Drainage Strategy

Anscombe Wood Crescent - Haywards Heath

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Non-Technical Summary

What is Proposed?	It is understood that proposals involve the erection of two buildings to provide eight apartments along with new access roads and hardstanding areas.
What is the Problem?	The proposed development will result in the following: ▶ Increase in impermeable surfacing across the site. ▶ Increase surface water runoff from the site. ▶ Have a detriment effect on water quality from the site. Without mitigation, development on the site has the potential to increase flood risk offsite and have a detrimental effect in water quality.
What is the Result?	The proposed development has been designed to ensure the development is safe throughout its lifespan. The following have been used in the outline scheme: ▶ SuDS techniques have been incorporated throughout the site to provide multiple benefits. ▶ A foul water strategy has been identified
What are the Next Steps?	This report has recommended the following next steps: ▶ Bespoke infiltration testing undertaken in March 2022 revealed an impermeable superficial geology, not suitable for partial of full infiltration SuDS. In absence of a nearby watercourse, post-development runoff discharges should be directed to the surface water sewer (MH Ref. 4751) at a maximum rate of 1.0 l/s. ▶ A capacity check submitted to Southern Water for a previous slightly larger development (10 units instead of 8) was agreed by the sewerage authority. A new capacity check for very similar surface and foul water values would be submitted at the detailed design stage. ▶ Permissions to lay sewer connections across third party land. This report should be submitted to the local planning authority to support the planning application. To mitigate the above identified risks, the following elements are expected to be conditioned by the Local Planning Authority to be implemented or considered further at detailed design stage: ▶ Detailed drainage design will need to be undertaken based upon the recommendations as set out within this Drainage Strategy and incorporate the results of further testing.

Report Record

Project Name	Anscombe Wood Crescent - Haywards Heath
Client	Homes (haywards Heath) Limited
Report Type	Drainage Strategy
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Report Revisions

Revision Ref	Date	Author	Details
A	23/10/25	SD	Amendments to suit final site layout of eight apartments.
B	13/11/25	SD	Minor amendments.

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Appendices

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1.0 Introduction

1.1 This report presents the findings of a Drainage Strategy - a report which assesses runoff from the natural, existing and proposed state of the site in relation to drainage. A strategy is prepared to provide suitable mitigation measures. This report has been prepared in line with best practice guidance and planning policy.

What is a Drainage Strategy?

1.2 A Drainage Strategy identifies and quantifies how the proposed development will affect the surface water and foul water requirements on the site and provides a strategy on how drainage will be managed over the development's lifetime, taking climate change into account.

1.3 A Sustainable Drainage System (SuDS) approach to surface water management is the preferred approach to surface water drainage design. SuDS are designed to maximise the opportunities and benefits that can be achieved by SuDS: water quantity, water quality, amenity and biodiversity.

1.4 A foul water drainage strategy determines how foul flows from a development can be managed.

1.5 A SuDS strategy is required by regulators to support planning application or remove objections if a new development (including extensions) or change-of-use proposal (to a more vulnerable use) is in an area that is at risk of flooding by rivers, the sea, surface water or groundwater (or a combination).

1.6 The National Planning Policy Framework (NPPF) states that developments within an area at risk of flooding and Major development incorporates SuDS unless there is clear evidence that this would be inappropriate.

1.7 The Lead Local Flood Authority (LLFA) are statutory consultees for any new major development consisting of 10 dwellings or more. Find out more about Drainage Strategies here.

The Subject Site

Table 1	Site Details
Address	Anscombe Woods Crescent, in Haywards Heath, West Sussex, GU19 5AQ
Eastings, Northings	533470, 122740
Area	0.61 ha

1.8 The site, irregular in plan, currently comprises an ancient woodland, areas of hard standings and dilapidated play equipment and formed part of a large former St Francis Hospital site. The site is located within a predominately residential area. The site area is shown in Figure 1.

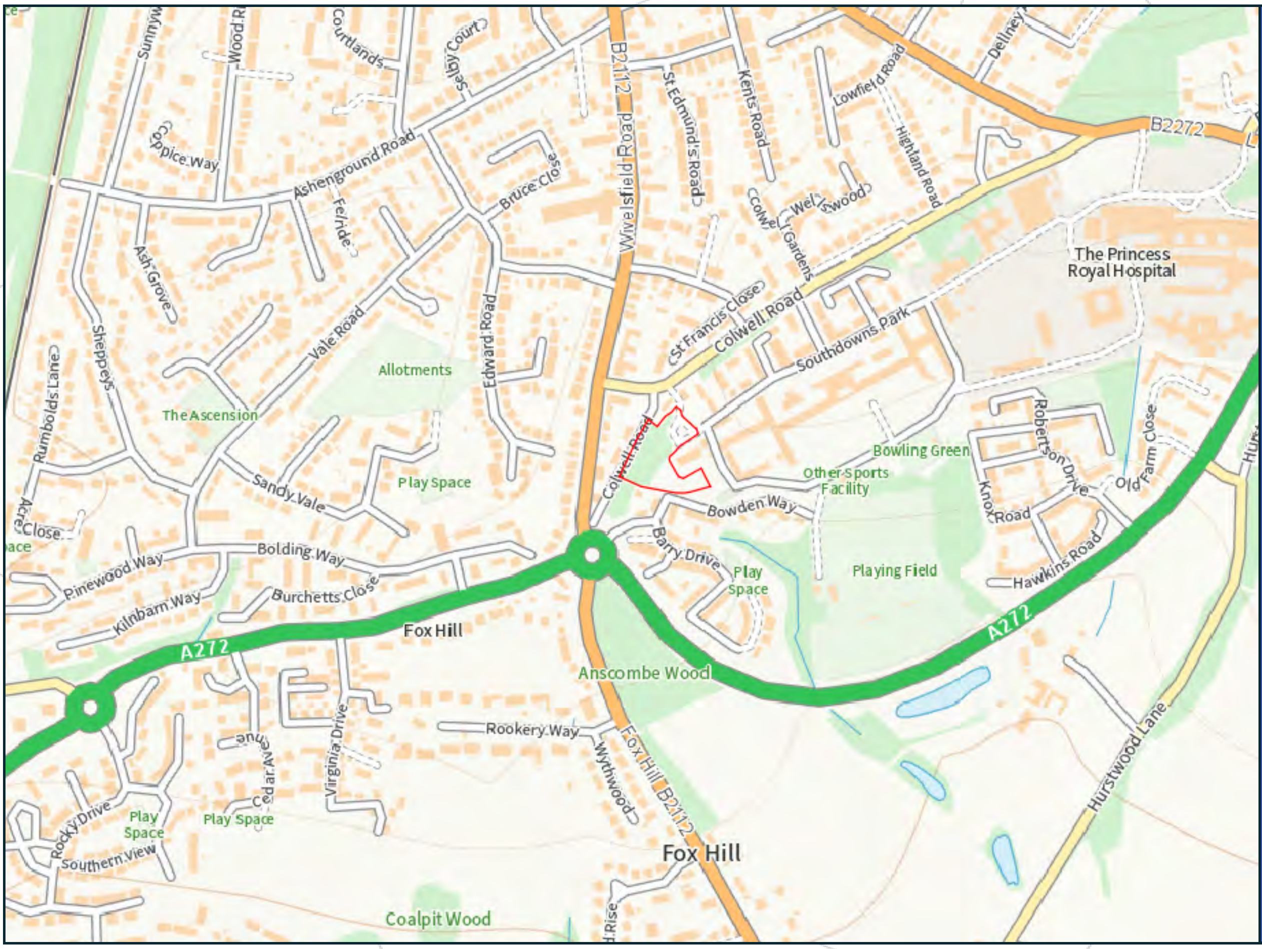

Figure 1 Site Location Plan

The Proposed Development

1.9 It is understood that the site is proposed to be redeveloped to provide a residential scheme, as illustrated in Figure 2.

1.10 The application proposes the erection of two buildings to provide: 2 no. 4 bedroom houses and 6 no. 1 bed apartments (total 8 units), with associated access, car parking, covered cycle parking, refuse store and woodland management plan.

1.11 Access to the site is taken from an existing vehicular access off Anscombe Woods Crescent and x 10 car parking spaces are proposed within the north eastern part of the site in a location of existing car parking. An access road follows round to the proposed buildings and an additional x3 car parking spaces and refuse storage are proposed adjacent to the most south easterly located building. Covered cycle parking is proposed close to each building. The total post-development impermeable area would be approximately 1420m^2 (0.142ha), 820m^2 more than the existing impermeable area (600m^2).

1.12 The proposal will allow for the provision of a woodland management plan that will enable improvements to the ancient woodland that exists on the site, to included native planting and the removal of invasive species.

Figure 2 Proposed Development Plan

The Stakes & Objectives

1.13 Increases in impermeable areas will increase surface water runoff and will therefore increase the risk of flooding both onsite and offsite.

1.14 Climate change is resulting in more extremes of weather including an increase in rainfall intensities. Therefore, the local and catchment flood risk will increase throughout the lifespan of the development if left unmitigated.

1.15 Flooding from any source has the potential to disrupt lives, communities and businesses. This risk is exacerbated when flood events occur suddenly with little or no warning.

Water quality is often compromised during heavy rainfall events as pollutants and sediments are washed off impermeable surfaces.

1.16 To ensure a compliant site, this drainage strategy requires consideration of a range of national and local policies, guidance and data sources. Full details on the relevant planning policy, as well as site specific county and borough guidance is detailed in Appendix A. For ease of reference this includes the National Planning Policy Framework (NPPF), National Climate Change Guidance, Mid Sussex Policy (District Plan) and West Sussex Council Guidance (Lead Local Flood Authority).

1.17 Based on the requirements of both national and local level policy and guidance, this drainage strategy will seek to show:

- How SuDS are incorporated into the design, providing multiple benefits
- Drainage calculations including an appropriate allowance for climate change
- An overall drainage strategy plan showing how the surface and foul water will be manged.

1.18 Where identified, this drainage strategy will present additional recommendations.

Report Structure, Limitations & Changes

1.19 Chapter 2 of the report provides information relating to the site setting. The development of a SuDS strategy is laid out Chapter 3, with Chapter 4 presenting a foul water strategy. Conclusions and recommendations are presented in Chapter 5.

1.20 This assessment has been undertaken in accordance with our Terms & Conditions. Full details on limitations and reliance are provided in those Terms. Third party information which has been reviewed and used to inform the assessments presented herein, including public records held by various regulatory authorities and environmental database data has been assumed to be true and accurate.

1.21 This assessment has been carried out to determine the potential risks posed to future end users, along with other key receptors, based on the current development. Should revisions in the development proposals result in a change any assessment parameters detailed in this report, a re-assessment of the risk should be carried out.

2.0 Site Setting

2.1 This chapter details the topology, geological, hydrogeological and hydrological site setting.

Topography

2.2 A site-specific topographical survey was undertaken in August 2008 by Survey Solutions. Site levels in the northern part of the site are generally flat with levels between 80.1 and 80.5 m AOD. The southern part of the site (from approximately the southern boundary of Larchwood House) is terraced over two levels, with the upper terrace at a level of around 79.9 m AOD and the lower terrace between 77.7 and 77.9 m AOD.

2.3 Figure 3 shows the topography within a wider context based upon 1 m resolution DTM LiDAR data. The site is shown to be within an elevated area, with elevations falling away to the north west and the south east of the site. Levels around Bowden Road nearest the site is around 72 m AOD, with levels falling towards the watercourse at around 65 m AOD.

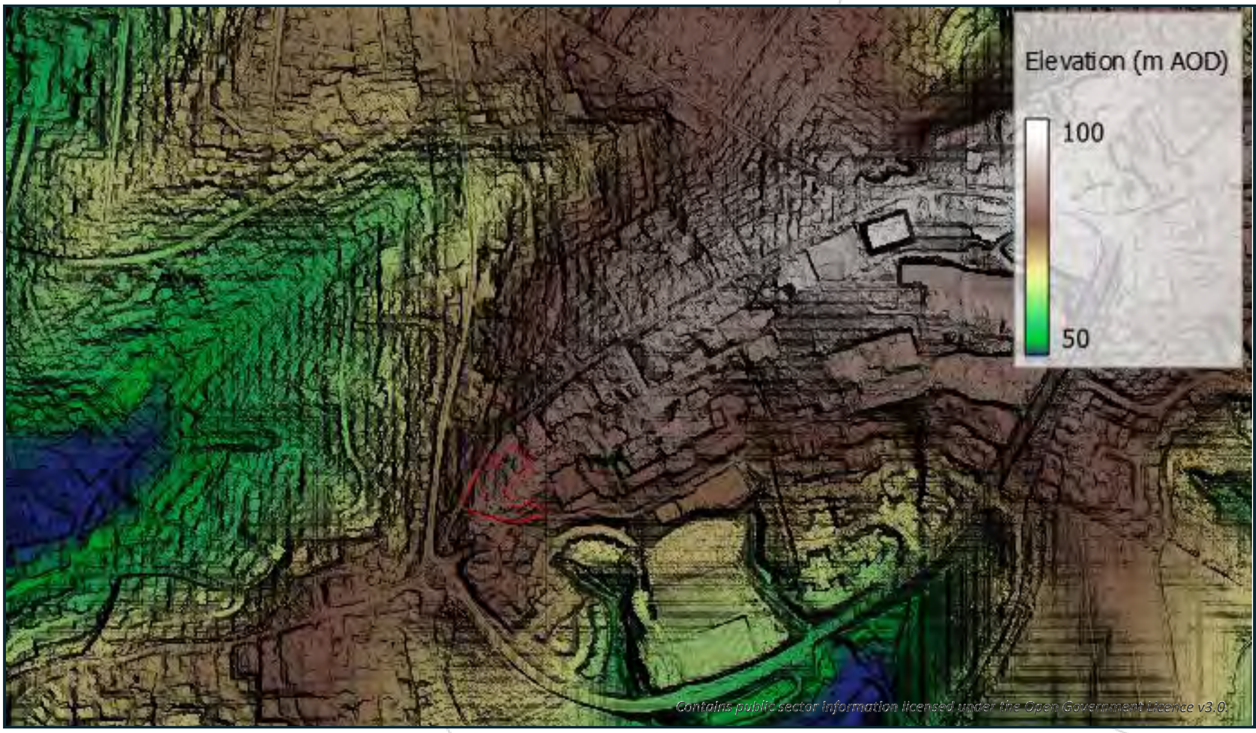

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Figure 3 Topography (LiDAR data)

2.4 The topographical survey of the site is included in Appendix B.

Geology

2.5 The 1:50,000 British Geological Survey (BGS) map and the BGS website (National Geoscience Information Service)1 show the site to be directly underlain by bedrock geology of the Upper Tunbridge Wells Sand comprising sandstone and mudstone. No superficial deposits are anticipated on site.

Hydrology

2.6 A tributary of the Pellingford Brook is located approximately 65 m to the south east of the site.

2.7 There are no significant open water features within the vicinity of the site.

2.8 A review of the Flood Risk Map for Planning shows the site to be situated within Flood Zone 1 (low risk).

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[1] Information from BGS website: www.bgs.ac.uk consulted in month of report issue

3.0 Management of Surface Water

3.1 A SuDS scheme has been developed in line with best practice, based upon the methodology and criteria as set out within this chapter.

3.2 The overall SuDS strategy is to reduce surface water runoff to greenfield rates, whilst maximising SuDS options to achieve multiple benefits.

3.3 A plan setting out the overall drainage strategy has been included in Appendix C, which should be viewed in conjunction with the detail chapter.

Greenfield and existing surface water runoff rates

Greenfield runoff rates

3.4 The ICP SuDS methodology has been used to calculate the greenfield runoff rates for the proposed developed area of the site as shown within Table 2.

Table 2 Greenfield Runoff Rates (ICP SuDS)

Return Period	Runoff rates (l/s) Proposed development area (0.142 ha)
1-year	0.7
Q_{BAR}	0.8
30-year	1.9
100-year	2.6

Existing runoff rates

3.5 Anscombe Wood Crescent is located in the northern part of the site, consisting of approximately 600 m² of tarmac surfacing. It does not appear there is drainage within this area, so that these hard standing surfaces results in increased surface water runoff. According to runoff calculations using FEH22 data and Cv factors of 1, the existing runoff rate for the design storm event is approximately 51.2 l/s. Other storm durations can be found in Appendix D.

Drainage hierarchy

3.6 The Planning Practice Guidance states:

Generally, the aim should be discharge surface runoff 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*

3.7 Table 3 shows how the drainage hierarchy has been considered in relation to the surface water strategy.

3.8 In addition, West Sussex SuDS Policy 1 prioritises the re-use of rainfall over disposal. Water reuse can range from capturing rainwater using water butts to large scale rainwater harvesting for irrigation purposes or as greywater for use within the development.

3.9 Rainwater harvesting options are to be explored as the design progresses.

Table 3 Drainage hierarchy

Options	Feasible?	Details
Can infiltration techniques be used?	No	See paragraphs 3.10 - 3.11
To a surface water body	No	No nearby surface water body
To a surface water sewer, highway drain or another drainage system	Yes	See paragraphs 3.12 - 3.16
To a combined sewer	No	Not necessary (or available)

Infiltration

3.10 Bespoke infiltration testing at the site (see Appendix C) demonstrated very poor infiltration capacity across all test locations, with minimal or no water level reduction observed during the test periods. Infiltration rates were extremely low and one borehole (WS1) even showed a slight rise in water level, indicating the potential presence of shallow groundwater. Overall, the results confirm that the site's soils are unsuitable for infiltration-based drainage systems, and alternative methods of surface water disposal, such as attenuation and controlled discharge, will be required.

3.11 An attenuation strategy has been prepared, which only encourages infiltration where possible (ie permeable paving) to encourage groundwater recharge and vegetation growth. No infiltration rates have been used in calculations.

Surface water sewer

3.12 Southern Water sewer plans have been obtained when preparing this strategy.

3.13 The asset plan shows a number of surface water sewers within the locality of the site, in particular to the south and south east of the site.

3.14 A 150 mm to 225 mm diameter surface water sewer is shown within Bowden Way. This sewer outfalls into the watercourse to the south east of the site. A further public surface water sewer is shown on the western end of Bowden Way, which presumably also discharges to the watercourse.

3.15 It is understood that as part of the overall drainage strategy for the redevelopment of the St Francis Hospital, lateral connection points for both the surface water and foul water, from the main site infrastructure have been left available at the boundary of the site. However, the location and details have not been made available. This connection remains a possibility once details are clarified.

3.16 Connection to the public sewer is subject to Southern Water agreement and obtaining rights for a new sewer over third party land. This strategy suggests a surface water connection point to Chamber 4751 and foul water connection to Chamber 4703.

SuDS Components

3.17 The design of a SuDS system has considered multiple SuDS options and opportunities, based upon the individual circumstances identified at the site.

3.18 Table 4 provides a list of potential SuDS components along with whether they have been taken forward.

Table 4 **SuDS suitability**

SuDS component	Appropriate	Taken forward?
Rainwater harvesting	**Yes**	**Yes** **See paragraph 3.9**

Table 4 SuDS suitability

SuDS component	Appropriate	Taken forward?
Rainwater harvesting	**Yes**	**A specialist should assess the development and confirm if/which RWH system would be most suitable.**
Green roofs	**Yes**	**An extensive green roof would be considered where possible, given that the roof type is suitable.**
Infiltration systems	N/A	Subject to further testing.
Proprietary treatment systems	No	The permeable paving element would provide the adequate treatment required.
Filter strips	Yes	This SuDS feature would provide little benefit to the overall drainage scheme.
Filter drains	Yes	This SuDS feature would provide little benefit to the overall drainage scheme.
Swales	No	This SuDS feature would not be feasible due to the site slope.
Bioretention systems	**Yes**	**Any new soft landscaped areas should be provided with bioretention systems/rain gardens.**
Trees	Yes	See paragraph 3.30.
Pervious pavements	**Yes**	**All new hardstanding areas would be built with permeable materials.**
Attenuation storage tanks	**Yes**	**In order to limit outflows to a minimum and given the layout and slope of the site, geocellular crates should be used to maximise the development's attenuation capacity.**
Detention basins	No	This SuDS feature would not be feasible due to the site slope and would provide little benefit to the overall drainage scheme.

Source control measures

3.19 Rainwater harvesting is being considered from the roof areas of the two proposed properties.

3.20 There are limited areas which are suitable for green roofs, however a green roof is proposed over the bike store.

3.21 Pervious paving is considered appropriate for all the external hard standing areas across the site. Pervious paving will replace existing hard standing areas on the site as well as the proposed new areas.

3.22 The pervious paving is proposed with a porous sub-base which will convey and attenuate surface water. Perforated drains will convey surface water to the outlet of this system.

Conveyance SuDS

3.23 Filter strips, filter drains and swales could be incorporated into the site, especially along the route of the proposed access road.

3.24 At present these have not been incorporated into the drainage strategy as the priority has been given to limit the footprint of proposed development (due to its setting adjacent to an ancient woodland). Conveyance and cleaning of surface water will be undertaken within a porous sub-base layer below the access road.

Retention and detention basins

3.25 Ponds and widespread detention basins have not been taken forward in the SuDS design. Small scale basins are possible along the access road, but would take considerable space and will need to be carefully designed around roots.

3.26 The topography and the extent of pervious pavements with a porous sub-base show that there is sufficient attenuation potential within the build development area and therefore additional volume is not required.

3.27 The topography at the lower end of the site would require any open water feature offering attenuation to be excessively deep and would require significant earthworks resulting to disturbance of roots.

3.28 A bio-retention system is proposed outside the proposed buildings at the lower end of the site, where roof water can be drained and can allow cleaning.

Other

3.29 Proprietary treatment systems have not been deemed necessary as the SuDS scheme provides alternative methods for improving water quality, including:

- Pervious paving with a porous sub-base for hard standing areas;
- Bio-retention in which roof water will flow through prior to reaching the permeable paving;
- Additional downpipe planters where necessary.

3.30 The site is situated on the edge of an ancient woodland. As part of the proposal a management plan is to be agreed and implemented which will protect and enhance this woodland. This will include appropriate tree planting. Although not directly linked to the SuDS scheme, it further demonstrates how the proposals can enhance the environment on the site overall.

Selected SuDS components

3.31 The following SuDS components have been considered for further consideration as part of a site wide SuDS strategy.

Table 5 SuDS components and benefits

SuDS component	Water Quantity	Water Quality	Amenity	Biodiversity
Rainwater harvesting	●		●	
Green roofs	●	●	●	●
Bioretention	●	●	●	●
Pervious pavements	●	○	○	
Attenuation storage tanks	●			

● Valuable contribution ○ Potential Contribution

3.32 Additional information on how these SuDS components contribute to the four pillars of SuDS is provided in Appendix E.

Surface Water Modelling

3.33 Calculations have been undertaken using the Autodesk InfoDrainage software, using the latest FEH22 rainfall data methodology. The proposed impermeable areas across the site will account for approximately 0.142 ha.

3.34 The model is made up of two main components, the pervious paving and the cellular storage. The global design parameters used within the model to provide various scenarios are as shown within Table 6.

Table 6 Model parameters

Parameter	Value/s
Rainfall methodology	FEH22
Return periods (years)	2, 30, 100
Total contributing area (ha)	0.142

Table 6 **Model parameters**

Parameter	Value/s
Runoff Coefficient (Cv)	1
Increased rainfall intensity (%)	45

3.35 The Urban Creep Coefficient has not been assumed due to the type of residential development (apartments) with low likelihood of additional units or extensions being provided without prior LPA consent. Any new hardstanding areas should be built with permeable materials and allowed to infiltrate.

3.36 Storing this quantity of surface water on the site provides a considerable challenge based upon the extent of developed areas, especially due to the quantity of roof areas which will convey surface water rapidly into the drainage system.

Surface Water Attenuation

3.37 Infiltration testing revealed a rather impermeable superficial geology, therefore partial of full infiltration is not further assumed. Infiltration should only be allowed to promote groundwater recharge and vegetation growth.

3.38 Attenuation is proposed in two main features, the porous sub-base (underneath the pervious paving on the access road) and within cellular storage underneath the vegetated area between the proposed buildings. The runoff in the access road would be attenuated by a 20mm orifice plate flow control and directed toward the geocellular crates for further attenuation. Offsite flows would be limited by a 50mm vortex flow control (ie Hydrobrake).

3.39 The geocellular units should not be located in site areas that would prohibit access to the buildings during maintenance/replacement works.

3.40 The porous sub-base depth and overall makeup will be dependent on ground conditions and traffic loadings. The modelling has assumed a flat 450 mm deep porous sub-base with a porosity of 0.3. The porous sub-base will extend over the whole generally flat area (~890m^2), providing approximately 120m^3 of attenuation capacity.

3.41 A series of perforated pipes set at the base of the porous sub-base can be designed to provide appropriate conveyance toward the outlet.

3.42 Cellular storage has been suggested beneath the gardens between the two buildings. This storage has been sized with a plan aera of 71.5 m² to a depth of 0.6 m and a porosity of 0.95, providing approximately 40.7m^3 of attenuation capacity.

3.43 Offsite flows would be limited to 1.0 l/s during the 1 in 100 year + 45%CC design storm event. It is recommended that a connection be made to Southern Water's chamber 4751, subject to their agreement and relevant consents.

3.44 A previous surface water capacity check (April 2022, see Appendix D) submitted for an outflow rate of 0.9 l/s was approved by Southern Water. As such, the proposed discharge rate of 1.0 l/s would most likely also be approved by the sewerage authority. A new capacity check application should be submitted at the detailed design stage, following confirmation of the final SuDS construction details and layout.

3.45 Between the landscaped area and the footpath there are landscaped areas which have been designed to be integrated into the SuDS system. These locations will provide an opportunity to act as a bioretention area to slow and clean surface water from the adjoining buildings and paths prior to entering the permeable paved paths.

Exceedance flows

3.46 It is possible that during the lifetime of the development a storm event may occur which is in excess of the scenarios presented within this report. Although the design of the scheme and the maintenance regime aims to reduce the risks of blockages, it is plausible that a blockage or failure of part of the system may occur.

3.47 During these scenarios, floodwater on the surface will follow the topography towards the south east of the site, although there may be areas of ponding on the relatively level land in the north west. The finished floor levels of the buildings will be set higher than the adjoining ground to encourage any floodwater away from the buildings. Ultimately this flood water would follow the local road system and either be captured by offsite drainage or follow the road towards the watercourse.

Ownership and maintenance

3.48 Ownership and maintenance consideration will need to be determined to ensure that all SuDS components including flow controls are regularly maintained and manged to ensure they operate efficiently.

3.49 It is understood that a maintenance company will be appointed to ensure that adequate maintenance is carried out in accordance with the maintenance schedule provided in Appendix F.

4.0 Management of Foul Water

4.1 In accordance with H1 of the Building Regulations, an adequate system of drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority:

- A public sewer
- A private sewer communicating with a public sewer
- A septic tank which has an appropriate form of secondary treatment or another wastewater treatment system
- A cesspool

4.2 It is understood that as part of the overall drainage strategy for the redevelopment of the St Francis Hospital, lateral connection points for both the surface water and foul water, from the main site infrastructure have been left available at the boundary of the site. However, the location and details have not been made available (but remains a possibility once details are clarified). Currently, new connection to the Southern Water sewers is proposed.

4.3 Reviewing Southern Water sewer record assets, there are public foul water sewers within the vicinity of the site. Of most interest is a 225 mm diameter VC foul sewer within Bowden Way to the south of the site, which flows towards the south.

4.4 From the data seen and the site layout, it is recommended that a connection be made to Southern Water's chamber 4703, subject to their agreement and relevant consents.

4.5 This link would allow foul water to be collected to the rear of the buildings before flowing towards the public sewer. In accordance with the Sewerage Sector Guidance, Appendix C[2] the peak design flow rates for dwellings should be calculated in accordance with BS EN 12056-2 or by applying a design peak flow rate per dwelling.

4.6 As there is insufficient information at this stage on the appliances, the design peak flow rate has been taken as 0.05 litres per second per dwelling in line with the guidance.

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[2] Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code"), Approved Version 2.1, 25th May 2021.

4.7 Based upon 8 proposed dwellings, the peak flow rate is therefore estimated to be 0.4 l/s.

5.0 Conclusions & Next Steps

5.1 This report has examined the greenfield and existing runoff rates from the site to better understand the current and natural surface water runoff regime of the site.

5.2 Various SuDS components have been assessed with the preferred SuDS features incorporated into a strategy to manage surface water across the site for the proposed development.

5.3 A foul water strategy has been identified.

Surface Water Drainage Summary

5.4 A SuDS strategy has been proposed which offers multiple benefits.

5.5 Bespoke infiltration testing undertaken in March 2022 revealed an impermeable superficial geology, not suitable for partial of full infiltration SuDS. In absence of a nearby watercourse, post-development runoff discharges should be directed to the surface water sewer (MH Ref. 4751) at a maximum rate of 1.0 l/s.

5.6 The outflow rate has been limited close to the greenfield QBar surface water runoff rate for all storm scenarios considered.

5.7 The final discharge from the site is proposed to connect into a public sewer, subject to Southern Water's agreement and consent. Alternatively, there may be a strategy sewer available, subject to confirmation.

Foul Water Strategy Summary

5.8 The eight proposed dwellings on the site will result in a peak flow rate of approximately 0.4 l/s.

5.9 The final discharge from the site is proposed to connect into a public sewer, subject to Southern Water's agreement and consent. Alternatively, there may be a strategy sewer available, subject to confirmation.

Planning Considerations & Next Steps

5.10 It is understood that this report will be submitted to the local planning authority to support the planning application.

5.11 The following elements may require further information through the planning process:

- Update agreement with Southern Water on connection locations and flows, or confirmation of the strategic sewer systems for the redevelopment of the St Francis Hospital.

5.12 The need for a detailed drainage design is likely to be conditioned on planning approval.

Advisory Matters

5.13 Aside from the specific drainage issues that require consideration under the planning regime, the findings of this assessment may impact other aspects of building design and construction. These items often require action to ensure that you continue to have a safe and compliant site and include the following:

- The finished floor level of the proposed buildings should have a FFL higher than the ground level to the front of the property. This will encourage any floodwater (exceedance flows) away from the proposed buildings.

- An ancient woodland is located within the boundary of the site and a woodland management plan is being prepared to ensure this woodland is maintained and enhanced. The SuDS strategy has been kept within the proposed development areas avoid unnecessarily disturbing root systems but also to allow the woodland management to make full use of the woodland edge to maximise biodiversity potential.

APPENDIX A: Policy & Guidance

National Planning Policy Framework

Paragraph 182 of the NPPF then goes on to specifically states that "Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major* development should:

a) take account of advice from the Lead Local Flood Authority;
b) have appropriate proposed minimum operational standards; and
c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development

National Climate Change Guidance

Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere.

Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances.

The data published on the DEFRA database shows the site located within London Management Catchment and for a residential development (lifespan approximately 100yrs) an upper end allowance of 40% should be applied to rainfall events as the climate change allowance within this region.

Local Guidance

This section considers local guidance at both county and borough levels.

West Sussex Council

West Sussex Council acts as the Lead Local Flood Authority. The Lead Local Flood Authority will be consulted on major development proposals in relation to local flood risk. The Lead Local Flood Authority have provided guidance on their requirements for providing a surface water drainage strategy and SuDS schemes. The West Sussex SuDS Policies are as follows:

- SuDS Policy 1: Follow the drainage hierarchy
- SuDS Policy 2: Manage Flood Risk Through Design
- SuDS Policy 3: Mimic Natural Flows and Drainage Flow Paths
- SuDS Policy 4: Seeks to Reduce Existing Flood Risk
- SuDS Policy 5: Maximise Resilience
- SuDS Policy 6: Design to be Maintainable
- SuDS Policy 7: Safeguard Water Quality
- SuDS Policy 8: Design for Amenity and Multi-Functionality
- SuDS Policy 9: Enhance biodiversity
- SuDS Policy 10: Link to Wider Landscape Objectives

Mid Sussex District Council

The Mid Sussex District Plan 2014 - 2031 was adopted in March 2018.

The relevant policies largely reiterate the requirements as set out by the NPPF and the LLFA and associated guidance documents. These relevant policies are:

- Policy DP41: Flood Risk and Drainage
- Policy DP42: Water Infrastructure and the Water Environment

APPENDIX B: Topographical Survey

TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	FH	Fire Hydrant	RSJ	Rolled Steel Joist
AR	Assumed Route	FBD	Floor Board Direction	SI	Sign Post
AV	Air Valve	FH	Fire Hydrant	SP	Arch Spring Point Height
BB	Belisha Beacon	FL	Floor Level	SV	Stop Valve
BH	Bore Hole	FP	Flag Pole	SW	Surface Water
BL	Bed Level	FW	Foul Water	SY	Stay
BO	Bollard	GG	Gully Grate	Tac	Tactile Paving
BrP	Brace Post	GV	Gas Valve	TC	Telecom Cover
BS	Bus Stop	HH	Head Height	TH	Trial Pit
BU	Bush	IC	Inspection Cover	THL	Threshold Level
B/W	Barbed Wire Fence	IL	Invert Level	TL	Traffic Light
BX	Box (Utilities)	I/R	Iron Railings	ToW	Top of Wall
C/B	Close Board Fence	KO	Kerb Outlet	TP	Telegraph Pole
CH	Cill Height	LP	Lamp Post	TV	Cable TV Cover
CL	Cover Level	MH	Manhole	UB	Universal Beam
C/L	Chain Link Fence	MP	Marker Post	UC	Unknown Cover
C-Lev	Ceiling Level	NB	Name Board	UK	Unknown Tree
Col	Column	OHL	Overhead Line (approx)	USB	Under Side Beam
C/P	Chestnut Paling Fence	Pan	Panel Fence	UTL	Unable To Lift
CR	Cable Riser	PB	Post Box	VP	Vent Pipe
DC	Drainage Channel	PM	Parking Meter	WB	Waste Bin
DH	Door Head Height	PO	Post	WH	Weep Hole
DP	Down Pipe	P/R	Post & Rail Fence	WL	Water Level
DR	Drain	P/W	Post & Wire Fence	WM	Water Meter
EL	Eaves Level	P/Wall	Partition Wall	WO	Wash Out
EP	Electric Pole	RE	Rodding Eye	(X.XX)	Floor to Ceiling Height
ER	Earth Rod	RL	Ridge Level		
ET	EP+Transformer	RP	Reflector Post	(X.XX)F/C	Floor to False Ceiling Ht
FB	Flower Bed	RS	Road Sign		
FBD	Floor Board Direction	RSD	Roller Shutter Door	⚠	Survey Control Station

DRAWING NOTE

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Measured Building Surveys

Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The survey control listed is only to be used for topographical surveys at the stated scale. All control must be checked and verified prior to use.

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Do not scale from this drawing.

SURVEY GRID AND LEVEL DATUM

The survey grid is based drawing no. S0775A/1 by Glen Surveys Ltd and orientated by best fit principles.

All levels relate to an Ordnance Survey (OS) benchmark situated on Larchwood Lodge and taken as 80.06m.

CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
ST01	310.654	728.185	79.759	PK Nail
ST02	333.836	722.037	80.183	Hilti Nail
ST03	376.226	701.307	80.447	Hilti Nail
ST04	402.991	714.972	80.127	Hilti NAil

REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS
Ipswich Coventry Yeovil Norwich Perth Nottingham Brentwood
Tel No: 0845 0405 969
Fax No: 0845 0405 970
www.survey-solutions.co.uk
enquiries@survey-solutions.co.uk
LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE
ST. FRANCIS HOSPITAL, COLWELL ROAD
HAYWARDS HEATH, WEST SUSSEX

DRAWING DETAIL
TOPOGRAPHICAL SURVEY
Sheet 1 of 1

CLIENT				SCALE
ANTLER HOMES				1:200
SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
RAH	24/8/2011	BWM		FINAL
DRAWING NUMBER			REVISION	ISSUE DATE
10325swg-01				30/8/2011

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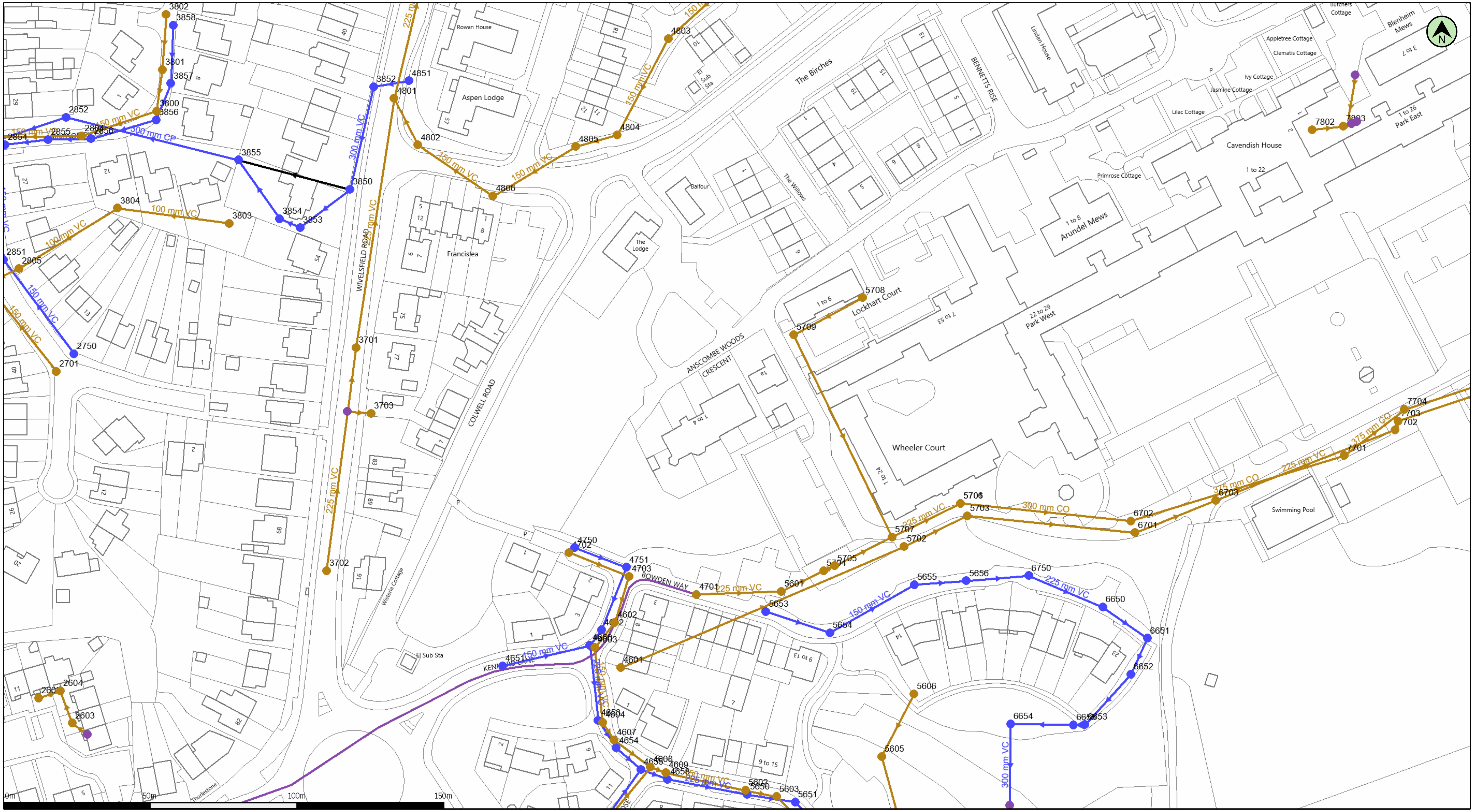
Original Sheet Size A0H

APPENDIX C: SuDS Strategy Plan



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Date: 16/12/21

Scale: 1:1250

Map Centre: 533518,122760

Data updated: 23/11/21

Our Ref: 739794 - 2

Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer

Combined Gravity Sewer

Culverted Water Course or Treated Effluent

Surface Water Gravity Sewer

Rising Main, Vacuum or Syphon

Combined Outfall

Surface Water Outfall

Foul Outfall

Surface Water Inlet

▲ Combined Pumping Station

▲ Surface Water Pumping Station

▲ Foul Pumping Station

WWTW Water Treatment Works

Section 104 Area

Building Over Agreement Area

● Foul Manhole

● Combined Manhole

● Surface Water Manhole

● Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

simon.stoate@lustreconsulting.com

Anscombe Woods

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2603	F	0.00	0.00	
2604	F	0.00	0.00	
2605	F	0.00	0.00	
2701	F	64.96	62.68	
2804	F	63.88	61.93	
2805	F	0.00	0.00	
3701	F	73.55	71.55	
3702	F	75.12	73.12	
3703	F	0.00	0.00	
3800	F	65.41	63.30	
3801	F	65.78	63.47	
3802	F	65.63	63.80	
3803	F	0.00	0.00	
3804	F	0.00	0.00	
4601	F	0.00	0.00	
4602	F	79.36	76.98	
4603	F	79.36	76.91	
4604	F	78.58	76.73	
4607	F	78.16	76.46	
4608	F	76.94	75.09	
4609	F	76.35	74.10	
4701	F	80.16	77.85	
4702	F	79.58	77.93	
4703	F	78.72	77.43	
4801	F	71.90	69.77	
4802	F	73.53	71.77	
4803	F	77.60	75.59	
4804	F	76.64	74.61	
4805	F	76.55	74.42	
4806	F	76.34	73.99	
5601	F	75.66	74.53	
5602	F	74.31	71.85	
5603	F	73.26	70.96	
5605	F	68.10	65.04	
5606	F	68.30	65.26	
5701	F	75.26	74.00	
5702	F	0.00	0.00	
5703	F	0.00	0.00	
5704	F	0.00	0.00	
5705	F	0.00	0.00	
5706	F	0.00	0.00	
5707	F	0.00	0.00	
5708	F	0.00	0.00	
5709	F	0.00	0.00	
6701	F	0.00	0.00	
6702	F	74.95	0.00	
6703	F	75.10	74.00	
7701	F	75.57	0.00	
7702	F	75.54	73.71	
7703	F	75.45	0.00	
7704	F	75.87	0.00	
7802	F	0.00	0.00	
7803	F	0.00	0.00	
2750	S	65.26	64.47	
2851	S	62.84	61.79	
2852	S	0.00	61.83	
2854	S	62.29	60.87	
2855	S	63.11	61.89	
2856	S	64.04	61.97	
3850	S	72.19	70.05	
3852	S	71.91	70.66	
3853	S	70.86	68.94	
3854	S	70.08	68.28	
3855	S	68.12	67.11	
3856	S	65.43	63.39	
3857	S	65.78	63.85	
3858	S	65.74	63.97	
4650	S	79.33	76.38	
4651	S	78.48	76.69	
4652	S	79.37	76.62	
4653	S	78.56	76.23	
4654	S	78.27	76.08	
4655	S	77.17	75.74	
4658	S	76.46	74.52	
4750	S	79.49	77.84	
4751	S	78.77	76.92	
4851	S	72.03	70.89	
5650	S	74.07	72.57	
5651	S	72.84	71.26	
5653	S	75.22	73.87	
5654	S	73.28	71.93	
5655	S	71.85	70.43	
5656	S	71.19	69.86	
6650	S	69.99	68.49	
6651	S	69.55	68.05	
6652	S	68.18	66.59	
6653	S	67.15	65.50	
6654	S	66.70	64.53	
6655	S	66.90	64.56	
6750	S	70.60	69.18	

▨	PROPOSED CELLULAR UNITS - TANKED
▨	PROPOSED PERVIOUS PAVING WITH 0.45M DEEP SUB-BASE
▨	PROPOSED PERVIOUS PAVING WITH 0.25M DEEP SUB-BASE
▨	PROPOSED BIORETENTION SYSTEM
- - -	PROPOSED FOUL
- - -	PROPOSED SURFACE WATER
——	SOUTHERN WATER FOUL
-·-·-	SOUTHERN WATER SURFACE WATER

CAR TRAFFICKED PERMEABLE PAVING

GROUND LEVEL: 80.2
SUB-BASE COVER LEVEL: 80.07
SUB-BASE INVERT LEVEL: 79.62

AREA: 890M^2
SUB-BASE DEPTH: 0.45M
SUB-BASE MATERIAL: 6-20MM CLEAN CRUSHED STONE (0.3 VOID RATIO)
SUB-BASE ATTENUATION VOLUME: 120M^3

THE SUB-BASE TO BE BUILT FLAT, OR PROVIDED WITH CHECK DAMS, IN ORDER TO PROVIDE THE REQUIRED ATTENUATION VOLUME. THE SUB-BASE SHOULD BE UNLINED (PROVIDED WITH PERMEABLE GEOTEXTILES) TO PROMOTE GROUNDWATER RECHARGE AND VEGETATION GROWTH.

PROVIDE TYPE 3 INSPECTION CHAMBERS (ICs) ALONG THE PERFORATED PIPE NETWORK FOR RODDING ACCESS. ICs TO BE PROVIDED WITH CATCHPITS FITTED WITH SILT TRAPS.

PERFORATED PIPE TO BE LAID AT THE BASE OF THE PERMEABLE PAVING. THE PAVEMENT'S SUB-BASE SHOULD HAVE A NOMINAL FALL TOWARD THE PERFORATED PIPE.

GEOCELLULAR CRATE STORAGE

GROUND LEVEL: 79.0
CRATE COVER LEVEL: 77.8
CRATE INVERT LEVEL: 77.3

CRATE AREA: 71.5M^2
CRATE DEPTH: 0.6M (ACO STORMBRIXX HD, OR SIMILAR)
CRATE POROSITY: 0.95
ATTENUATION VOLUME: 40.7M^3

WRAP TANK IN IMPERMEABLE GEOMEMBRANES TO PROHIBIT INFILTRATION OR INGRESS OF GROUNDWATER.

CAR PARKING PERMEABLE PAVING FLOW CONTROL

TO BE FITTED WITH A Ø20MM ORIFICE PLATE FLOW CONTROL AT IL79.72 (100MM ABOVE THE IL OF THE PAVEMENT'S SUB-BASE) LIMITING OUTFLOWS TO 0.4 L/S DURING THE 1 IN 100 YEAR +45%CC DESIGN STORM EVENT.

THE RUNOFF WITHIN THE PAVEMENT (100MM DEPTH) WOULD FULLY INFILTRATE.

BIORETENTION SYSTEMS TO BE PROVIDED IN THE LANDSCAPED AREAS, WHERE POSSIBLE. THE ENGINEERED SOIL COMPOSITION AND DEPTH TO BE ESTABLISHED BY THE LANDSCAPE ARCHITECT TO SUIT THE PLANTING REQUIREMENTS OF EACH AREA.

NEW SURFACE WATER CONNECTION WITH A PEAK FLOW OF 1.0 l/s.

OFFSITE FLOW CONTROL MANHOLE TO BE FITTED WITH A Ø50MM VORTEX FLOW CONTROL (IE HYDROBRAKE OR SIMILAR), LIMITING OUTFLOWS TO A MAXIMUM OF 1.0 L/S DURING THE 1 IN 100 YEAR + 45%CC DESIGN STORM EVENT.

CL 79.0
IL 77.1

4750	
C.L.	79.49
I.L.	77.84

4751	
C.L.	78.77
I.L.	76.92

4702	
C.L.	79.58
I.L.	77.93

4703	
C.L.	78.72
I.L.	77.43

ALL WORKS AND DISCHARGE RATES TO BE APPROVED BY SOUTHERN WATER PRIOR TO COMMENCEMENT OF CONSTRUCTION WORKS.

NEW FOUL WATER CONNECTION WITH AN ANTICIPATED PEAK FLOW OF 0.4 l/s.

80mm PERMEABLE PAVING BLOCK
50mm PERMEABLE LAYING COURSE (& JOINTING MATERIAL)
250-450mm DEEP COARSE GRADED AGGREGATE [SUBJECT TO LOADING AND DETAILED DESIGN] WITH 30% VOIDS
FULLY PERFORATED TWINWALL PIPE
PERMEABLE GEOTEXTILE AROUND PERFORATED PIPE
L0WER GEOTEXTILE AT FORMATION
SUBGRADE (AND SUBGRADE IMPROVEMENT LAYER AS REQUIRED)

TYPICAL PERMEABLE PAVING DETAIL

TO ALLOW PARTIAL INFILTRATION AS AVAILABLE

NOTES:

1. DO NOT SCALE FROM THIS DRAWING. APPROXIMATELY POSITIONS ONLY. REPORT ALL ERRORS AND OMISSIONS TO AUTHOR.
2. THIS DRAINAGE STRATEGY SHOULD BE READ IN CONJUNCTION WITH FLOOD RISK ASSESSMENT 4216-211215-SS (OCTOBER 2025).
3. SUITABILITY OF THE STRATEGY IS DEPENDANT ON FINAL DEVELOPMENT PROPOSALS, SUDS FEATURES AND CONFIRMATION OF EXISTING DRAINAGE ON THE SITE.
4. ATTENUATION SCENARIO IS BASED UPON NO INFILTRATION. WHERE INFILTRATION IS AVAILABLE THEN THE OVERALL VOLUME WILL BE REDUCED. AREAS WITH A POROUS SUB-BASE SHOULD BE KEPT UNLINED TO ENCOURAGE INFILTRATION WHERE POSSIBLE.
5. INFILTRATION TO BE AVOIDED NEAR TO PROPERTIES. THEREFORE CELLULAR UNITS AND DEPRESSED LANDSCAPED AREAS TO BE LINED TO PREVENT INFILTRATION FROM OCCURRING.
6. ATTENUATION SCHEME BASED UPON 100-YEAR + 45%CC STORM SCENARIO. RUNOFF COEFFICIENT OF 1 HAS BEEN GIVEN FOR ALL PROPOSED HARD STANDING AREAS. MAXIMUM SURFACE WATER RUNOFF FROM THE SITE IS LIMITED TO A MAXIMUM OF 1.0 l/s, THE LOWEST FEASIBLE RATE AND CLOSE TO THE GREENFIELD QBAR RATE (0.8 L/S).
7. THE PEAK ATTENTION VOLUMES FOR THE DESIGN STORM EVENT PROVIDES 120 m³ IN THE POROUS SUB-BASE AND 71.5m³ IN THE CELLULAR STORAGE TANK.
9. FOUL AND SURFACE WATER CONNECTIONS TO BE AGREED WITH SOUTHERN WATER (OR OWNER) AND ROUTE AGREEMENTS MADE WITH THIRD PARTY LAND OWNERSHIP.
10. PEAK RATE OF FOUL FLOW HAS BEEN TAKEN AS 0.05 l/s PER DWELLING. THEREFORE TOTAL PEAK FOUL FLOW RATE IS 0.4 l/s (8 RESIDENTIAL UNITS).

REV	DESCRIPTION	DES	CHK	DATE
A	DRAINAGE SCHEME AMENDED TO SUIT FINAL SITE LAYOUT	SD	MD	20/10/25

Lustre Consulting Limited
2nd Floor North
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w: lustreconsulting.co.uk

Client

HOMES (HAYWARDS HEATH) LIMITED

Project

ANSCOMBE WOOD CRESCENT HAYWARDS HEATH

Drawing Title

SURFACE WATER ATTENUATION AND FOUL WATER DRAINAGE STRATEGY

	Name	Date
Designed	SCS	DEC 21
Checked		DEC 21

Scale 1:500

File No. 4216-D-001_v2.dwg

Drawing Status FOR INFORMATION

Drawing No. 4216-D-001

Revision A

LUSTRE
CONSULTING

30 March 2022

Our Ref: L-4216-20220330-FR

Dean McNamara
Homes (Haywards Heath) Limited
Knightway House
Park Street
Bagshot
GU19 5AQ

Sent via email

Dear Dean,

Anscombe Woods Crescent – Haywards Heath

Lustre has been commissioned to provide drainage design support at a parcel of land adjacent to Colwell Road, Haywards Heath. This letter report provides a factual account of site investigation works undertaken to assess the rate of infiltration at specific depths beneath the site. It includes details of site investigation methodology, ground conditions and data obtained from falling head tests.

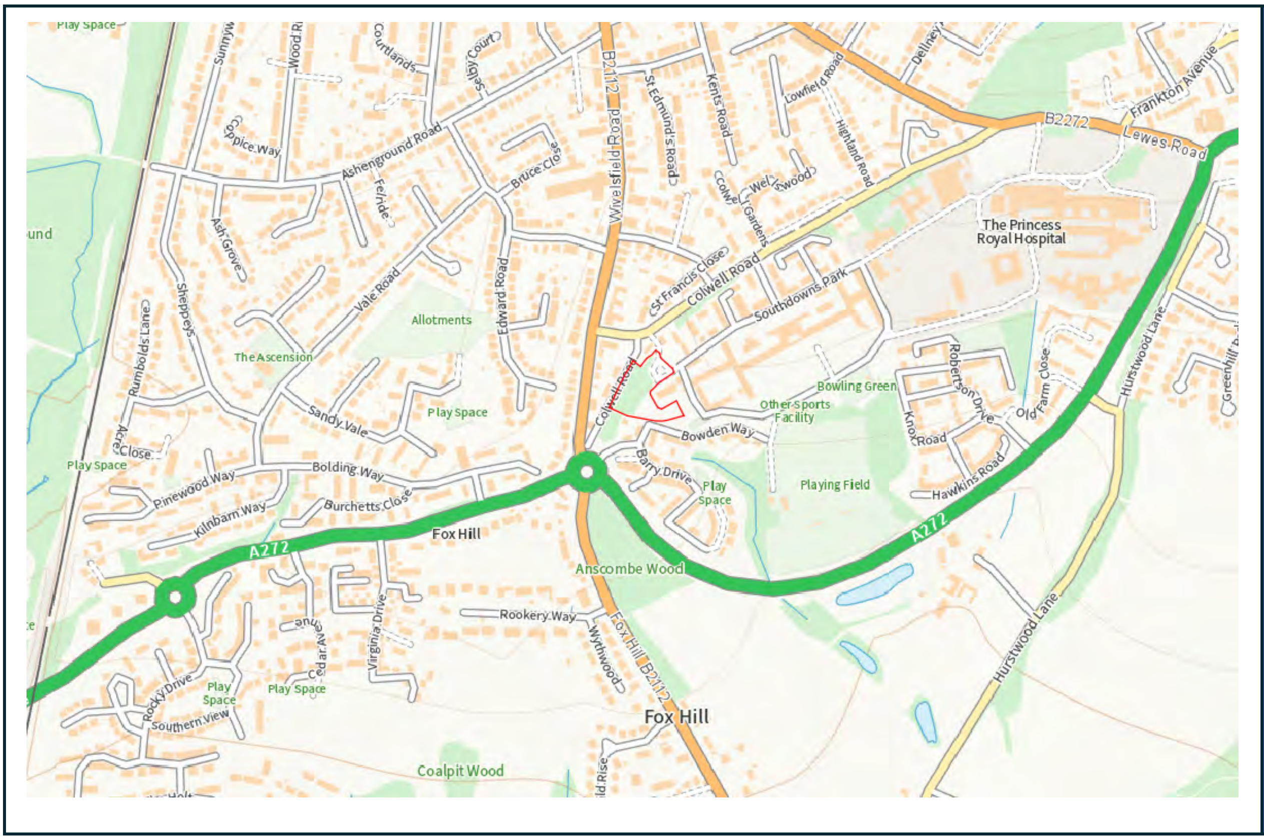
This work was undertaken both to satisfy the requirements of the Lead Local Flood Authority and as part of recommendations made in Lustre's drainage strategy report (ref: R15-DS-01.0_4216, dated December 2021). The results will be used to inform updates to the surface water drainage strategy, and it is therefore recommended that both the original and updated drainage strategy reports are referred to in conjunction with this letter report.

Site Setting

Table 1 Site Details

Address	Anscombe Woods Crescent, in Haywards Heath, West Sussex, GU19 5AQ
Eastings, Northings	533470, 122740
Area	0.61 ha

The site, irregular in plan, currently comprises an ancient woodland and open ground. The site is located within a predominately residential area. The site area is shown in Figure 1.



Site Location Plan

Site Investigation Methodology

The intrusive site investigation works were undertaken on the 21 March 2022 under the direct co-ordination of a suitably trained and qualified consultant employed by Lustre.

Enabling Works

Prior to commencing with the intrusive works, each exploratory location was checked for any readily detectable shallow services. The method employed to avoid buried services involved the scanning of all exploratory investigation holes with a cable avoidance tool (CAT) to detect any traceable below ground services.

Investigation Location Rationale

Exploratory locations advanced in this investigation are summarised below comments on rationale, termination depth and monitoring installations

Table 2: Exploratory Position Details

Hole ID	Base Depth (m bgl)	Objective	Monitoring Well
WS1	2.3	Proposed location of development soakaway	No
HP1	1.0	Proposed permeable paving	No
HP2	0.97	Proposed permeable paving	No

Exploratory holes were located to obtain the required information to meet the project objectives, whilst avoiding services, ancient woodland buffer zones and tree root protection zones. Drawing 4216-002 shows the positions of all exploratory locations.

Windowless Sampler Borehole

One windowless sample borehole was advanced on site to a maximum depth of 2.3m bgl. Initially a hand dug starter pit was excavated to 1.2m bgl. The remainder of the borehole was then progressed using a conventional tracked WS drilling rig. Upon completion the borehole was backfilled with arisings and compacted to form a level surface.

Hand Dug Trial Pits

Two trial pits were advanced to depths of 1m bgl using hand excavation tools. Upon completion each trial pit was backfilled with arisings and compacted to form a level surface.

In-situ Field Tests

Infiltration testing was undertaken at the base of each exploratory hole location. Water was rapidly added to the hole. Water levels were then measured over set time intervals to monitor changes in the water levels over time and where possible generate a rate of infiltration.

Ground Conditions

Geological progression beneath the site was identified as Topsoil over Made Ground over Tunbridge Well Sand Formation which is consistent with BGS geological records. Further details of each soil type are provided in the sections below. Exploratory hole logs are enclosed with this letter report.

Shallow Soils (Topsoil and Made Ground)

Tunbridge Wells Sand Formation

Topsoil

Topsoil was encountered in all three exploratory hole locations to depths of between 0.17 and 0.35m bgl. It comprised gravelly clayey SILT in one location (HP2) and sandy clayey SILT in two locations (WS1, HP1). Gravels where present were flint. Anthropogenic materials included brick and concrete which were encountered in HP1 only. No groundwater was encountered within Topsoil.

Made Ground

Made Ground was encountered in all three exploratory hole locations. It was encountered as a homogenous layer comprising slightly gravelly sandy CLAY. Gravel is sandstone. Anthropogenic materials included brick which was encountered in all three locations. No groundwater was encountered within Made Ground.

Tunbridge Wells Sand Formation

Tunbridge Wells Sand Formation was encountered in one location only, WS1. This comprised three layers as follows:

- Silty fine to medium SAND from 0.82 to 1.3m bgl
- Sandy silty CLAY from 1.3 to 2.25m bgl
- Sandstone from 2.25 to base of the hole at 2.3m bgl

No anthropogenic materials were encountered. A suspected water strike was encountered at the interface between sandy silty clay and sandstone at the base of WS1. Water was encountered as a seepage with no discernible rise in levels detected.

Falling Head Tests

Hand Dug Trial Pits

One falling head test was undertaken within each location (HP1 and HP2) with water added to a depth of 0.37 in HP1 and 0.38m bgl in HP2. The total depth of water at the start of the test was therefore approximately 0.6m. Field data sheets are enclosed with this letter report.

In HP1 the total test time was 180 minutes and water level upon completion was recorded at 0.41m bgl meaning that insufficient water had drained to be able to complete any further testing. The total decreased recorded across the whole testing period was 0.04m.

In HP2 the total test time was 150 minutes and water level upon completion was recorded at 0.54m bgl meaning that insufficient water had drained to be able to complete any further testing. The total decrease recorded across the whole testing period was 0.16m.

Borehole

One falling head test was undertaken at this location (WS1) with water added to a depth of 1.06m bgl. The total depth of water at the start of the test was therefore approximately 1.2m.

The total test time was 210 minutes and water level upon completion was recorded at 1.03m bgl meaning that water levels had actually risen slightly by 0.03m during the testing period. This is considered to be another potential indicator for the presence of shallow groundwater. No further testing was possible due to insufficient draining of water during the first test. The field data sheet is enclosed with this letter report.

I trust the above is clear. If you have any queries or require further clarification, please do not hesitate to contact the undersigned.

Yours sincerely,

Claire Munns
Senior Consultant
BSc (Hons) MIEnvSc

Enc: Exploratory Hole Location Plan 4216-002
Exploratory Hole Logs
Falling Head Test Data Sheets

NOTES:

1. DO NOT SCALE FROM THIS DRAWING. APPROXIMATELY POSITIONS ONLY. REPORT ALL ERRORS AND OMISSIONS TO AUTHOR.

WS - WINDOW SAMPLE
HP - HAND PIT

REV	DESCRIPTION	DES	CHK	DATE

Lustre Consulting Limited
2nd Floor North
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Client

HOMES (HAYWARDS HEATH)
LIMITED

Project

ANSCOMBE WOOD CRESCENT
HAYWARDS HEATH

Drawing Title

INFILTRATION TESTING LOCATIONS

	Name	Date	
			Scale 1:500
Designed	SCS	MAR 22	File No. 4216-D-002.dwg
Checked	RH	MAR 22	Drawing Status FOR INFORMATION

Drawing No. 4216-D-002

Revision -

Trial Pit Log

Trialpit No	**HP1**	Sheet 1 of 1	
Project Name:	Anscombe Wood Crescent	Project No. 4216	Co-ords: Level:
Date	21/03/2022		
Location:	Haywards Heath	Dimensions (m): Depth 1.00	
Scale	1:20		
Client:	Homes (Haywards Heath) Limited	Logged	Gemma Heyworth

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.35		▨	Dark brown sandy slightly gravelly clayey SILT with a low cobble content. Sand is fine to coarse. Gravel is fine subangular to subrounded of flint. Cobbles are concrete and brick. Frequent fine to medium sized rootlets. (TOPSOIL)
				1.00		▨	Soft to firm brown and yellowish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded of sandstone and brick. (MADE GROUND)
							End of pit at 1.00 m

Remarks: Hand dug pit. Falling head teat undertaken.

Stability:

Trial Pit Log

Trialpit No
HP2
Sheet 1 of 1

Project Name:	Anscombe Wood Crescent	Project No. 4216	Co-ords: Level:	Date 21/03/2022
Location:	Haywards Heath		Dimensions (m): Depth 0.97	Scale 1:20
Client:	Homes (Haywards Heath) Limited			Logged Matthew Larkin

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.17		▨	Damp dark brown slightly gravelly clayey SILT. Gravel is fine to coarse subangular to subrounded of flint. Rare cobble sized fragments of brick. (TOPSOIL)
				0.97		▨	Firm brown and yellowish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded of sandstone and brick. (MADE GROUND)
							End of pit at 0.97 m

1
2
3
4

Remarks: Hand dug pit. Falling head test undertaken.

Stability:

LUSTRE CONSULTING

Borehole Log

Borehole No.
WS1
Sheet 1 of 1

Project Name: Anscombe Wood Crescent
Project No. 4216
Co-ords:
Hole Type WS
Location: Haywards Heath
Level:
Scale 1:20
Client: Homes (Haywards Heath) Limited
Dates: 21/03/2022
Logged By Matthew Larkin

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.35			Dark brown sandy slightly gravelly clayey SILT. Sand is fine to coarse. Gravel is fine subangular to subrounded of flint. Frequent fine to medium sized rootlets. (TOPSOIL)
					0.82			Soft to firm brown and yellowish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded of sandstone and brick. (MADE GROUND)
					1.30			Yellowish brown mottled light grey silty slightly gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded of sandstone. (TUNBRIDGE WELL SAND FORMATION)
	▼				2.25			Soft to firm yellowish brown mottled light grey sandy silty CLAY. Sand is fine to coarse. Rare fine to medium gravel of sandstone. Occasional iron staining. (TUNBRIDGE WELLS SAND FORMATION)
					2.30			SANDSTONE (TUNBRIDGE WELLS SAND FORMATION)

End of borehole at 2.30 m

Remarks
Hand pitting carried out. Water seepage at 2.3m bgl. Borehole terminated due to refusal on sandstone at 2.3m bgl. Falling head test undertaken.

AGS

FALLING HEAD TEST TO DETERMINE INFILTRATION RATE (BS EN 22282-2:2012)

LUSTRE
CONSULTING

PROJECT NAME:	**Hayward Heath**	**PROJECT NO.:**	**4216**
CLIENT:	**Homes (Haywards Heath) Limited**	**CONSULTANT:**	**Matthew Larkin**
DATE:	**21/03/2022**	**WEATHER:**	**Sunny**

Borehole ID:	**HP1**			**Test No.:**	**1**
Borehole Diameter (m):	**0.16**	**Base of Hole (m):**	**1**	**Depth of Casing (m):**	
Pipe Diameter (m):		**Base of Test (m):**	**1**	**Top of Test Zone (m):**	**0.37**
Measuring datum level (m agl):	**0**	**Length of Test Section (m):**	**0.63**	**Depth of Water Table**	

TIME	**TIME**	**WATER DEPTH**	**ht**	**ho/ht**	**ln (h0/ht)**	**dh**	**dt**	**dh/dt**	**hcor, (t)**	**ln (h0 + hst)/hcor(t)**	**h(av)**
(min)	**(sec)**	**(m bgl)**	**(m)**			**(m)**	**(sec)**	**(m/sec)**	**= h(t)-hst**		**(m)**
0	0	0.37	0.63	1.00	0.00	0.00	0	0	0.63	0.000	0.00
0.5	30	0.37	0.63	1.00	0.00	0.00	0	0	0.63	0.000	0.00
1	60	0.37	0.63	1.00	0.00	0.00	60	0.000000	0.63	0.000	0.63
1.5	90	0.37	0.63	1.00	0.00	0.00	60	0.000000	0.63	0.000	0.63
2	120	0.35	0.65	0.97	-0.03	-0.02	60	-0.000333	0.65	-0.031	0.64
3	180	0.35	0.65	0.97	-0.03	0.00	60	0.000000	0.65	-0.031	0.65
4	240	0.35	0.65	0.97	-0.03	0.00	60	0.000000	0.65	-0.031	0.65
5	300	0.37	0.63	1.00	0.00	0.02	60	0.000333	0.63	0.000	0.64
7	420	0.37	0.63	1.00	0.00	0.00	120	0.000000	0.63	0.000	0.63
8	480	0.37	0.63	1.00	0.00	0.00	60	0.000000	0.63	0.000	0.63
9	540	0.37	0.63	1.00	0.00	0.00	60	0.000000	0.63	0.000	0.63
12	720	0.37	0.63	1.00	0.00	0.00	180	0.000000	0.63	0.000	0.63
14	840	0.37	0.63	1.00	0.00	0.00	120	0.000000	0.63	0.000	0.63
18	1080	0.37	0.63	1.00	0.00	0.00	240	0.000000	0.63	0.000	0.63
22	1320	0.37	0.63	1.00	0.00	0.00	240	0.000000	0.63	0.000	0.63
40	2400	0.38	0.62	1.02	0.02	0.01	1080	0.000009	0.62	0.016	0.63
60	3600	0.38	0.62	1.02	0.02	0.00	1200	0.000000	0.62	0.016	0.62
90	5400	0.42	0.58	1.09	0.08	0.04	1800	0.000022	0.58	0.083	0.60
120	7200	0.39	0.61	1.03	0.03	-0.03	1800	-0.000017	0.61	0.032	0.60
150	9000	0.41	0.59	1.07	0.07	0.02	1800	0.000011	0.59	0.066	0.60
180	10800	0.41	0.59	1.07	0.07	0.00	1800	0.000000	0.59	0.066	0.59

Soil Infiltration Rate:	5.10E-06 m/min	or	8.50E-08 m/sec	

FALLING HEAD TEST TO DETERMINE INFILTRATION RATE (BS EN 22282-2:2012)

LUSTRE
CONSULTING

PROJECT NAME:	**Hayward Heath**	**PROJECT NO.:**	**4216**
CLIENT:	**Homes (Haywards Heath) Limited**	**CONSULTANT:**	**Matthew Larkin**
DATE:	**21/03/2022**	**WEATHER:**	**Sunny**

Borehole ID:	**HP2**			**Test No.:**	**1**
Borehole Diameter (m):	**0.16**	**Base of Hole (m):**	**0.97**	**Depth of Casing (m):**	
Pipe Diameter (m):		**Base of Test (m):**	**0.97**	**Top of Test Zone (m):**	**0.38**
Measuring datum level (m agl):	**0**	**Length of Test Section (m):**	**0.59**	**Depth of Water Table**	

TIME	**TIME**	**WATER DEPTH**	**ht**	**ho/ht**	**ln (h0/ht)**	**dh**	**dt**	**dh/dt**	**hcor, (t)**	**ln (h0 + hst)/hcor(t)**	**h(av)**
(min)	**(sec)**	**(m bgl)**	**(m)**			**(m)**	**(sec)**	**(m/sec)**	**= h(t)-hst**		**(m)**
0	0	0.38	0.59	1.00	0.00	0.00	0	0	0.59	0.000	0.00
0.5	30	0.38	0.59	1.00	0.00	0.00	0	0	0.59	0.000	0.00
1	60	0.39	0.58	1.02	0.02	0.01	60	0.000167	0.58	0.017	0.59
1.5	90	0.38	0.59	1.00	0.00	0.00	60	0.000000	0.59	0.000	0.59
2	120	0.38	0.59	1.00	0.00	-0.01	60	-0.000167	0.59	0.000	0.59
3	180	0.39	0.58	1.02	0.02	0.01	60	0.000167	0.58	0.017	0.59
4	240	0.39	0.58	1.02	0.02	0.00	60	0.000000	0.58	0.017	0.58
5	300	0.41	0.56	1.05	0.05	0.02	60	0.000333	0.56	0.052	0.57
6	360	0.41	0.56	1.05	0.05	-0.02	-240	0.000083	0.56	0.052	0.55
7	420	0.41	0.56	1.05	0.05	-0.02	-300	0.000067	0.56	0.052	0.55
8	480	0.42	0.55	1.07	0.07	-0.02	-360	0.000056	0.55	0.070	0.54
9	540	0.42	0.55	1.07	0.07	-0.02	-420	0.000048	0.55	0.070	0.54
10	600	0.43	0.54	1.09	0.09	-0.01	-480	0.000021	0.54	0.089	0.54
12	720	0.43	0.54	1.09	0.09	-0.01	-480	0.000021	0.54	0.089	0.54
14	840	0.44	0.53	1.11	0.11	-0.01	-660	0.000015	0.53	0.107	0.53
16	960	0.44	0.53	1.11	0.11	-0.02	-840	0.000024	0.53	0.107	0.52
18	1080	0.44	0.53	1.11	0.11	-0.03	-1320	0.000023	0.53	0.107	0.52
20	1200	0.44	0.53	1.11	0.11	-0.05	-1800	0.000028	0.53	0.107	0.51
25	1500	0.45	0.52	1.13	0.13	-0.06	-2100	0.000029	0.52	0.126	0.49
30	1800	0.46	0.51	1.16	0.15	-0.05	-3600	0.000014	0.51	0.146	0.49
40	2400	0.47	0.50	1.18	0.17	-0.05	-4800	0.000010	0.50	0.166	0.48
50	3000	0.49	0.48	1.23	0.21	-0.05	-6000	0.000008	0.48	0.206	0.46
60	3600	0.51	0.46	1.28	0.25	0.51	3600	0.000142	0.46	0.249	0.23
90	5400	0.51	0.46	1.28	0.25	0.51	5400	0.000094	0.46	0.249	0.23
120	7200	0.52	0.45	1.31	0.27	0.52	7200	0.000072	0.45	0.271	0.23
150	9000	0.54	0.43	1.37	0.32	0.54	9000	0.000060	0.43	0.316	0.22

Soil Infiltration Rate: 2.39E-05 m/min or 3.98E-07 m/sec

FALLING HEAD TEST TO DETERMINE INFILTRATION RATE (BS EN 22282-2:2012)

PROJECT NAME:	**Hayward Heath**	**PROJECT NO.:**	**4216**
CLIENT:	**Homes (Haywards Heath) Limited**	**CONSULTANT:**	**Matthew Larkin**
DATE:	**21/03/2022**	**WEATHER:**	**Sunny**

Borehole ID:	**WS1**			**Test No.:**	**1**
Borehole Diameter (m):	**0.86**	**Base of Hole (m):**	**2.25**	**Depth of Casing (m):**	
Pipe Diameter (m):		**Base of Test (m):**	**2.25**	**Top of Test Zone (m):**	**1.06**
Measuring datum level (m agl):	**0**	**Length of Test Section (m):**	**1.19**	**Depth of Water Table**	

TIME	TIME	WATER DEPTH	ht	ho/ht	ln (h0/ht)	dh	dt	dh/dt	hcor, (t)	ln (h0 + hst)/hcor(t)	h(av)
(min)	(sec)	(m bgl)	(m)			(m)	(sec)	(m/sec)	= h(t)-hst		(m)
0	0	1.06	1.19	0.89	-0.12	0.00	0	0	1.19	-0.116	0.00
0.5	30	1.07	1.18	0.90	-0.11	0.00	0	0	1.18	-0.107	0.00
1	60	1.08	1.17	0.91	-0.10	0.02	60	0.000333	1.17	-0.099	1.18
1.5	90	1.08	1.17	0.91	-0.10	0.01	60	0.000167	1.17	-0.099	1.18
2	120	1.08	1.17	0.91	-0.10	0.00	60	0.000000	1.17	-0.099	1.17
3	180	1.08	1.17	0.91	-0.10	0.00	60	0.000000	1.17	-0.099	1.17
7	420	1.08	1.17	0.91	-0.10	0.00	240	0.000000	1.17	-0.099	1.17
9	540	1.08	1.17	0.91	-0.10	0.00	120	0.000000	1.17	-0.099	1.17
10	600	1.08	1.17	0.91	-0.10	0.00	60	0.000000	1.17	-0.099	1.17
30	1800	1.04	1.21	0.88	-0.13	-0.04	1200	-0.000033	1.21	-0.132	1.19
40	2400	1.03	1.22	0.87	-0.14	-0.01	600	-0.000017	1.22	-0.141	1.22
50	3000	1.07	1.18	0.90	-0.11	0.04	600	0.000067	1.18	-0.107	1.20
60	3600	1.07	1.18	0.90	-0.11	0.00	600	0.000000	1.18	-0.107	1.18
100	6000	1.07	1.18	0.90	-0.11	0.00	2400	0.000000	1.18	-0.107	1.18
130	7800	1.05	1.20	0.88	-0.12	-0.02	1800	-0.000011	1.20	-0.124	1.19
160	9600	1.04	1.21	0.88	-0.13	-0.01	1800	-0.000006	1.21	-0.132	1.21
190	11400	1.04	1.21	0.88	-0.13	0.00	1800	0.000000	1.21	-0.132	1.21
220	13200	1.03	1.22	0.87	-0.14	-0.01	1800	-0.000006	1.22	-0.141	1.22

Soil Infiltration Rate: -1.39E-05 m/min or -2.31E-07 m/sec

APPENDIX D: Drainage Calculations

from
Southern Water

Simon Stoate
Lustre Consulting
2nd Floor North
Fitted Rigging House
The Historic Dockyard
Chatham
Kent
ME4 4TZ

Your ref

Our ref
DSA000010432

Date
27 April 2022

Contact
Tel 0330 303 0119

Dear Mr Stoate,

Level 1 Capacity Check Enquiry: Land at Anscombe Woods Crescent, Haywards Heath, West Sussex, RH16 4UJ.

We have completed the capacity check for the above development site and the results are as follows:

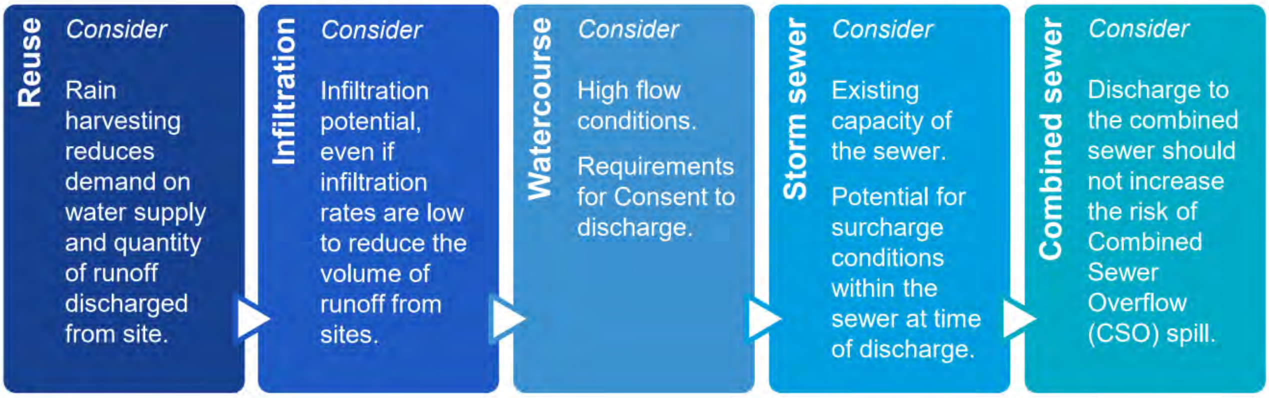
Foul Water

There is currently adequate capacity in the local sewerage network to accommodate a foul flow of **0.09 l/s** for the above development at manhole reference TQ3322**4701**. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system unless agreed by the Lead Local Flood Authority in consultation with Southern Water, after the hierarchy Part H3 of Building Regulations has been complied with.

Surface Water

There is currently adequate capacity in the local surface water sewerage network to accommodate a surface water flow of **0.9 l/s** for the above development at manhole reference TQ3322**5655** and TQ3322**4751**.

Although capacity in the surface water network has been identified, in all situations where surface water is being considered for discharge to our network, we require the below hierarchy for surface water to be followed which is reflected in part H3 of the Building Regulations. Whilst reuse does not strictly form part of this hierarchy, Southern Water would encourage the consideration of reuse for new developments.



Reuse

Consider

Rain harvesting reduces demand on water supply and quantity of runoff discharged from site.

Infiltration

Consider

Infiltration potential, even if infiltration rates are low to reduce the volume of runoff from sites.

Watercourse

Consider

High flow conditions.

Requirements for Consent to discharge.

Storm sewer

Consider

Existing capacity of the sewer.

Potential for surcharge conditions within the sewer at time of discharge.

Combined sewer

Consider

Discharge to the combined sewer should not increase the risk of Combined Sewer Overflow (CSO) spill.

Guidance on Building Regulations is here: gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h

We would welcome the opportunity to engage with you on the design for disposal of surface water, with a particular focus on the potential for incorporating Sustainable Drainage Systems (SuDS), for this development at the earliest opportunity and we recommend that civil engineers and landscape architects work together and with Southern Water.

Where a surface water connection to the foul or combined sewer is being considered, this should be agreed by the Lead Local Flood Authority, in consultation with Southern Water.

It should be noted that although the above assessment indicates that there is capacity available for your proposed surface water flows the LLFA (Local Lead Flood Authority) may impose/request that a lower flow is discharged to the public surface water sewer.

If the excess surface water flows are to be attenuated on site, it could have a significant effect on any proposed Sewer Adoption (S104) Agreements. Any attenuation proposals should be agreed before any works are implemented on site. Where capacity is limited/restricted, agreement should be sought if you are to include any highway drainage within your proposals as Southern Water is not obligated to accept highway flows.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: developerservices.southernwater.co.uk

Please note the information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Should it be necessary to contact us please quote our above reference number relating to this application by email at southernwaterplanning@southernwater.co.uk

Yours sincerely,

Growth Planning Team
Business Channels

southernwater.co.uk/developing-building/planning-your-development

Paths & Buildings Proposed Impermeable Area

Type : Catchment Area

Area (ha)	0.053

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric	1.000
Winter Volumetric Runoff	1.000
Time of Concentration	5
Percentage Impervious	100

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Car Park & Driveway Proposed Impermeable Area

Type : Catchment Area

Area (ha)	0.089

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric	1.000
Winter Volumetric Runoff	1.000
Time of Concentration	5
Percentage Impervious	100

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Existing Impermeable Area

Type : Catchment Area

Area (ha)	0.06

Preliminary Sizing

Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time of Concentration (mins)	5

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric	1.000
Winter Volumetric Runoff	1.000
Time of Concentration	5
Percentage Impervious	100

4216 - Anscombe Wood Crescent:
Proposed Calculations v2

Date:
20/10/2025

Designed by:
SD

Checked by:

Approved By:

Report Details:
Type: Junctions
Storm Phase: Phase

Company Address:

Name	Junction Type	Easting (m)	Northing (m)	Sealed	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)	Lock
Offsite Flow Control	Manhole	208650.952	601593.084	☐	79.000	1.900	77.100	Circular	1.200	None
Car Park Flow Control	Manhole	208647.379	601596.337	☑	80.200	0.700	79.500	Circular	0.450	None
Existing Runoff Rates	Manhole	208651.002	601588.881	☐	1.000	1.000	0.000	Circular	1.200	None

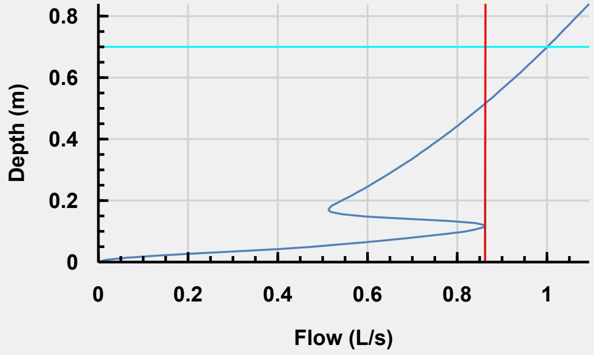
Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
Offsite Flow Control	Inlet (1)	Pipe (2)	(None)	No Restriction
Car Park Flow Control	Inlet (1)	Pipe	(None)	No Restriction
Existing Runoff Rates	Inlet	Existing Impermeable Area	(None)	No Restriction

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Offsite Flow Control	Outlet	(None)	Hydro-Brake®
	Invert Level (m)	77.100	
	Design Depth (m)	0.700	
	Design Flow (L/s)	1.0	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0050-1000-0700-1000	



Junction	Outlet Name	Outgoing Connection	Outlet Type
Car Park Flow Control	Outlet (1)	Pipe (1)	Orifice
	Diameter (m)	0.020	
	Coefficient of Discharge	0.600	
	Invert Level (m)	79.720	

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Car Parking Permeable Paving

Type : Tank

Dimensions

Exceedance Level (m)	80.200
Depth (m)	0.580
Base Level (m)	79.620
Freeboard (mm)	130
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	120.150

Depth (m)	Area (m²)	Volume (m³)
0.000	890.00	0.000
0.450	890.00	120.150

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Car Park & Driveway Proposed Impermeable Area
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	0.316

Geocellular Crate Tank

Type : Tank

Dimensions

Exceedance Level (m)	79.000
Depth (m)	1.800
Base Level (m)	77.200
Freeboard (mm)	1
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	41.954

Depth (m)	Area (m²)	Volume (m³)
0.000	71.50	0.000
0.600	71.50	40.755

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Paths & Buildings Proposed Impermeable Area
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (1)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (2)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	0.095

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Car Park & Driveway Proposed Impermeable Area	Car Parking Permeable Paving		Time of Concentration	0.089	100	0	100	0.089
Existing Impermeable Area	Existing Runoff Rates		Time of Concentration	0.060	100	0	100	0.060
Paths & Buildings Proposed Impermeable Area	Geocellular Crate Tank		Time of Concentration	0.053	100	0	100	0.053
TOTAL		**0.0**		**0.202**				**0.202**

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Title: UK and Ireland Rural Runoff Calculator	Company Address:		

ICP SUDS / IH 124

Details

Method	ICP SUDS
Area (ha)	0.142
SAAR (mm)	820.0
Soil	0.47
Region	Region 7
Urban	0
Return Period (years)	0

Results

Region	QBAR Rural (L/s)	QBAR Urban (L/s)	Q 1 (years) (L/s)	Q 30 (years) (L/s)	Q 100 (years) (L/s)
Region 7	0.8	0.8	0.7	1.9	2.6

FEH: 2 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 2 years: +45 %: 15 mins: Summer	0.09	27.2	11.813
Paths & Buildings Proposed Impermeable Area	FEH: 2 years: +45 %: 15 mins: Summer	0.05	16.2	7.041
Existing Impermeable Area	FEH: 2 years: +45 %: 15 mins: Summer	0.06	18.4	7.965

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FEH: 30 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 30 years: +45 %: 15 mins: Summer	0.09	60.4	26.224
Paths & Buildings Proposed Impermeable Area	FEH: 30 years: +45 %: 15 mins: Summer	0.05	36.0	15.617
Existing Impermeable Area	FEH: 30 years: +45 %: 15 mins: Summer	0.06	40.7	17.681

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 100 years: +45 %: 15 mins: Summer	0.09	75.8	32.939
Paths & Buildings Proposed Impermeable Area	FEH: 100 years: +45 %: 15 mins: Summer	0.05	45.2	19.617
Existing Impermeable Area	FEH: 100 years: +45 %: 15 mins: Summer	0.06	51.1	22.209

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 2 years: +0 %: 15 mins: Summer	0.09	18.8	8.153
Paths & Buildings Proposed Impermeable Area	FEH: 2 years: +0 %: 15 mins: Summer	0.05	11.2	4.856
Existing Impermeable Area	FEH: 2 years: +0 %: 15 mins: Summer	0.06	12.7	5.498

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 30 years: +0 %: 15 mins: Summer	0.09	41.7	18.088
Paths & Buildings Proposed Impermeable Area	FEH: 30 years: +0 %: 15 mins: Summer	0.05	24.8	10.771
Existing Impermeable Area	FEH: 30 years: +0 %: 15 mins: Summer	0.06	28.1	12.196

FEH: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Car Park & Driveway Proposed Impermeable Area	FEH: 100 years: +0 %: 15 mins: Summer	0.09	52.3	22.719
Paths & Buildings Proposed Impermeable Area	FEH: 100 years: +0 %: 15 mins: Summer	0.05	31.1	13.529
Existing Impermeable Area	FEH: 100 years: +0 %: 15 mins: Summer	0.06	35.3	15.317

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FEH: 2 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 2 years: +45 %: 240 mins: Winter	79.000	77.100	77.388	0.288	0.9	0.326	0.000	0.9	16.451	OK
Car Park Flow Control	FEH: 2 years: +45 %: 1440 mins: Winter	80.200	79.500	79.803	0.303	0.2	0.048	0.000	0.2	22.754	Surcharged
Existing Runoff Rates	FEH: 2 years: +45 %: 15 mins: Summer	1.000	0.000	0.000	0.000	18.4	0.000	0.000	18.4	7.965	OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FEH: 30 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 30 years: +45 %: 240 mins: Winter	79.000	77.100	77.635	0.535	0.9	0.605	0.000	0.9	21.979	OK
Car Park Flow Control	FEH: 30 years: +45 %: 1440 mins: Winter	80.200	79.500	79.928	0.428	0.4	0.068	0.000	0.4	42.839	Surcharged
Existing Runoff Rates	FEH: 30 years: +45 %: 15 mins: Summer	1.000	0.000	0.000	0.000	40.7	0.000	0.000	40.8	17.681	OK

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 100 years: +45 %: 360 mins: Winter	79.000	77.100	77.776	0.676	1.0	0.764	0.000	1.0	36.324	OK
Car Park Flow Control	FEH: 100 years: +45 %: 1440 mins: Winter	80.200	79.500	80.016	0.516	0.4	0.082	0.000	0.4	53.315	Surcharged
Existing Runoff Rates	FEH: 100 years: +45 %: 15 mins: Summer	1.000	0.000	0.000	0.000	51.1	0.000	0.000	51.2	22.209	OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 2 years: +0 %: 240 mins: Summer	79.000	77.100	77.312	0.212	1.0	0.240	0.000	0.9	13.983	OK
Car Park Flow Control	FEH: 2 years: +0 %: 1440 mins: Winter	80.200	79.500	79.754	0.254	0.1	0.040	0.000	0.1	9.784	Surcharged
Existing Runoff Rates	FEH: 2 years: +0 %: 15 mins: Summer	1.000	0.000	0.000	0.000	12.7	0.000	0.000	12.7	5.498	OK

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 30 years: +0 %: 240 mins: Winter	79.000	77.100	77.469	0.369	0.9	0.417	0.000	0.9	18.590	OK
Car Park Flow Control	FEH: 30 years: +0 %: 1440 mins: Winter	80.200	79.500	79.834	0.334	0.3	0.053	0.000	0.3	28.728	Surcharged
Existing Runoff Rates	FEH: 30 years: +0 %: 15 mins: Summer	1.000	0.000	0.000	0.000	28.1	0.000	0.000	28.1	12.196	OK

FEH: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Offsite Flow Control	FEH: 100 years: +0 %: 240 mins: Winter	79.000	77.100	77.557	0.457	0.9	0.516	0.000	0.9	20.521	OK
Car Park Flow Control	FEH: 100 years: +0 %: 1440 mins: Winter	80.200	79.500	79.892	0.392	0.3	0.062	0.000	0.3	37.951	Surcharged
Existing Runoff Rates	FEH: 100 years: +0 %: 15 mins: Summer	1.000	0.000	0.000	0.000	35.3	0.000	0.000	35.3	15.317	OK

4216 - Anscombe Wood Crescent:
Proposed Calculations v2

Date:
20/10/2025

Designed by:
SD

Checked by:

Approved By:

Report Details:
Type: Stormwater Controls Summary
Storm Phase: Phase

Company Address:

FEH: 2 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 2 years: +45 %: 1440 mins: Winter	79.803	79.803	0.183	0.183	1.7	48.844	0.000	0.000	0.2	23.043		OK
Geocellular Crate Tank	FEH: 2 years: +45 %: 240 mins: Winter	77.389	77.389	0.189	0.189	3.6	12.809	0.000	0.000	0.9	16.672		OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FEH: 30 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 30 years: +45 %: 1440 mins: Winter	79.928	79.928	0.308	0.308	2.9	82.216	0.000	0.000	0.4	43.218	1170	OK
Geocellular Crate Tank	FEH: 30 years: +45 %: 240 mins: Winter	77.636	77.636	0.436	0.436	6.8	29.615	0.000	0.000	0.9	22.475		OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 100 years: +45 %: 1440 mins: Winter	80.016	80.016	0.396	0.396	3.7	105.748	0.000	0.000	0.4	53.769		OK
Geocellular Crate Tank	FEH: 100 years: +45 %: 360 mins: Winter	77.777	77.777	0.577	0.577	6.3	39.175	0.000	0.000	1.0	36.913		OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Total Lost Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 2 years: +0 %: 1440 mins: Winter	79.754	79.754	0.134	0.134	1.1	35.680	0.000	0.000	0.1	10.052		OK
Geocellular Crate Tank	FEH: 2 years: +0 %: 240 mins: Summer	77.312	77.312	0.112	0.112	3.7	7.624	0.000	0.000	1.0	13.998		OK

4216 - Anscombe Wood Crescent: Proposed Calculations v2	Date: 20/10/2025		
	Designed by: SD	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 30 years: +0 %: 1440 mins: Winter	79.834	79.834	0.214	0.214	2.0	57.140	0.000	0.000	0.3	29.036		OK
Geocellular Crate Tank	FEH: 30 years: +0 %: 240 mins: Winter	77.469	77.469	0.269	0.269	4.6	18.275	0.000	0.000	0.9	18.903		OK

4216 - Anscombe Wood Crescent:
Proposed Calculations v2

Date:
20/10/2025

Designed by:
SD

Checked by:

Approved By:

Report Details:
Type: Stormwater Controls Summary
Storm Phase: Phase

Company Address:

FEH: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Status
Car Parking Permeable Paving	FEH: 100 years: +0 %: 1440 mins: Winter	79.892	79.892	0.272	0.272	2.5	72.671	0.000	0.000	0.3	38.302	720	OK
Geocellular Crate Tank	FEH: 100 years: +0 %: 240 mins: Winter	77.557	77.557	0.357	0.357	5.7	24.265	0.000	0.000	0.9	20.931	105	OK

APPENDIX E: SuDS Components

SuDS Components

1.0 Green Roofs

1.1 Green roofs are areas of living vegetation, installed on top of buildings. They provide multiple benefits when considering the four pillars of SuDS. These include visual benefit, ecological value, enhanced building performance (insulation and sound absorption) and the reduction of surface water runoff. The types of green roof can be divided into two main categories:

Extensive roofs, have low substrate depths (and therefore low loadings on the building structure), simple planting and low maintenance requirements; they tend not to be accessible.

Intensive roofs, (or roof gardens) have deeper substrates (and therefore higher loadings on the building structure) that can support a wide variety of planting but which tend to require more intensive maintenance; they are usually accessible.

Design

1.2 Green roofs typically have a substrate depth of between 80 – 150 mm. The depth of substrate will determine the type of plants, overall use and overall benefit when considering the four pillars of SuDS. Intensive roofs generally have substrate depths from 200 mm but is typically much deeper.

1.3 The details of the green roofs have yet been finalised, however it has been assumed that an extensive green roof will be used on the bike storage building.

1.4 The green roof will have very limited effect on the surface water strategy overall, but does offer multiple benefits a hard roof cannot. For the purposes of these calculations, the green roof has not been modelled separately, but as hard standing.

The following figure (from The SuDS Manual) shows a typical green roof section showing extensive green roof components.

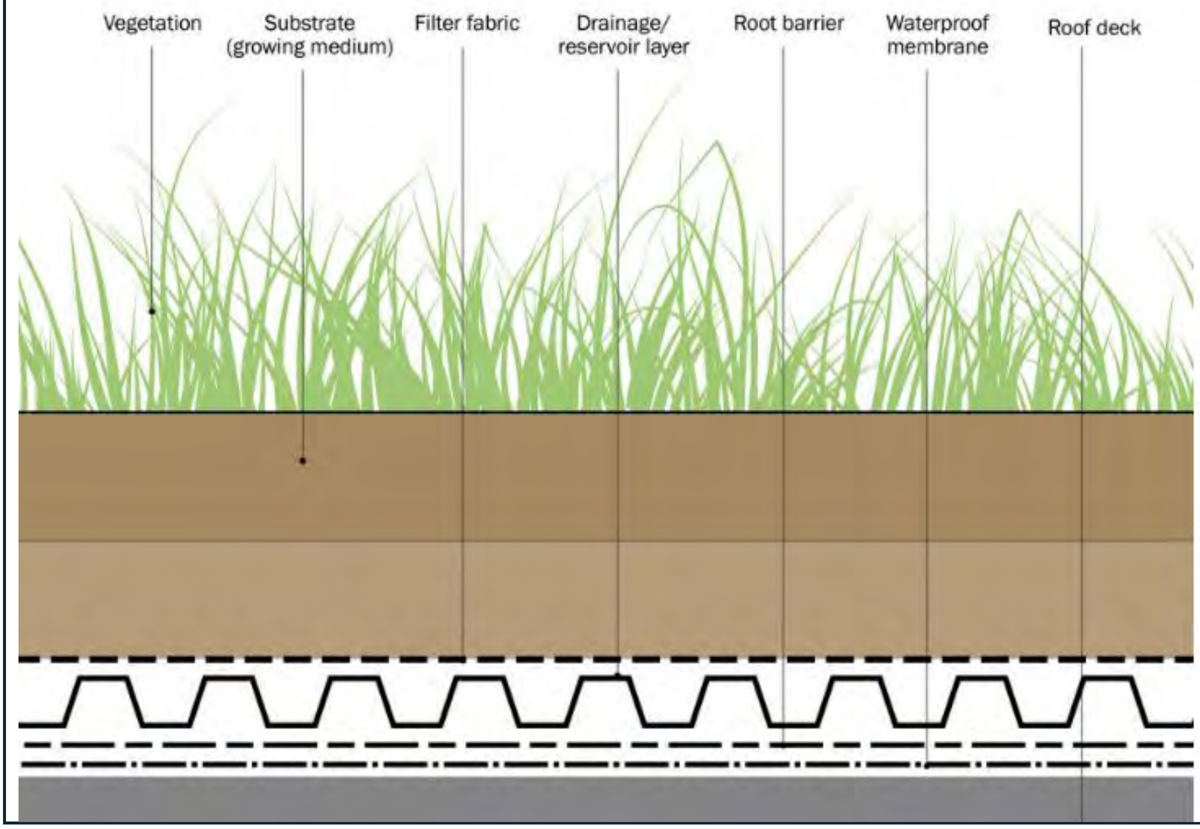


Figure 1 Section showing typical extensive green roof components

Green roof benefits

1.5 As stated within the report, green roofs provide multiple benefits when considered against the four pillars of SuDS. The benefits will vary in relation to the final makeup of the green roof.

Water Quantity

1.6 Retention of water in the substrate reduces and slows runoff. Evidence as noted within the SuDS Manual states that green roofs can provide benefits in terms of reducing peak flow rates to the stie drainage system principally for small and medium sized events. Their impact tends to be most significant in summer where intense short duration events may generate very little runoff from the roof.

1.7 During extreme events and during critical storm events in the order of 12 to 36 hours, the overall runoff volumes from green roofs are likely to be small. This will be affected by the depth and storage potential of the substrate and the antecedent soil moisture and any specific drainage layer capacity.

Water Quality

1.8 Improves water quality through filtration.

1.9 Vegetation filters out airborne particulates as the air passes over the plants, settling on the leaves and stems. These particles are washed down into the growing substrate via natural rainfall or irrigation. They are then held within the green roof substrates and prevented from getting into the drainage system. Heavy metals such as lead, zinc and coper are recognised pollutants within urban areas, green roofs play a major role in limiting their potential to contaminate downstream receptors.

Biodiversity

1.10 Providing habitat at roof level, especially within urban areas, can have significant benefits for wildlife, notably invertebrates and birds.

1.11 The extent and type of biodiversity will depend on the makeup and layout of the final design. Green roofs provide opportunities to provide different habitats for different species.

Amenity

1.12 Roofs can provide areas for recreation and relaxation and can be aesthetically pleasing.

1.13 Green roofs can provide climate resilience, through:

- Improved building thermal efficiency, reduced energy demand and reduction of the urban heat island effect.
- Improved air quality
- Reduced noise levels
- Increased building service life

Maintenance

1.14 A maintenance schedule for the scheme including the green roofs is included in Appendix F.

2.0 Pervious Paving

2.1 Pervious pavements are described by the SuDS Manual as providing a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. There are two type of pervious pavements that are defined based on the surfacing materials:

Porous pavements infiltrate water across their entire surface material, for example reinforced grass or gravel surfaces, resin bound gravel, porous concrete and porous asphalt.

Permeable pavements have a surface that is formed of material that is itself impervious to water. The materials are laid to provide a void space through the surface to the sub-base.

Design

2.2 It is proposed that pervious paving is used wherever possible on the external hard standing areas.

2.3 Where there is a risk of mobilizing contaminates the system will need to be fully lined to prevent rainwater from seeping through the underlaying geology. However, this is not understood to be the case on the site and subject to a site investigation, would recommend that a permeable geo-textile is used which will allow infiltration to ground if and where ground conditions permit.

2.4 A porous sub-base will provide a degree of cleaning, attenuation and a further measure to slow water down.

2.5 A series of perforated drains will be provided at the base of the porous sub-base layer to convey surface water to the outfall, which will be controlled via an orifice.

2.6 It is not envisaged that any services will be situated underneath the access road, and services can be provided from near the proposed properties.

2.7 The final design will need to be undertaken to take into account these requirements.

Pervious paving benefits

Water Quantity

2.8 The design will ultimately attenuate surface water within a combination of porous sub-base and cellular storage.

2.9 The volume and water level within the system will be controlled using a vortex control. Porous sub-base usually has approximately 30% voids.

Water Quality

2.10 Treatment processes occurring within pervious pavements include:

- Filtration of silt and the attached pollutants
- Biodegradation of organic pollutants, such as petrol and diesel within the pavement construction
- Adsorption of pollutants
- Settlement and retention of solids

2.11 Permeable pavement drainage has been shown to have decreased concentrations of a range of surface water pollutants when compared to impermeable surface drainage, including heavy metals, oil and grease, sediment and some nutrients.

Biodiversity

2.12 Pervious pavements do not have any direct biodiversity benefits. However, the improvements in water quality will play a role in maximising the benefits downstream.

Amenity

2.13 There are no specific design requirements to achieve amenity over and above the choice of surface as part of the overall planning, architectural or landscape design. Pervious pavements provide flexibility in visual aspects for multiple uses and activities.

Maintenance

2.14 A maintenance schedule for the scheme including the pervious pavements is included in Appendix F.

3.0 Attenuation storage tanks

3.1 Geocellular storage systems are modular plastic units with a high porosity (generally around 95%) that can be used to efficiently create a below ground structure of the temporary storage of surface water before controlled release or use.

3.2 They often come as modular systems, providing a high degree in flexibility in terms of size and shape they can be positioned.

3.3 They can be designed underneath roads and car parks or landscaped areas.

3.4 There are a number of different manufacturers of these systems, each having a specific use or benefit, such as ease of maintenance or strength to withstand certain loading requirements.

3.5 The following figure (from The SuDS Manual) shows a typical green roof section showing extensive green roof components.

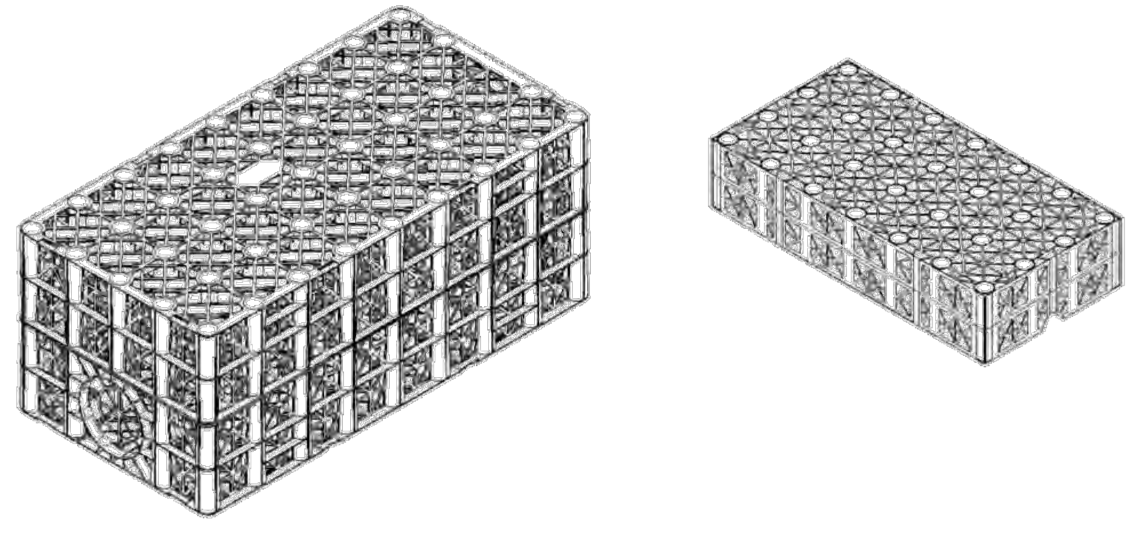


Figure 2 Illustration of cellular units, [Polypipe]

Design

3.6 Due to constraints at the downstream end of the site (namely spatial and elevation), geocellular units have been selected as the most appropriate means of providing the large attenuation volume required.

3.7 The final cellular system shall be designed with good access arrangements for maintenance. The positioning underneath the footpaths will allow this.

3.8 The surface water will be restricted at the downstream manhole with a vortex flow control.

3.9 Connections and levels to the public surface water sewer will to be confirmed.

Cellular attenuation benefits

Water Quantity

3.10 Cellular units are very effective in providing water quantity, generally with porosity at around 95%. They are very adaptable and can be located under multiple surfaces, subject to design for maximum flexibility.

3.11 The volume of attenuation which cellular units provides is derived by the design of the flow control and allowable outflow rate.

Water Quality

3.12 Cellular units in themselves do not provide advantages for water quality. SuDS components incorporated into the design, such as pervious pavements and tree pits will help improved water quality prior to reaching cellular units.

3.13 Catchpits may be required where a primary means of surface water cleaning has not been provided.

Biodiversity

3.14 Cellular units do not provide any biodiversity benefits. However by managing the surface water runoff from the site, they will reduce impacts of high flows downstream.

Amenity

3.15 The flexibility of tanks allows for multiple use of surfaces be used above. This can be used to improve amenity at the surface.

Maintenance

3.16 A maintenance schedule for the scheme including cellular attenuation is included in Appendix F.

4.0 Bioretention systems (Rain gardens and planters)

4.1 Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide:

- Attractive landscape features that are self-irrigating and fertilising
- Habitat and biodiversity
- Cooling of the local microclimate due to evapotranspiration

Design

4.2 Bioretention systems can come in a number of different forms but the principle is that they can be designed for intermittent flow and the surface should be designed to drain and re-aerate between rainfall events.

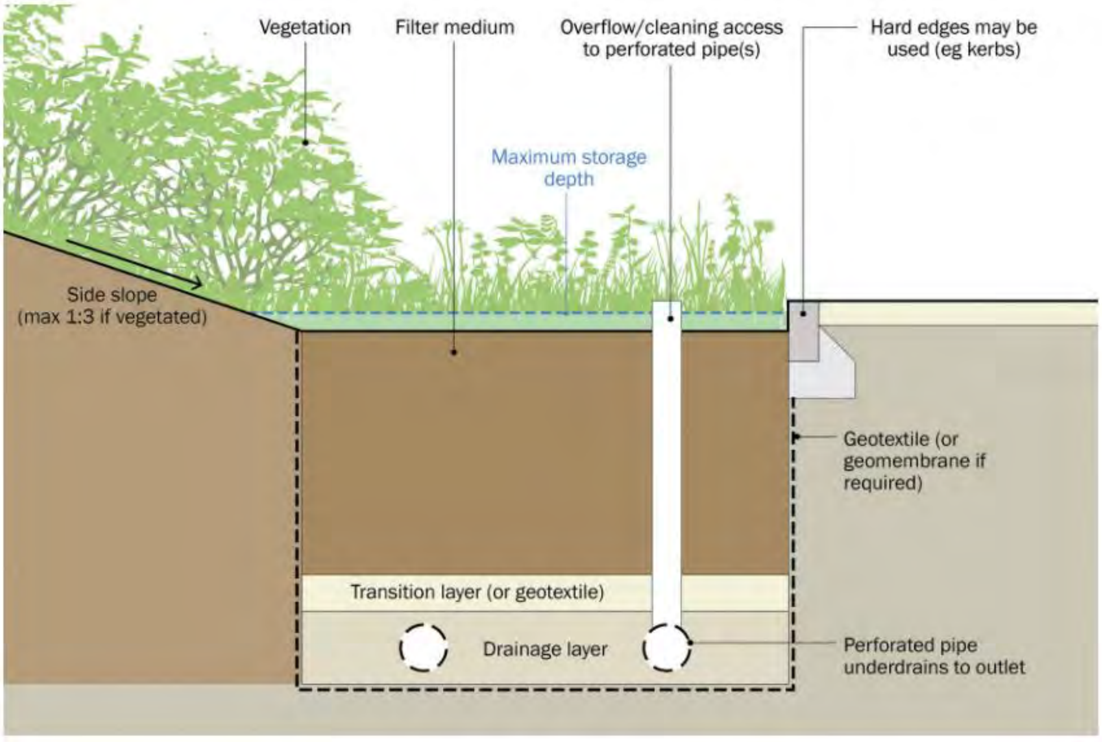


Figure 3 Illustration of a bioretntion system (SuDS Manual Figure 18.1)

Benefits

Water Quantity

4.3 Trees, shrubs and grasses naturally provide interception storage although the level of which will depend on may factors such as time of year, species and age.

4.4 Most planters and raingardens will intercept the first 5 mm of rainfall. Depending on the depth of soil this could be significantly higher. The slowing down of surface water runoff will also benefit the management of surface water on the site as a whole.

Water Quality

4.5 A well design and maintained bioretention system are able to retain pollutants.

4.6 The removal of sediments and associated pollutants by filtration through surface vegetation and groundcover

4.7 The removal of fine particulates and associated contaminates by infiltration through the underlying filter medium layers – this provides treatment by filtration, extended detention treatment and some biological uptake by vegetation and subsoil biota.

4.8 The removal of dissolved pollutants by sorption of pollutants to the filter medium

Biodiversity

4.9 Through appropriate design, biodiversity can be maintained or enhanced across a site.

4.10 Native plant species should normally be used in providing a dense and durable cover for vegetation that creates appropriate habitat for indigenous species. However, these systems are relatively flexible in terms of the planting that can be included.

Amenity

4.11 Bioretention systems are very flexible in terms of size and appearance.

4.12 They can therefore be adapted to suit the visual aspects required whilst maintaining the other benefits.

Maintenance

4.13 A maintenance schedule for the scheme including the bio-retention area is included in Appendix F.

5.0 References

5.1 Creating Green Roofs for Invertebrates, A best practice guide, Buglife

5.2 The GRO Green Roof Code (Anniversary Edition 2021)

5.3 The SuDS Manual, Chapter 12, CIRIA 2015

5.4 Polypipe products [polypipe.com]

APPENDIX F: SuDS Maintenance Schedule

SuDS Maintenance

1.0 Green Roofs

1.1 The following maintenance schedule on green roofs have been derived from information within the SuDS Manual.

Operation and maintenance requirement for green roofs (The SuDS Manual, Table 12.5)

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

1.2 Additional maintenance requirements may be required where specific products are specified. Manufacturers will be able to advice on maintenance of their products.

2.0 Pervious pavements

2.1 The following maintenance schedule on pervious pavements have been derived from information within the SuDS Manual.

Operation and maintenance requirement for pervious paving (The SuDS Manual, Table 20.15)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 t o15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rats and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

2.2 Additional maintenance requirements may be required where specific products are specified. Manufacturers will be able to advice on maintenance of their products.

3.0 Bioretention systems including rain gardens

3.1 The following maintenance schedule on bioretention systems (including rain gardens) have been derived from information within the SuDS Manual.

Operation and maintenance requirement for bioretention systems (The SuDS Manual, Table 18.3)

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter, and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

3.2 Additional maintenance requirements may be required where specific products are specified. Manufacturers will be able to advice on maintenance of their products.

4.0 Attenuation storage tanks

4.1 The following maintenance schedule on cellular attenuation tanks has been derived from information within the SuDS Manual.

Operation and maintenance requirement for attenuation storage tanks (The SuDS Manual, Table 21.3)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and / or internal forebays	Annually, or as required
Remedial actions	Repair /rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

4.2 Additional maintenance requirements may be required where specific products are specified. Manufacturers will be able to advice on maintenance of their products.

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