown in **Appendix B**.
- 4.3.3 The risk of groundwater flooding to the site is therefore considered to be low.

4.4 Flood Risk from Sewers

- 4.4.1 When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.

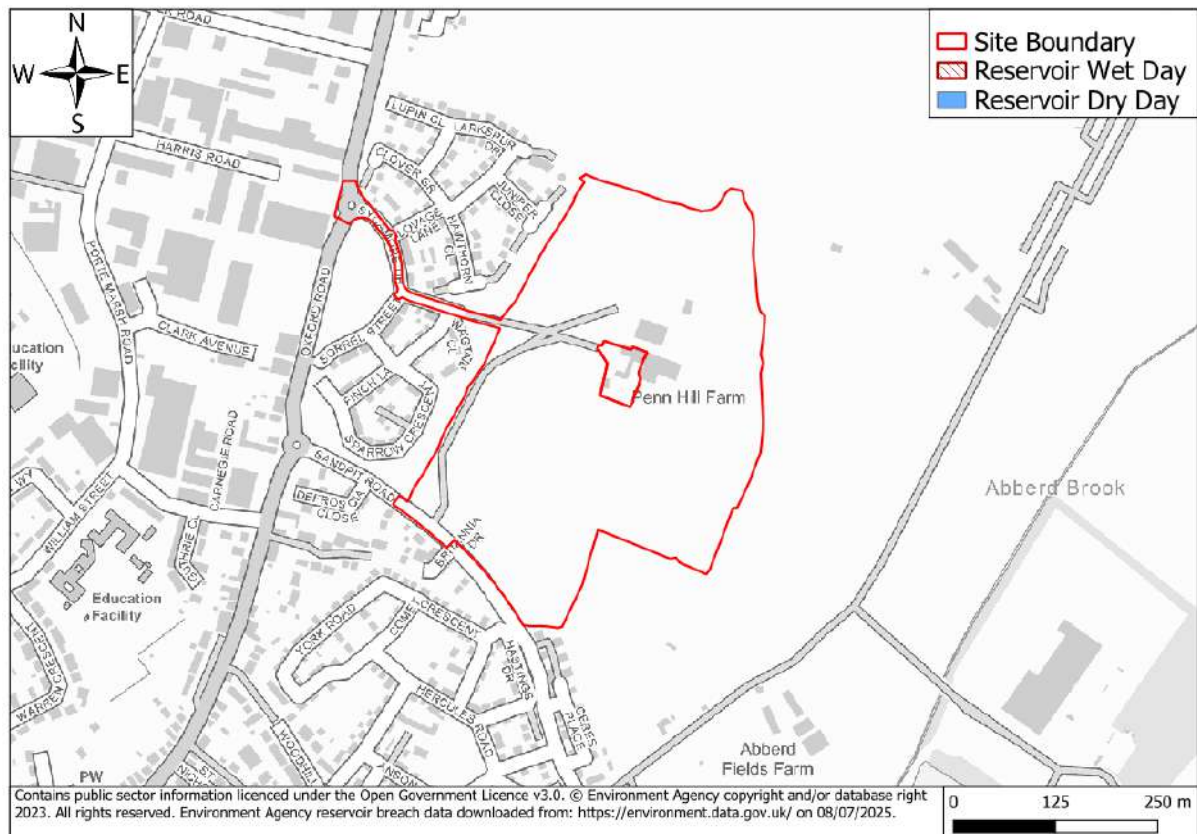
4.4.2 The WW asset location map shows that there are no sewers within the site. The risk of flooding from this source is therefore considered to be low. This mapping is shown in **Appendix A**.

4.5 Flood Risk from Reservoirs

4.5.1 The EA flood risk from reservoirs mapping indicates areas that would be at risk of flooding in the event of a reservoir breach.

4.5.2 **Figure 4.3** shows the flood risk from reservoirs.

Figure 4.3: EA Flood Risk from Reservoirs



4.5.3 The mapping shows that the entirety of the site lies outside of areas at risk of flooding from reservoir breach.

4.5.4 Overall, the risk of flooding from reservoirs is considered low.

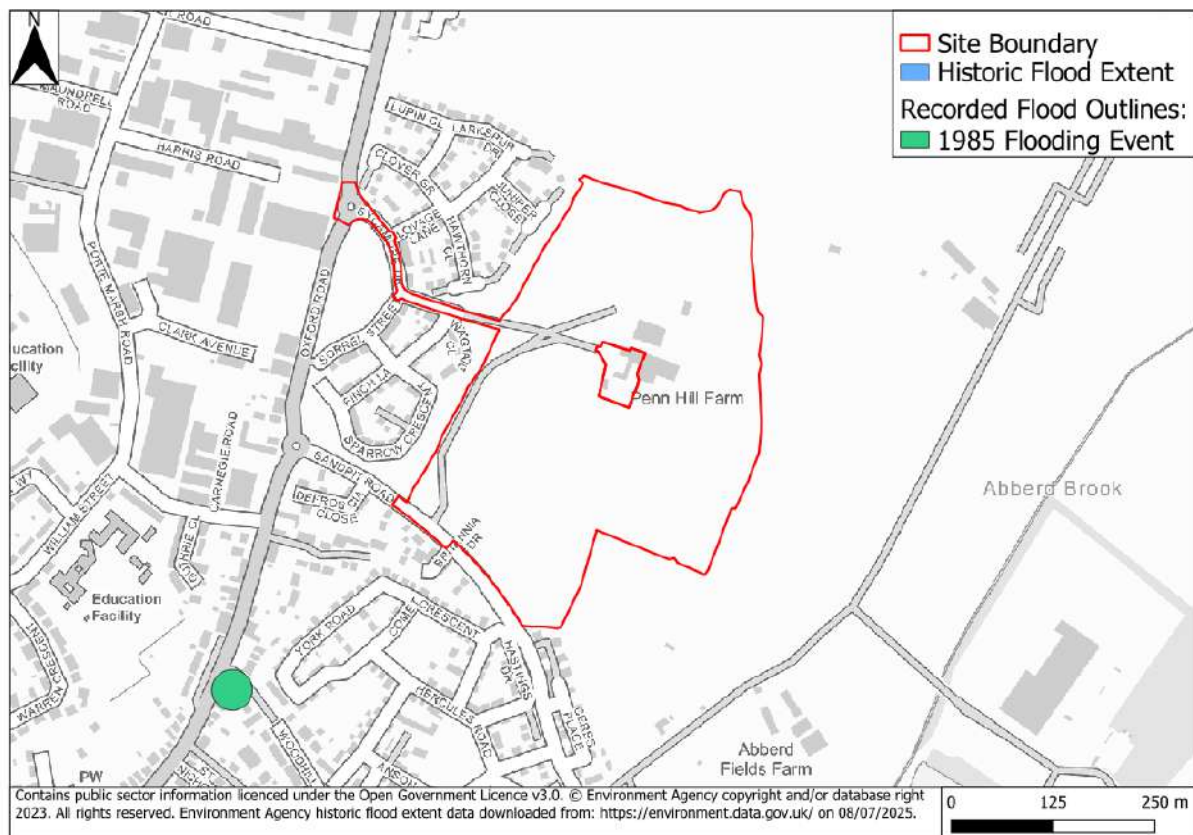
4.6 Flood Risk from Other Sources

4.6.1 The EA flood risk maps, WC PFRA and WC Level 1 and Level 2 SFRA indicate there is low risk from other sources of flooding.

4.7 Historic Flooding

4.7.1 **Figure 4.4** shows the historic flood extent records held by the EA. The EA Historic Flood Map shows the maximum extent of recorded flood events.

Figure 4.4: EA Historic Flood Extents



4.7.2 **Figure 4.5.** shows there are no recorded flooding extents or events that have occurred within the area of the site boundary.



4.8 Flood Risk Summary

4.8.1 A summary of flooding from all sources is provided in **Table 1.1**.

Table 1.1: Summary of Flood Risk

Source of Flooding	Risk of Flooding			Comments
	High	Medium	Low	
Fluvial			✓	The site is located entirely within Flood Zone 1. Therefore, the risk of flooding from fluvial sources is considered low.
Pluvial			✓	The majority of the site has a 'Very Low' risk of surface water flooding. With only two small areas of ponding with 1 in 30 Annual Probability of flooding from surface water. Overall, the risk of flooding from surface water is considered low.
Groundwater			✓	The JBA groundwater mapping within the WC Level 1 SFRA data explorer shows that none of the site is within the highest risk category and that less than 75% the site is within the second highest risk category.
Sewers			✓	The WW asset maps show that there are no sewers within the site boundary. The risk is therefore considered to be low.
Reservoirs, canals and other artificial sources			✓	EA and WC Level 1 SFRA mapping does not indicate the site to be at risk of flooding from other sources.



5.0 Sequential and Exception Test

5.1 NPPF Sequential Test

- 5.1.1 NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test 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.
- 5.1.2 The entire site is located with Flood Zone 1 and is confirmed to be at low risk of flooding from all sources.
- 5.1.3 On this basis, as the site is at a low risk of flooding, the Sequential Test is not required.

5.2 Exception Test

- 5.2.1 By extension of the Sequential Test not being required, the Exception Test also is deemed not to be required.



6.0 Flood Mitigation Strategy

6.1 Sequential Approach

- 6.1.1 The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk from all sources.
- 6.1.2 The masterplan reflects this sequential approach with all residential development located in Flood Zone 1.

6.2 Ground Floor Levels

- 6.2.1 The requirements for setting ground floor levels for new developments are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Developments – Code of Practice'.
- 6.2.2 The WC Level 1 SFRA states that '*Finished Floor Levels (FFL) should be set to a minimum of whichever is higher of 600mm above the:*
 - *Average ground level of the site*
 - *Adjacent road level to the building*
 - *Estimated flood event level (1% AEP fluvial plus climate change although other sources of flood risk should also be considered).*
- 6.2.3 *Where this is a high level of certainty about the estimated flood level, it may be appropriate to reduce this to 300mm.'*
- 6.2.4 In addition, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from the development.

6.3 Floodplain Storage and Flow Routing

- 6.3.1 The proposed development areas are located outside of the fluvial flood extents for the design event. There is therefore no impact on fluvial floodplain storage or conveyance as a result of the proposed built residential development.

6.4 Safe Access

- 6.4.1 The proposed development areas are located outside of the fluvial flood extent. Continuous safe access for the development is located outside of the fluvial extent.

6.5 Residual Risk

- 6.5.1 The NPPF PPG – 'Flood Risk and Coastal Change' defined residual risk as coming from 'flood risk management infrastructure' and the 'residual risk to a development once any site-specific flood mitigation measures are taken into account'.
- 6.5.2 Residual risk to the site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.
- 6.5.3 The residual risk to the site is low. The EA AIMS dataset which contains information of flood defences indicates that the site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the site is not located within an area at risk of flooding in the event of a reservoir breach. The residential development is located outside of the 1 in 1,000 annual probability flood extent.



7.0 Surface Water Drainage Strategy

7.1 Introduction

- 7.1.1 This chapter provides details on the surface drainage strategy and includes measures to drain the proposed development site.

7.2 Overall Strategy

- 7.2.1 The proposed drainage strategy has been designed to the requirements of the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principles. The utilisation of Sustainable Drainage Systems (SuDS) not only provides the benefit of controlling waters at source and online treatment of collected surface water but also allows enhanced aesthetics through improved landscaping, biodiversity, and ecological opportunities.
- 7.2.2 These features offer a holistic treatment train and management system to the benefit of new residents, members of the wider community, downstream receptors and the environment.
- 7.2.3 The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. Changes of land uses can have significant downstream impacts where existing drainage systems may not have sufficient capacity for any additional surface water flow.
- 7.2.4 A surface water management strategy is therefore required to manage and reduce the flood risk posed by the surface water runoff from the site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates to the pre-development scenario, unless specific offsite arrangements are made and result in the same net effect.
- 7.2.5 Sustainable water management measures (SuDS) should be introduced to control the surface water runoff from the proposed development site therefore, managing the flood risk to the site and surrounding areas from the surface water runoff.
- 7.2.6 The Construction Industry Research and Information Association, CIRIA's C690 states the following:
- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing surfaces)
 - **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting)
 - **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways for the entire site)
 - **Regional Control** – management of runoff from several sites, typically in a detention basin or wetland.
- 7.2.7 The SuDS Manual 2015 (C753) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS. This document provides guidance to ensure that SuDS are planned and designed to maximise the opportunities and benefits of surface water management.
- 7.2.8 The four main categories of benefits that can be achieved by SuDS, referred to as the four pillars of SuDS design, are:
- **Water quantity** – control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle;
 - **Water quality** – manage the quality of the runoff to prevent pollution
 - **Amenity** – create and sustain better places for people
 - **Biodiversity** – create and sustain better places for nature.



- 7.2.9 Supplemental to CIRIA guidance, Document H of the Building Regulations 2015 sets out three possible options to discharge surface water runoff. Rainwater shall discharge to one of the following, listed in order of priority:
- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
 - A watercourse; or where that is not reasonably practicable
 - A sewer.
- 7.2.10 As the underlying geology is not conducive to the use of infiltration type techniques (Ref: Para 3.8.2 above), the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses.
- 7.2.11 Implementation of SuDS will ensure that flood risk downstream is not increased due to the proposed development. These features will also provide positive improvements to the quality of surface water runoff.
- 7.2.12 The following SuDS components are deemed applicable to the site:
- **Pervious surfacing systems** – structural surfaces that allow water to penetrate into a granular layer thus providing storage and treatment, e.g. pervious paving.
 - **Conveyance systems** – components that convey flows to downstream storage systems, e.g. swales and filter drains.
 - **Storage systems** – components that control flow, and possibly volumes, by storing water and releasing it slowly, e.g. geocellular units, attenuation basins and wetlands.
 - **Treatment systems** – components that remove or facilitate the degradation of contaminants present in runoff, e.g. filter strips and proprietary treatment systems.

7.3 Pre and Post Development Areas/Rates

- 7.3.1 The overall site is approximately 15.8ha and the developable area is 7.162ha. It is classified as a greenfield site and it is currently considered 100% permeable.
- 7.3.2 Given the underlying geology, it is assumed part of the rainfall infiltrates to the ground up to a point and the rest occurs as overland flow at source towards the lower parts of the site.
- 7.3.3 To quantify any potential increase in surface water runoff, the existing Greenfield/Pre-Development runoff rate from the site must be determined. The rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS. The recommended methodology for sites up to 200 hectares in area is the IH124 method.
- 7.3.4 An assessment of existing surface water runoff has been undertaken, to determine the potential surface water options and attenuation requirements for the site utilising the following parameters.
- Average Annual Rainfall (SAAR): 717mm/year
 - Soil: 0.47
 - Region No.: 8

Pre-Development Discharge Areas & Rates

- 7.3.5 With a developable catchment area of 7.162ha the calculated Greenfield runoff discharge rates and volumes are as presented in Table 7.1. The corresponding runoff outputs created with the use of HR Wallingford and drainage modelling software can be found within **Appendix C**.



Table 7.1: Pre-Development Runoff Rates/ Volume per Hectare

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s/ha)	Greenfield/Pre-Development Runoff Rate for 7.162ha (l/s)	Greenfield/Pre-Development Volume 360 minute storm (m ³)
1 in 1 year event (100% AEP)	3.9	27.9	-
1 in 2 year event (50% AEP)	4.6	33.0	278
1 in 2.3 year event QBar (44% AEP)	5.0	35.8	-
1 in 30 year event (3.3% AEP)	9.7	69.5	655
1 in 100 year event (1% AEP)	12.1	86.7	928

- 7.3.6 Based on the Illustrative Masterplan, it has been conservatively estimated that the impermeable surfaces will be approximately 65% of the developable area. The use of 65% therefore provides for a robust assessment which allows for fluctuations in residential density, and future urban creep on private curtilage areas, in accordance with The SuDS Manual (CIRIA 753).
- 7.3.7 The post development impermeable area of the dwellings and of the roads has been calculated to approximately 4.287ha and in this value the future urban creep in accordance with The SuDS Manual (CIRIA 753) is included. The impermeable area of the proposed basins is 0.566ha and therefore the total impermeable area of the proposed development is 4.853ha.
- 7.3.8 In order to comply with best practice as stipulated in EA Report SC030219 'Rainfall Runoff Management for Developments', proposed discharge rates should be restricted to one of two methods for all storms up to and including the 1 in a 100 year storm event plus a 45% allowance for climate change.

Post-Development Discharge Areas & Rates

- 7.3.9 All discharge flows could be restricted to the existing greenfield runoff rates QBar. This negates the requirement for Long Term Storage and again flows could be attenuated on site and discharged utilising an onsite control device, such as a vortex control device. This normally requires a greater volume of attenuation.
- 7.3.10 The site naturally splits between three different catchments. Refer to drawing A325-001 in **Appendix C** for the catchments and the proposed drainage strategy discharge rates.
- 7.3.11 The proposed development's discharge rates are designed to be restricted to 30% betterment of the existing greenfield runoff rate (QBAR). The calculated runoff discharge rates are presented in **Table 7.2** and drainage modelling calculations with the use of software are included in **Appendix C**.



Table 7.1: Post-Development Runoff Rates and Volumes

Catchment	Catchment Area (ha)	Impermeable Area (ha)	QBAR (l/s)	Proposed Discharge Rates with 30% betterment (l/s)	Attenuation Volume Provided (m ³)
A	1.727	1.163	8.6	6.0	928
B	3.549	2.384	17.7	12.4	1,934
C	1.886	1.305	9.4	6.6	1,109
Total	7.162	4.853	35.8	25.1	3,971

7.4 Surface Water Proposals

- 7.4.1 It is proposed to provide a network of trapped gullies, pipes and Sustainable Drainage (SuDS) features to collect the surface water runoff from impermeable areas such as roads, roofs and driveways. The traditional system could work in combination with such features such as permeable pavement, swales and filter drains, to filtrate, store and transport water to attenuation basins to provide attenuation storage and high-quality water benefits.
- 7.4.2 The final attenuation basins will drain, with controlled discharge rates to the existing outfall ditches, which are located within or close to the Catchments.
- 7.4.3 Storage features upstream of these basins to facilitate the function of the surface water drainage system could be provided. These features may come in the form of permeable paving, swales, filter drains, crate storage or even smaller attenuation basins and provide filtration at source and on plot SuDS to provide a betterment to the existing Greenfield conditions as well as enhance the Green Blue corridors through the site.
- 7.4.4 Drawing A325-001, a copy of which is included within **Appendix C**, provides a high level overview of the drainage proposals together with the estimated requirements for the required storage and SuDS features for the parcels within the various zones of the proposed development.
- 7.4.5 Catchment A, B and C utilise detention basins to provide the required attenuation. The detention basins could provide permanent water pools with depths varying, to promote vegetation and trap sediments.
- 7.4.6 Sediment forebays are proposed to the detention basins to trap sediments and reduce pollution.
- 7.4.7 The banks of the SuDS basins will be designed in accordance with the SuDS Manual C753 in respect to having a gradient of 1 in 3 and an appropriate freeboard of 300mm above the maximum water level. This allows landscaping of both wetland and wildflower mixes to provide an appropriate landscape context in the vicinity of the features through the provision of permanent water pools.
- 7.4.8 Open SuDS features will be designed so as not to compromise the safety of residents, visitors and their property. Generally open boundaries are provided, and perimeter planting could be utilised to define the extents of the features.
- 7.4.9 Proposed discharge rates will be restricted to 30% betterment of the greenfield runoff rate QBAR (refer to Para.7.3.11 and Table 3) for all storm events up to and including the 1 in 100 year storm event plus 45% allowance for climate change. This would negate the requirement for Long Term Storage and flows would be attenuated on site and discharged utilising onsite flow control devices such as a Hydrobrake.



- 7.4.10 All conveyance systems will be designed to cater for the 1:30 year storm event, in accordance with industry standard, with all attenuation features designed to allow for the 1 in 100 year storm event plus 45% climate change allowance. All the drainage modelling calculations can be found in **Appendix C**.
- 7.4.11 The proposals draw reference to the DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, as well as CIRIA C753 The SuDS Manual.
- 7.4.12 Current uncontrolled pluvial runoff exhibited onsite during high rainfall events will be mitigated as a result of the Development. This will occur by virtue of the change in surface from greenfield to positively drained impermeable areas, which will serve to capture, attenuate and delay surface water runoff. This will be a benefit to downstream receptors.
- 7.4.13 This proposal identifies the principal components of the surface water strategy and is subject to further detailed localised investigations as part of the subsequent Reserved Matters applications. These assumptions are subject to evolution as the design develops and the individual parcels are further realised.
- 7.4.14 Subject to the provision of additional geotechnical information, the proposed drainage features may require partial lining to protect against the ingress of natural groundwater. Such lining provides the ability to create localised, small permanent bodies of water which adds landscaping and biodiversity opportunities to the scheme.

7.5 Exceedance Flood Routing

- 7.5.1 Flows in excess of the above design storms, which may flood from the network for storms in excess of the 1 in 100 year storm plus 45% climate change, will be kept within the internal road network, until such time as they can be directed into adjacent landscaping areas or existing vegetation/woodland. This ensures that no onsite or offsite residential units are afforded an increased level of protection from flood waters until such time as the rain events become significant.
- 7.5.2 The attenuation basins of the Development are designed to provide 300mm freeboard and therefore can accept additional flood water from manholes upstream.

7.6 Water Quality Improvements

- 7.6.1 CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new development. This is a simple index approach which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.
- 7.6.2 This process identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.
- 7.6.3 Surfaces generating runoff are 'graded' on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out overleaf.



Table 7.2: Extract from Table 26.2 SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons	Land Use
Residential Roofs	Very Low	0.2	0.2	0.05	Residential Roofs
Other Roofs	Low	0.3	0.2-0.8	0.05	Other Roofs
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4	Low traffic residential roads and non-residential parking with infrequent change.
Commercial yard, parking with frequent change, other roads,	Medium	0.7	0.6	0.7	Commercial yard, parking with frequent change, other roads,
Sites with heavy pollution	High	0.8	0.8	0.9	Sites with heavy pollution

- 7.6.4 Historically, PPG3 documentation would recommend that pollutants were removed utilising oil separators, but since its superseding, more recent guidance has shifted to the use of SuDS features to remove pollutants; thereby providing significant improvements in treatment.
- 7.6.5 The use of non-mechanical features decreases the requirements for maintenance and increase natural biodiversity. That said, the SuDS Manual does not remove the possibility of utilising separators, so long as they are considered in partnership with a comprehensive overall SuDS regime.
- 7.6.6 Without adequate treatment, the pollutants would cause damage if they were to enter the watercourse or water table in large volumes. The use of SuDS features to slow down and degrade these pollutants is critical to the provision of an acceptable discharge.
- 7.6.7 The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below.

Table 7.4 – Extract from Table 26.3 SuDS Manual

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

- 7.6.8 The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.



7.6.9 The proposed detention basins and bio-swales provide adequate pollution mitigation to the pollution hazard levels that the proposed development will create, in accordance with **Table 7.3 and 7.4**.

7.6.10 In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

7.7 SuDS Maintenance Strategy

7.7.1 For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented.

7.7.2 During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the Management Company, statutory authority, or community group commissioned to maintain the features in perpetuity.

7.7.3 As part of the strategy, a regular maintenance regime will be created, which consists of several primary measures required to ensure the longevity of the system. These should be undertaken on a regular basis to ensure consistent performance. Typical maintenance activities consist of:

- Inspecting and reporting; relatively regular review of the condition identifying issues and providing resolutions. Periodic review from the maintenance contractor;
- Litter and debris removal;
- Grass trimming, overall cutting and localised strimming preventing blockages;
- Weed and evasive plant control;
- Shrub management;
- Aquatic and shoreline vegetation management;
- Sweeping pervious surfaces; and
- Oil removal from proprietary systems.

7.7.4 A remedial maintenance schedule would be recommended as part of the handover of the SuDS features, remedial maintenance is required to provide repairs to the system and monitor long term damage ensuring the system remains consistently productive. The schedule could consist of;

- Structure rehabilitation and repair;
- Infiltration surface rehabilitation;
- Scarifying to remove “Thatch”;
- Spiking or Tining the soil;
- Air pressure treatment.

7.7.5 The maintenance schedule contents and timing will depend upon multiple factors including usage, contents of water utilising the system, location and biology. To this end, it is suggested that the schedule be finalised as part of detailed design; ensuring the most comprehensive maintenance schedule is incorporated for the phase in hand.

7.7.6 Community outreach can be undertaken as part of the development, which will raise awareness on the importance of SuDS to both flood risk and water quality in the local area. Imparting the new residents with knowledge on the risks associated with pollution to the surface water drainage system is key, as is the direct effect their actions may have on water quality and biodiversity in the area.

7.8 Adoption and Ownership

7.8.1 The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and the requirement of the National Planning Policy Framework.

7.8.2 The intention of adoption and ownership of drainage and SuDS is as follows:

- Surface water sewers within development parcels to be offered for adoption to Wessex Water under the Section 104 process of the Water Industry Act.



- Surface water highway drains, gullies and leads within adopted roads to be maintained by the Highway Authority.
 - Above ground attenuation (i.e. swales and basins) to be maintained by a private maintenance company funded by residential properties or subject to agreement with the Local Authority.
 - SuDS features serving single properties, for example, permeable paved driveways to single dwellings, will be owned and maintained by the owner of that property.
- 7.8.3 Suitable adoption and maintenance regimes for SuDS should be submitted in support of the Reserved Matters application.



8.0 Foul Water Drainage

8.1 Introduction

- 8.1.1 This chapter provides details on the proposed foul water drainage strategy and measures to convey effluent.

8.2 Overall Strategy

- 8.2.1 Due to the topography of the site and location of the existing foul sewer point of connection, wastewater from the site will require pumping to the receiving public sewer.
- 8.2.2 There are currently no public sewers located within the adjacent roads bordering the site, therefore construction of the infrastructure necessary to service the site will be required.
- 8.2.3 Discussions are currently ongoing with Wessex Water as to the best possible location for the final connection for the foul water coming from the site depending on capacity of the sewage treatment works and incoming pipework.
- 8.2.4 Discussions are ongoing with Wessex Water regarding the exact location(s) and specifications of possible pump stations that will be required to provide sufficient capacity to service the development.
- 8.2.5 Notwithstanding this, the delivery of the proposed onsite foul water sewers will be designed in collaboration with Wessex Water as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Wessex Water for adoption under S104 Agreement of the Water Industry Act. The connection to the existing public sewer system will be made via a S106 Agreement of the Water Industry Act with Wessex Water as part of the overall adoption process.
- 8.2.6 Refer to drawing A325-001 Drainage Strategy Layout in **Appendix C** to see indicative location for the pumping station and indicative route of the rising mains, prior connection to the Wessex Water network. The closest available Wessex Water public foul manhole chamber is located in Sand Pitt Road.

8.3 Adoption and Ownership

- 8.3.1 The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.
- 8.3.2 Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to Wessex Water under the Section 104 process of the Water Industry Act.



9.0 Conclusion

9.1 Flood Risk

- 9.1.1 The EA Flood Risk mapping has been reviewed alongside the Wiltshire Council (WC) Preliminary Flood Risk Assessment (PFRA) and WC Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA).
- 9.1.2 This Flood Risk Assessment (FRA) concludes that:
- The entire site is located within Flood Zone 1 'Low Probability' (land at less than 1 in 1,000 (0.1%) annual probability of river or sea flooding').
 - The site is at low risk of tidal flooding due to its inland location.
 - The majority of the site is located in an area with a 'Very Low' (land lower than 1 in 1000 (0.1%) annual probability) risk of flooding from surface water.
 - The WC Level 1 SFRA data explorer shows that the majority of the site has a low risk of groundwater flooding.
 - The site is not at risk of flooding in the event of a reservoir breach.
 - In summary, the site is at a low risk of flooding from all sources.

9.2 Sequential Test and Exception Test

- 9.2.1 The site is located within Flood Zone 1.
- 9.2.2 The Sequential Test and by extension the Exception Test are deemed unnecessary.

9.3 Mitigation Strategy

- 9.3.1 Where the site is located away from the edge of the extent of the fluvial design flood, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. Surrounding ground levels should also be appropriately contoured to direct surface water away from houses.
- 9.3.2 The proposed surface water drainage strategy will manage the flood risk posed by uncontrolled surface water runoff from the site. Any increase in surface water run-off can be managed using SuDS source control techniques as well as attenuation features to provide storage in extreme storm events. This provides the required treatment stages in accordance with the recommendations of CIRIA C753. All surface water drainage systems will be designed to restrict drainage discharge rates to QBAR runoff rates and store the balance of water for all events up to and including the 1 in 100-year event including an allowance for a 45% increase in rainfall intensities as a result of climate change and urban creep.

9.4 Summary

- 9.4.1 This FRA demonstrates that the proposed development complies with national and local planning policy with respect to flood risk and drainage. The risk of flooding is adequately managed, and, with the implementation of a suitable surface water drainage strategy, the offsite flood risk is not increased.



Appendices



Appendix A – Plans and Background Information

Masterplan

Wessex Water Asset Record

Topographical Survey



	Site Boundary		Green Infrastructure and Public Open Space (POS)		Proposed Access		Wildflower Meadows		Proposed Attenuation Basin
	Existing / Retained Public Right of Way		Indicative Pedestrian Routes within POS		Employment Access		Established Hedgerow Linked to Green Network		Wet Pond & Wetland Habitat
	Rerouted Public Right of Way		Existing Trees and Hedgerows		Retained Farmhouse Access		Community Orchard		Street Trees
	Residential Development		Proposed Tree Planting		Enhanced Tree Belt with Woodland Edge Planting		Picnic & Seating Areas		Swales or Rain Gardens
	Employment		Proposed Allotments		Local Equipped Area of Play (LEAP)		Woodland Copse Planting		Proposed Pumping Station

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CLIENT Castlewood Properties Ventures Ltd

PROJECT Land at Penn Farm, Calne

DRAWING: Framework Masterplan

PROJECT NO. CASS3002

DRAWING NO. 3001

REVISION S

STATUS Submission

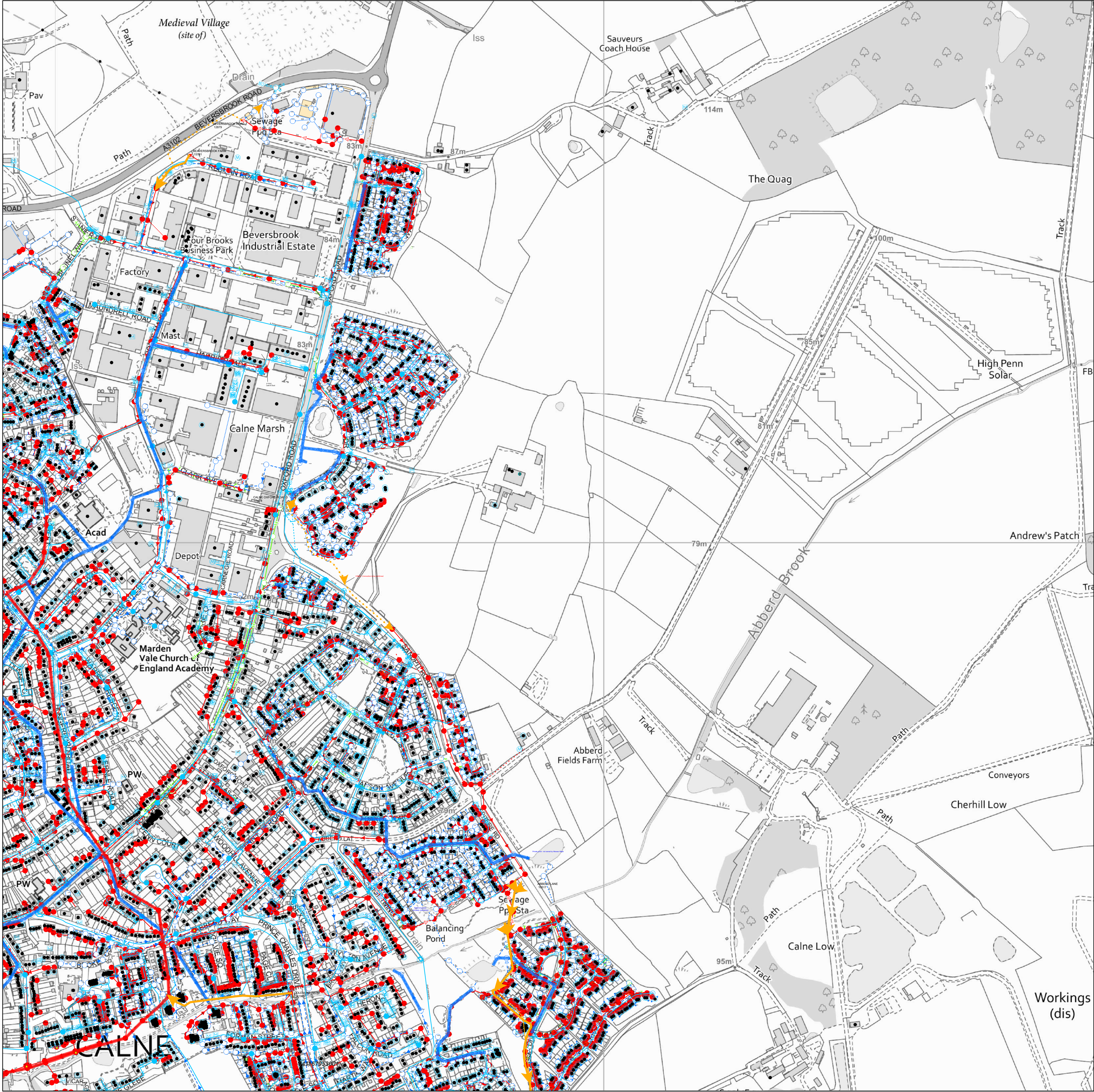
SCALE 1:2500 @ A3

DATE November 2025

CHECKED BY CD/CA

Turley

Wessex Water Web Map



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WATER MAINS	SEWERS	PUBLIC	PRIVATE	SECTION 104	OTHER WESSEX PIPES	NON-WESSEX / UNKNOWN
Distribution Main	Foul	Surface	Combined	Abandoned	Rising Mains	Standby Rising Mains
Washout Main	Combined	Surface	Abandoned	Abandoned	Effluent Disposal	Highway Drain
Raw Water Main	Abandoned	Surface	Abandoned	Abandoned	Overflow	Use Unknown
Abandoned Main					Syphon	Status Unknown
Private Main						
SITES	STRUCTURES				OTHER STRUCTURES	
Source	Manhole - Foul				Attenuation Tank	Chamber
Reservoir	Manhole - Surface				Storage Tank	Tunnel
Pump	Manhole - Combined					Interceptor
Treatment Works	Outfall					
FITTINGS	Inlet					
Valve - Open	Lamphole					
Valve - Closed	Bifurcation - Foul					
Fire Hydrant	Bifurcation - Surface					
Pressure Reducing Valve	Bifurcation - Combined					
Meter	Combined Sewage Overflow					
	Air Valve					
	Hatch Box					

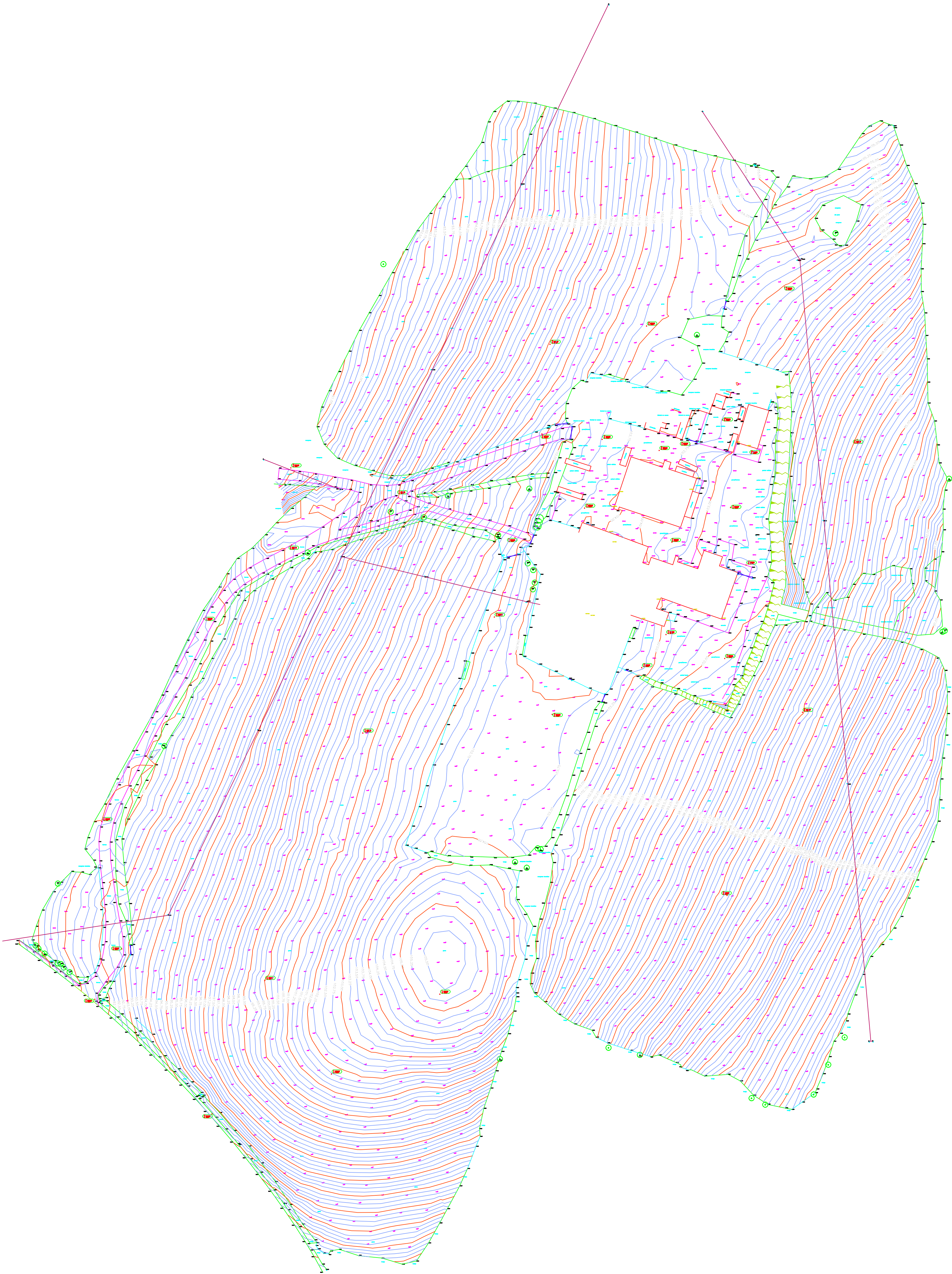
Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow) styles of line are shown on the key in sample/typical colours.

Information in this plan is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. Building over or near Wessex Water's apparatus is not normally permitted.

Date: 01/10/2025

Centre: 400899E, 171994N

Scale: 1:3,536
(when printed at A1 size)



Job No.

P4549JJ2629

Rev.

Legend

AM apex height

BS benchmark

CB control box

CL cover level

D drain

EDC electric TC

EP electricity pole

ER eave height

FB foot bridge

FL flood light

G gully

GP gate post

GV gas valve

IC inspection cover

IL level

KO kerb outlet

L1 light post

LP lamp post

NI north

OSM benchmark

P post

RB pillar box

RE reading eye

RI roof height

RP reflector post

SS road sign

SAP sapling

SC security covers

SK sky light

SL street level

SP sign post

SV stop valve

TC telephone TC

TP telegraph pole

TM street machine

VM water meter

UTL utility to lift

VP vent pipe

Notes.

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Key dimensions to be checked by engineer before major structural works commence on site.

1. This survey has been computed and drawn about O. S. National Grid.

2. All levels are in metres and relate to O. S. National Datum by GPS instruments.

3. This survey was measured for a scale of 1:200, any subsequent enlargements should be verified on site.

Amendments

Rev	Date	By	Chkd

JOMASENGINEERINGENVIRONMENTAL

Jomas Associates Ltd.
Unit 24 Sarum Complex
Salisbury Road
Upton
W88 2RZ
Tel. 0843 2892167

Client

Castletwood Commercial Properties Ltd

Project

Penn Hill Farm

Drawing

Topographic Survey
3D

Dwg no

Figure 1

Date

Job No.

Checked

BH

24-08-22

P4549JJ2629

Surveyor

JH

Scale 1:1000 @ A1

Rev 01

Grid

Contours

Level Datum



Appendix B – Wiltshire Council SFRA Extracts

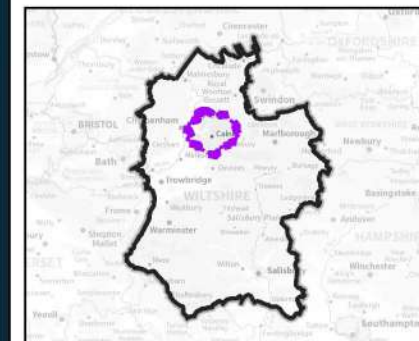
Groundwater Emergence Mapping



Arlington House
Park Five
Harrier Way
Sowton
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Wiltshire Council



Groundwater Emergence: Calne

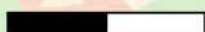
Legend

- Wiltshire boundary
- Community Partnership Area

Groundwater Emergence

- This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
- Flooding from groundwater is not likely.
- There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.
- Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
- Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.

0 1 2 km



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Appendix C – Drainage Strategy

Greenfield Runoff Rates

Greenfield Volumes

Proposed Drainage Modelling Calculations

Proposed Drainage Strategy Layout

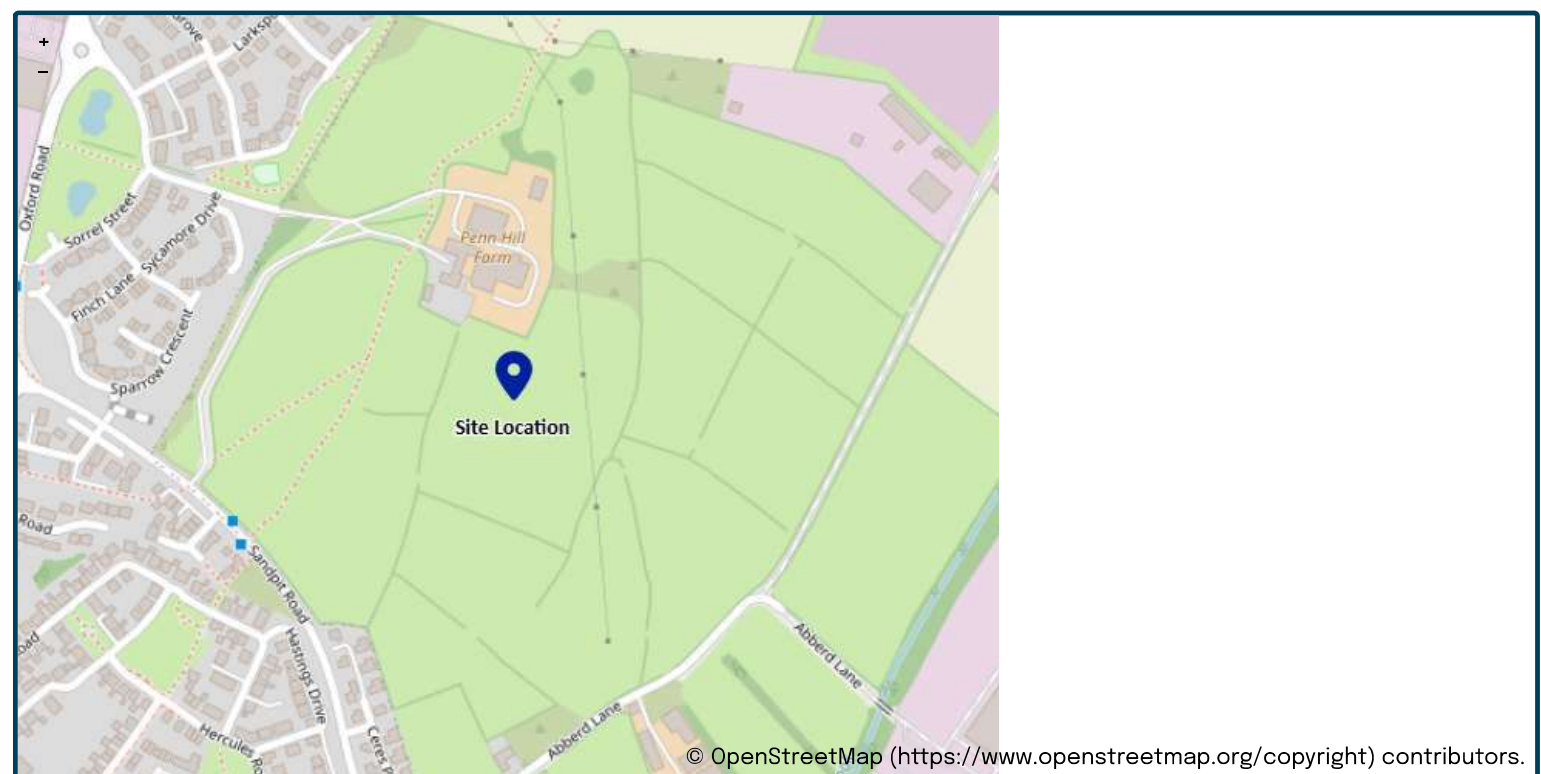
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	07/11/2025
Calculated by	GEORGIOS ROINAS
Reference	A325 Penn Farm, Calne
Model version	2.2.2

Location

Site name	A325 Penn Farm, Calne
Site location	Penn Farm, Calne



Site easting (British National Grid)	400860
Site northing (British National Grid)	171942

Site details

Total site area (ha)	1	ha
----------------------	--------------------------------	----

Greenfield runoff

Method

Method	IH124
--------	-------

IH124

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	717	mm	717
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	5	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	8		8
1 year growth factor	0.78		
2 year growth factor	0.93		
10 year growth factor	1.49		
30 year growth factor	1.95		
100 year growth factor	2.43		
200 year growth factor	2.78		

Results

Method	IH124	
Flow rate 1 year (l/s)	3.9	l/s
Flow rate 2 year (l/s)	4.6	l/s
Flow rate 10 years (l/s)	7.4	l/s
Flow rate 30 years (l/s)	9.7	l/s
Flow rate 100 years (l/s)	12.1	l/s
Flow rate 200 years (l/s)	13.8	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Greenfield Volume

50% AEP

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	7.162
Soil Index	4
SPR	0.47
Catchment Wetness Index	1.014
Return Period (years)	2
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.160
Runoff Volume (m³)	278

3.3% AEP

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	7.162
Soil Index	4
SPR	0.47
Catchment Wetness Index	1.014
Return Period (years)	30
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.183
Runoff Volume (m³)	655

1% AEP

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	7.162
Soil Index	4
SPR	0.47
Catchment Wetness Index	1.014
Return Period (years)	100
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.202
Runoff Volume (m³)	928

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	550.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Basin A	1.163	5.00	100.000	35.605	84.237	1.500
Basin B	2.384	5.00	100.000	20.689	64.068	1.500
Basin C	1.305	5.00	100.000	-0.836	37.797	1.000

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node Basin A Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	98.500	Product Number	CTL-SHE-0112-6000-1200-6000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node Basin B Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	98.500	Product Number	CTL-SHE-0158-1240-1200-1240
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.4	Min Node Diameter (mm)	1500

Node Basin C Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	99.000	Product Number	CTL-SHE-0125-6600-0700-6600
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.6	Min Node Diameter (mm)	1200

Node Basin A Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	534.0	534.0	1.500	1162.0	1180.1

Node Basin B Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1227.0	1227.0	1.500	2219.0	2242.8

Node Basin C Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1233.0	1233.0	1.000	2276.0	2286.3

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Basin A	360	98.776	0.276	22.6	163.4701	0.0000	OK
480 minute winter	Basin B	360	98.766	0.266	46.4	349.5622	0.0000	OK
600 minute winter	Basin C	450	99.156	0.156	21.6	205.0616	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Basin A	Hydro-Brake®	5.9	189.8
480 minute winter	Basin B	Hydro-Brake®	12.2	369.0
600 minute winter	Basin C	Hydro-Brake®	6.4	200.4

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Basin A	464	99.108	0.608	46.0	402.4165	0.0000	OK
600 minute winter	Basin B	570	99.088	0.588	79.3	835.6750	0.0000	OK
600 minute winter	Basin C	570	99.335	0.335	43.4	471.1284	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Basin A	Hydro-Brake®	6.0	209.4
600 minute winter	Basin B	Hydro-Brake®	12.4	485.7
600 minute winter	Basin C	Hydro-Brake®	6.6	249.7

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Basin A	705	99.375	0.875	47.4	627.1169	0.0000	OK
720 minute winter	Basin B	705	99.359	0.859	97.1	1298.6380	0.0000	OK
960 minute winter	Basin C	915	99.487	0.487	42.8	723.8754	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Basin A	Hydro-Brake®	6.0	262.5
720 minute winter	Basin B	Hydro-Brake®	12.4	525.3
960 minute winter	Basin C	Hydro-Brake®	6.6	345.9

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Basin A	705	99.315	0.815	44.1	573.9578	0.0000	OK
720 minute winter	Basin B	705	99.296	0.796	90.5	1186.7980	0.0000	OK
960 minute winter	Basin C	915	99.450	0.450	40.1	660.8947	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Basin A	Hydro-Brake®	6.0	257.4
720 minute winter	Basin B	Hydro-Brake®	12.4	528.7
960 minute winter	Basin C	Hydro-Brake®	6.6	351.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Basin A	930	99.667	1.167	51.8	908.0293	0.0000	OK
960 minute winter	Basin B	930	99.664	1.164	106.1	1875.8810	0.0000	OK
960 minute winter	Basin C	930	99.665	0.665	58.1	1049.6840	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Basin A	Hydro-Brake®	6.0	363.7
960 minute winter	Basin B	Hydro-Brake®	12.4	731.6
960 minute winter	Basin C	Hydro-Brake®	6.6	373.7

Catchments	Total Developable Area (ha)	Total Impermeable Area (ha)	Discharge Rates Based on 30% Betterment on QBAR (l/s)	Volume Provided (m ³)	Depth (m)	Side Slopes
A	1.727	1.163	6.0	928	1.5	1 in 3
B	3.549	2.384	12.4	1,934	1.5	1 in 3
C	1.886	1.305	6.6	5,080	1.0	1 in 3

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TURLEY - CASS3002 - 3000 - F
JOMAS - P4549J2629

- NOTES:
1. QBAR Greenfield Runoff rate = 4.9 l/s/ha. Discharge rate = 3.5 l/s/ha (30% WCC Betterment Policy).
 2. CV Value of 0.75 for summer and 0.84 for winter used for storage estimates.
 3. Invert level of basins subject to confirmation of ditch levels.
 4. Employment Site based on 65% impermeable area of the developable area and 100% impermeable area from the basins.

SURFACE WATER KEY:

- Catchment Boundary
- Direction of flow
- Attenuation basin
- Existing Site Contours
- Indicative Network
- Headwall

FOUL WATER KEY:

- Indicative Network
- Proposed Pumping Station
- Proposed Rising Main
- Existing Foul Network
- Existing Rising Main



P8	11.25	LAYOUT AMENDED	GR	SI
P7	10.25	LAYOUT AMENDED	GR	SI
P6	08.24	UPDATED TO SUIT CATCHMENTS	GR	KW
P5	02.23	UPDATED TO SUIT ROAD ALIGNMENT	GR	KW
P4	02.23	DRAINAGE STRATEGY UPDATED TO SUIT LATEST LAYOUT	GR	KW
P3	12.22	DRAINAGE STRATEGY UPDATED TO SUIT LATEST LAYOUT INFORMATION. EMPLOYMENT SITE CATCHMENT ADDED.	TR	KW
P2	09.22	FOUL STRATEGY ADDED	KW	PJ
P1	09.22	FIRST ISSUE	KW	PJ
Rev	Date	Description	Drawn	Checked

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CASTLEWOOD
COMMERCIAL

PENN FARM
CALNE

INDICATIVE
DRAINAGE STRATEGY

Status
FOR INFORMATION

Scale	Date	Drawn	Checked
1:1000 @ A1	SEPT 2022	KLW	PJ
Drawing No	001	Revision	P8
A325	001		



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