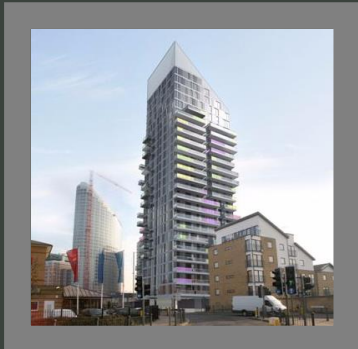


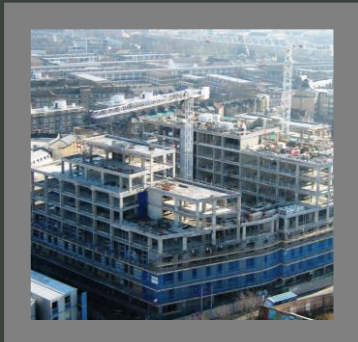


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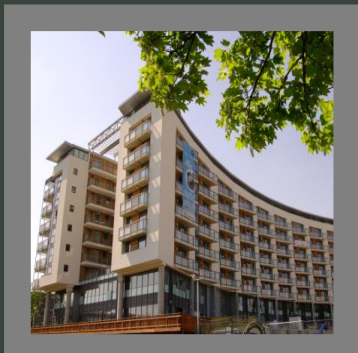


Ashcroft, 100 Kingston Lane Shoreham-By-Sea, West Sussex

For Worthing Homes



Project Ref: 8015
Date: July 2025



Consulting Structural and Civil Engineers

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Revision History

Revision Ref./ Date Issued	Amendments	Issued to
11.07.25	Draft	Bugler
Rev A 22.09.25	Table 8 updated	Bugler
Rev B 18.11.25	Updated to further soakage testing	Bugler
Rev C 02.12.25	Updated for conditions	Bugler

Prepared by: Dale Barford

Reviewed by: Lee Wilson (Director)

Approved by: Lee Wilson (Director)

Date: July 2025

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Job No: 8015

Project: Ashcroft 100 Kingston Lane Shoreham-By-Sea



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2. Planning Policy Context
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4. Flood Risk Overview
5. Surface Water Discharge
6. Foul Water Discharge
7. SuDS Maintenance Schedules
8. Water Quality
9. Summary and Residual Risk

Appendices

Appendix 1 – Proposed Drainage Plans

Appendix 2 – Existing Site Survey Plans

Appendix 3 – Causeway Flow Critical Storm Simulation Calculations

Appendix 4 – Southern Water Asset Map

Appendix 5 – Site Landscape Plans

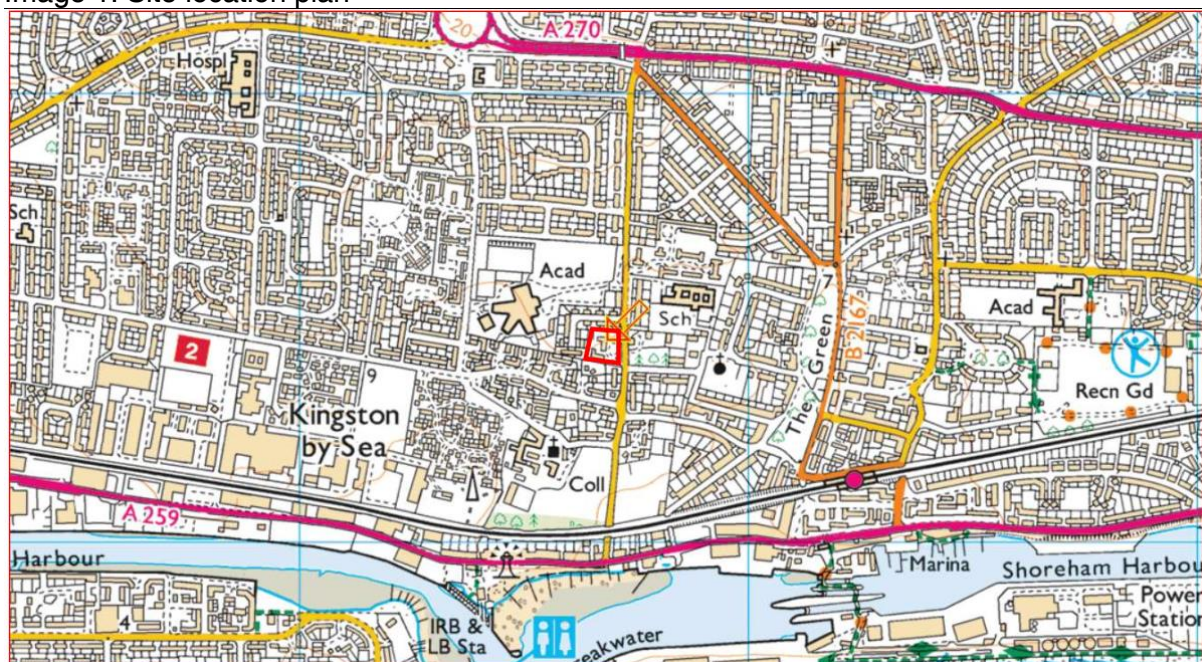
Appendix 6 – Geotechnical information

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1.0 Introduction and General Comments

- 1.1 Walker Associates Consulting Ltd has been commissioned by Worthing Homes to prepare a site specific Flood Risk Assessment and drainage strategy in support of a full planning application to Adur District Council at land at the former Ashcroft House site located at 100 Kingston Lane, Shoreham-By-Sea, West Sussex (the site) for the 'Demolition of remaining bungalows and the full redevelopment of the site to deliver 57 high-quality, sustainable apartments for people over 65'.
- 1.2 The site covers an area of 0.57 hectares and is generally rectangular in shape extending approximately 75m in both directions.
- 1.3 The site is located to the east of Shoreham-By-Sea centre just south of The Shoreham Academy. The site is bounded to the east by Kingston Lane and from which vehicular access is taken. Existing residential properties surround all other boundaries of the site.
- 1.4 The topography of the site is relatively flat with a gentle fall towards the southeast corner of the site. Levels range between 8.68 and 10.21m AOD
- 1.5 A site location plan can be seen in **Image 1** below.

Image 1: Site location plan



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2.0 Planning Policy Context

National Planning Policy

2.1 The PPG released in August 2022, advises of the requirements for a site-specific Flood Risk Assessment (FRA) for any of the following cases:

- All proposals (including minor development and change of use) located within the EA designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
- All proposals greater than 1ha in an area located in Flood Zone 1 (low probability);
- All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the EA); and
- Where proposed development may be subject to other sources of flooding.

2.2 The NPPF para 173. States the following

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

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

2.3 Defra published their 'Non-statutory technical standards for sustainable drainage systems', in support of the above policy changes, in March 2015.

2.4 Adur and Worthing Council Strategic Flood Risk Assessment (SFRA)

2.4.1 The Adur and Worthing Council SFRA was completed by JBA Consulting in July 2024 and aims to provide a level of understanding on all the major sources of flood risk within the councils area.

This report has been prepared to provide evidence to support and inform future updates to the Adur Local Plan. It supersedes the previous 2020 Adur and Worthing Level 1 SFRA and considers the Local Plan areas of Adur District Council and Worthing Borough Council excluding the South Downs National Park.

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The SFRA update was required to be compliant with the latest guidance described in the revised 2023 National Planning Policy Framework (NPPF) and updated 2022 Planning Policy Guidance (PPG). The SFRA provides flood risk evidence and long term strategy to support the management and planning of development, protect the environment and deliver infrastructure. It also supports the selection of site allocations in the Local Plan reviews and provides information and guidance to be used in the preparation of Flood Risk Assessments in support of site specific planning applications.

2.4.2 The Adur and Worthin Council SFRA confirms that the site is situated outside of the floodplain for the River Adur and is not at risk from flooding from sea in both the defended and un-defended scenarios.

2.4.3 The SFRA also confirms that the site is not at risk from any other form of flooding and site wholly within Flood Zone 1 .

2.5 Non-Statutory Technical Standards for Sustainable Drainage Systems

2.5.1 The Non-statutory Technical Standards (NTS) for sustainable drainage systems, produced by the Department for Environment, Food and Rural Affairs (DEFRA) March 2015, states that for greenfield developments, the peak runoff rate to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield rate for the same event.

2.5.2 Similarly, where reasonably practicable, for greenfield developments, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100- year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

2.5.3 Surface water conveyance routes under exceedance conditions must also be planned for to ensure that life and property over the site and surrounding area are not put at risk in the event of drainage system failure or storms in excess of design standards.

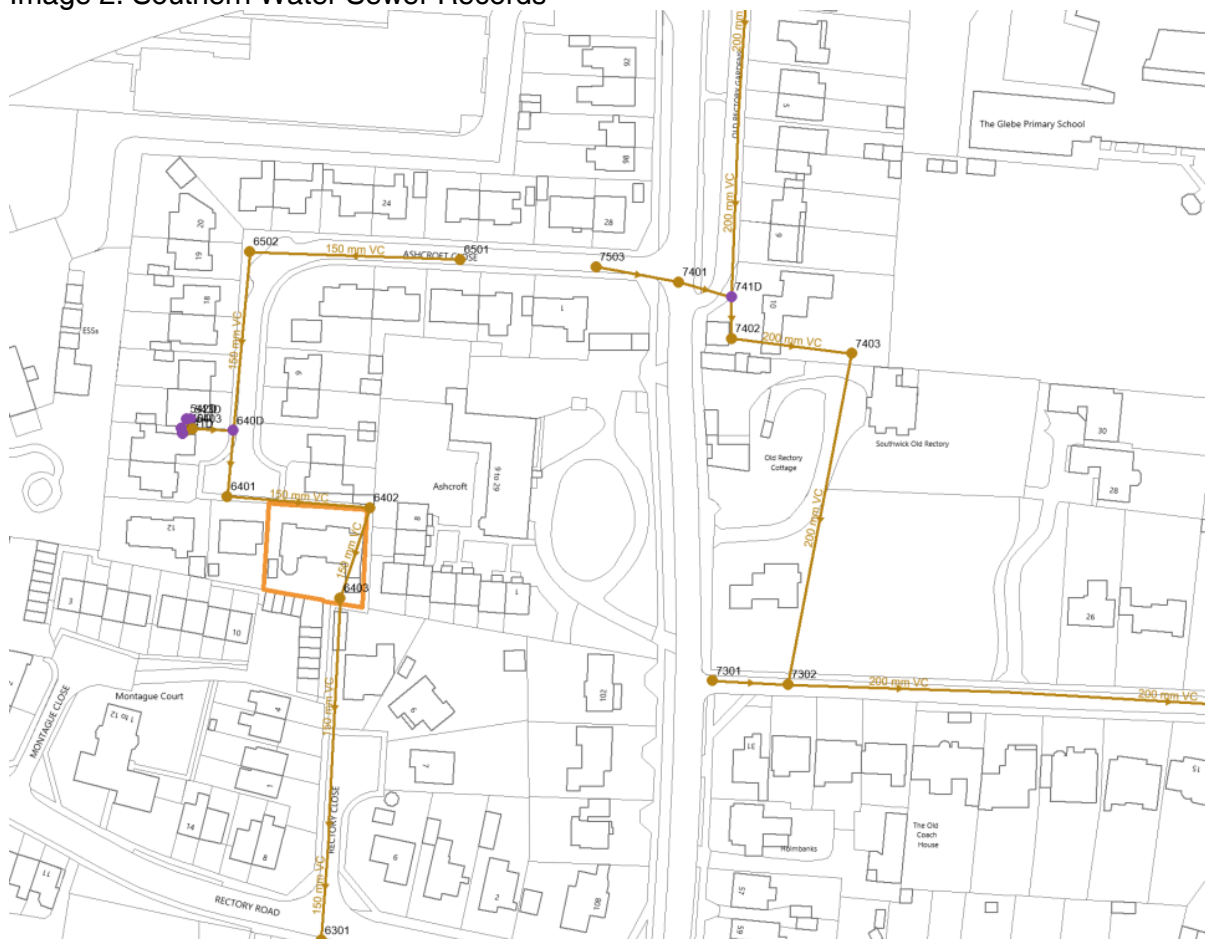
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3.0. Background information

3.1 Existing drainage

- 3.1.1 The site is surrounded by a network of foul sewers maintained by Southern water. See **Image 2** below. There are no adopted surface water sewers in the area.

Image 2: Southern Water Sewer Records



3.2 Geology and Hydrology

- 3.2.1 The British Geological Survey Solid and Drift Geology Map for the Shoreham area (Brighton and Worthing Sheet No. 318/333) revealed that the site was underlain by superficial Undifferentiated River Terrace Deposits overlying the bedrock deposits of the Tarrant Chalk Member. It is common to encounter Aeolian Deposits overlying the Undifferentiated River Terrace Deposits.
- 3.2.2 The site is underlain by a Secondary B Aquifer comprising the superficial river terrace deposit. The site is not located within a ground water Source Protection Zone.
- 3.2.3 The Environment Agency Flood Risk Map, shows the site is located within a Flood Zone 1, (low probability of flooding).

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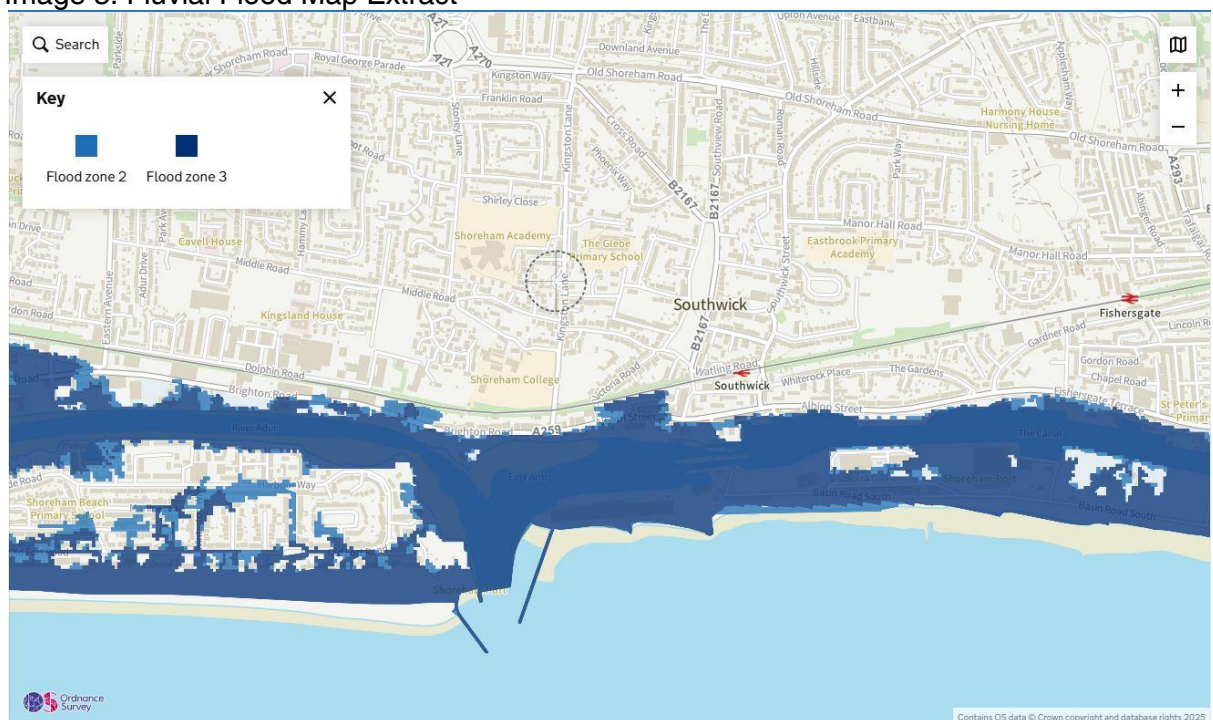
4.0. Flood Risk Overview

- 4.1 This section identifies the potential sources of flood risk to the site, and the impacts which the development could have in the wider catchment. These are discussed in greater detail in the forthcoming points below.
- 4.2 According to Annex 3 of the National Planning Policy Framework (NPPF) the flood risk vulnerability classification of the proposed development comprises residential “More Vulnerable”.
- 4.3 Table 2 of the NPPG sets out the compatibility of different land uses based on their flood risk vulnerability. As the site falls within Flood Zone 1 the proposed development is deemed to meet the requirements of the sequential test as outlined in the NPPG.

4.4 Flood Risk from Rivers and/or Sea

- 4.4.1 The site is located approximately 0.4 mile north of the Kingston Beach. The site sits outside the extent of coastal flooding from the sea in both defended and undefended scenarios as well as being outside the flood extent of the River Adur whose estuary is also located to the south of the site. The site is therefore not at risk of flooding from Rivers or Seas and sits wholly within Flood Zone 1.

Image 3: Fluvial Flood Map Extract



4.5 Flooding from Land

- 4.5.1 Intense rainfall, often of short duration, that is unable to infiltrate into the ground or enter the drainage system can run quickly off land and result in local flooding. As the site is in a highly developed location and bounded by buildings and infrastructure, the risk from overland flood flows is considered low.

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4.6 Flooding from Groundwater

- 4.6.1 The Aviron Preliminary Risk Assessment and Site Investigation Report Ref 25-127-01 (see **Appendix 6**) confirms that the site is underlain by River terrace deposits – Silty sandy gravelly Clays and Sands.
- 4.6.2 The mapping from the Adur and Worthing SFRA suggests that the area of the site may be subject to ground water depths of between 0.025m and 0.5m below ground level.

However, the Aviron Report states the following;

Groundwater was noted in BH2 at a depth of 3.0m bgl during the ground investigation works of April 2025. However, groundwater was not encountered during the return monitoring in WS1, WS5 and WS9 to the maximum installed depth of 5.06m bgl (as of May 2025).

An earlier Phase 2 site investigation report undertaken by Ground and Water (GW) also states the following;

Groundwater was not encountered in the shallow boreholes or the trial pits during the two phases of investigation. It should be noted that a groundwater strike may have been obstructed by the drilling process. Groundwater was recorded at a depth of 3.16m bgl in the 3.45m standpipe installed within WS1 on the 15th March 2022. This isolated recording was considered to be the result of surface water following a period of rainfall accumulating within the base of a standpipe installed within mainly cohesive soils. No other groundwater was recorded during the groundwater monitoring undertaken between December 2021 and March 2022.

During the drilling of the deeper boreholes during May 2022, groundwater was encountered in BH1 at a depth of 7.90m bgl rising to 7.60m bgl after 20 minutes standing and at a depth of 7.40m bgl rising to 7.20m bgl

- 4.6.3 Based on the findings of the Aviron report It is not considered that the site is at risk of groundwater flooding.

4.7 Flooding from Sewers

- 4.7.1 The Southern Water sewer records indicate that the site is surrounded by small diameter foul water sewers only.
- 4.7.2 Based on this information, the site is not considered to be at significant risk of flooding from sewers.

4.8 Flooding from Reservoirs, Canals and other artificial Sources

- 4.8.1 The mapping provided within the SFRA and government website do not indicate the site as being subject to flooding from artificial sources and as such the risk from this form of flooding is considered to be very low.

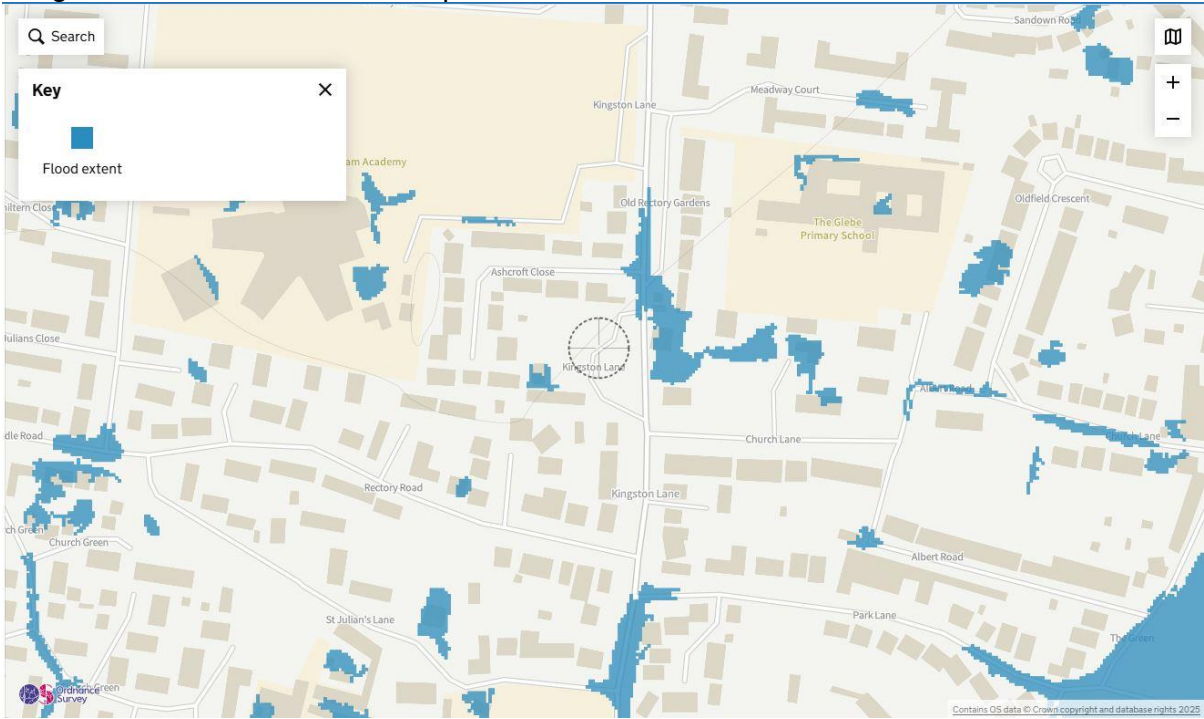
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4.9 Pluvial Flood Risk

4.9.1 The mapping provided within the SFRA and government website do not indicate the site as being subject to significant flooding from surface water sources. See **Image 4** below.

Image 4: Surface Water Flood Map Extract



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5.0 Surface Water Discharge.

- 5.1 Undeveloped sites generally rely on natural drainage to convey or absorb rainfall. The effect of development on a site is generally to reduce the permeability of at least part of the site. This markedly changes a site's response to rainfall. Without specific measures to address surface water drainage new developments can increase the risk of flooding on the site and elsewhere.
- 5.2 The NPPG suggests that surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development.
- 5.3 The term Sustainable Urban Drainage Systems (SuDS) is frequently used when considering surface water control, and covers a range of drainage management including:
- Source control
 - Infiltration devices
 - Filter strips and swales
 - Filter drains and porous paving
 - Basins, ponds, and or other below ground drainage systems

Table 5.3.1 below assesses the suitability of these SuDS approaches

Table 5.3.1: Assessment of suitability of SuDS at the Project Site

SUDS	Viability	Comments
Rainwater harvesting,	X	Insufficient roof space vs population density to be viable for harvesting.
Bio retention areas	?	Potential for raingardens and tree pits to be provided to drain external areas where non permeable surfaces are proposed.
Swales (shallow grass ditches)	X	Not suitable due to site constraints
Infiltration devices	✓	Soil conditions are suitable for infiltration to ground
Porous surfacing	✓	Permeable paving to be provided to all external roads, parking areas and internal courtyards
Balancing Ponds and basins	X	Site layout constraints preclude the use of ponds
On site storage	✓	Underground storage proposed in the form of geo-cellular soakage crates.
Green/Brown Roofs	✓	Sedum roofs proposed on all blocks

- 5.4 The latest guidance regarding surface water drainage hierarchy requires that surface water runoff should where possible be dealt with at source by means of infiltration or harvesting. Where this is not possible, then surface water discharge should be directed firstly to a local water course, or where there are none to a public sewer.
- 5.5 Infiltration tests carried out by Aviron Associates Ltd confirm that the ground conditions underlying the site are suitable for infiltration with rates recorded between 2.36x10-4m/s and 5.84x10-6m/s. It is therefore proposed to discharge surface water at source by means of infiltration features. The Aviron report noted groundwater was only encountered in one borehole (BH2) at a depth of 3m. All other boreholes and window samples were dry down below 6.9m BGL. An earlier report carried out by Ground & Water only encountered ground water in one window sample at a depth of 3.16m and no other

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ground water was encountered during further winter monitoring with boreholes found to be dry down to 7.2m BGL.

- 5.6 In line with the current guidance, SuDS provision will be provided throughout the site as follows.
- A large cellular soakage tank located within the centre of the site is to be provided, which can attenuate run off for all events up to and including the 100year plus 45% climate change event. Gross sediment will be collected by means of catchpit manholes prior to the soakage tank. As the higher infiltration rates were observed closer to the main soakage tank a conservative rate of 1x10⁻⁵m/s has been for the design.
 - Permeable paving to be used for private courtyards and paved areas.
 - Sedum roofs to all blocks.
- 5.7 A drainage strategy plan based on these principles has been produced and can be found in **Appendix 1** of this report.
- 5.8 Exceedance routes have been considered as part of the drainage strategy. For all storm events up to the 100year plus 45% climate change event, run off will be held on site within the soakage tanks. Any excess run off above this event would be expected to route to the southeast corner of the site towards the public highway and be channelled along Kingston Lane.

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6.0 Foul Water Discharge.

- 6.1 It is proposed to discharge foul water generated from the site via the existing sewer connections on the site. These connections will be subject to approval from Southern Water as part of a S106 connection agreement.

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7.0. SuDS Maintenance Schedules.

- 7.1 General maintenance inspections should be carried out on a yearly basis unless noted otherwise in this report.

During any routine inspection, the condition of manhole covers, gully gratings, channel drains etc. should be checked for damage, deformation and settlement. Settlement of paved surfaces may be an indication of a collapsed sewer / drain, check the position of the fault against known drainage runs i.e. between manholes.

- 7.2 Manholes - The most common problems are settlement of levelling brickwork and break up of mortar bedding / benching to the frame. Block paving is a particular problem around the manhole frame where there are often small 'cuts' of paving with insufficient bedding, resulting in the rapid displacement of the pieces. Remedial action is to re-bed the segments in mortar and dust with dry paving sand. Other problems may not be apparent unless the manhole cover is lifted to expose the chamber, benching and channels. With correctly constructed manholes there should be no need to visually inspect for at least five years. On inspection, the following should be checked:

- Infiltration, ground water entering the chamber through construction joints, seepage or squirting / gushing (proprietary sealants are available but excavation and partial reconstruction may be required).
- Damaged benching should not really occur unless by high pressure infiltration or poor construction. Check for deposition of detritus which may cause blockages of the sewer / drain. Can normally be jetted or hosed clear, larger items will need to be removed.

- 7.3 Deep chambers, over 1.5m in depth must not be entered unless two fully trained persons are present and only if gas monitoring equipment is available. Note, also that it may take two persons to lift the cover, using only the correct keys.

- 7.4 Pipelines are designed to be self-cleansing so should not require regular maintenance. Maintenance will therefore be restricted to resolving problems as they occur such as blockage or collapse.

- 7.5 Gully pots or chambers should be inspected and cleared out annually by suitable plant.

- 7.6 Channel drains, particularly gratings are susceptible to damage in heavily trafficked areas. The channels are designed to be self-cleansing but should be checked for signs of blockage and jetted as necessary.

- 7.7 Remedial actions are to be carried out following identification of the problem(s). The works must only be undertaken by a reputable civil engineering contractor, carrying appropriate public liability insurance.

- 7.8 Biodiverse roof maintenance varies and will be as per the suppliers recommendations.

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Permeable paving maintenance shall be as per the Table 7.8.1 below

Table 7.8.1: Permeable Pavements: Operation & Maintenance Requirements		
Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Brushing & Vacuuming (Standard cosmetic sweep over whole surface)	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturers' recommendations.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate 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 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection.	Monthly for 3 months after installation.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually.
	Monitor inspection chambers	Annually.
Source: CIRIA C753, Table 20.15		

Cellular soakage tanks maintenance shall be as per the Table 7.8.2 below

Table 7.8.2: Cellular Storage Tanks: Operation & Maintenance Requirements		
Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (Where may cause risk to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface filter for blockage or silt, algae or other matter. Removal and replace surface infiltration medium as necessary	Monthly (and after large storms)
	Remove sediment from catch pit manholes	Annually, or as required.
Remedial Actions	Repair /rehabilitation of inlets, outlets, 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 and after large storms
Source: CIRIA C753		



Green roof maintenance shall be as per the Table 7.8.3 below

Table 7.8.3 Green and Blue Roof Maintenance Requirements		
Maintenance Schedule	Required Action	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 integrity	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 run off 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 litter & debris to prevent clogging of inlet drains and interference with plant growth	6 monthly and annually or as required
	During establishment (i.e year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Remove fallen leaves and debris from deciduous plant foliage	6 Monthly, or as required
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually in autumn
	remove nuisance and invasive vegetation and weeds	6 Monthly, or as required
Remedial Actions	Mow grass, prune shrubs and manage other planting (if appropriate) as required -Clippings should be removed and not allowed to accumulate	6 Monthly, or as required
	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosions damage should be identified and controlled	As required
	if drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required
Source: CIRIA C753, Table 12.5		

8.0 Water Quality

- 8.1 In accordance with The SuDS Manual (CIRIA C753), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications. It is considered that the SuDS provided as part of the surface water drainage strategy would offer sufficient mitigation for the land use classification as demonstrated in Table 8.1 (as informed by Table 26.2 and 26.4 of the SuDS Manual respectively).

Project: Ashcroft				Job Ref: 8015
Water Quality Management -Simple Index Approach				
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual driveways, low traffic roads & Car Parking	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45
SUDS Pollution Mitigation (Treatment)				
Permeable Paving (Private Driveways & Access Road)		0.7	0.6	0.7
Green roofs		0.2	0.2	0.05
Total		0.9	0.8	0.75
		0.9 > 0.7	0.8 > 0.6	0.75 > 0.45
		Therefore OK	Therefore OK	Therefore OK



9.0 Summary and Residual Risk

- 9.1 This report confirmed that the development site is at low risk from all sources of flooding.
- 9.2 The surface water strategy aims to reduce run off rates from the site with all surface water being dealt with at source.
- 9.3 Where appropriate suitable SuDS systems have been incorporated into the surface water drainage strategy in line with current planning guidance.
- 9.4 It is considered that the proposed development will not be at risk from flooding and will have a positive impact on the current drainage scenario both in and around the vicinity of the site by providing reductions in run off and improvement to both water quality and biodiversity.

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Appendix 1

Proposed Drainage Strategy Plan

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Appendix 2

Existing Site Survey Plan

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Appendix 3

FLOW Critical Storm Simulation Calculations

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Appendix 4

Southern Water Asset Map

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Appendix 5

Site Landscape Plan

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Appendix 6

Geotechnical Information

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