



Drainage Strategy

57 Queensway , Bognor Regis, PO21 1QW

Reference: 560 -Rev - V2

Date: Dec-25

- 1 Introduction**
- 2 Site Characteristics**
- 3 Discharge Arrangement**
- 4 Peak Runoff**
- 5 Proposed Sustainable Drainage**
- 6 Maintenance and Management Plan**

Appendices

- A Distribution Existing and Proposed Areas**
- B Site Characteristics**
- C Drainage Calculations**
- D Drainage System General Arrangement**

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Drainage Strategy

57 Queensway , Bognor Regis, PO21 1QW

Reference: 560 -Rev - V2

Report Limitations

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Purpose of this report

- 1.1 The purpose of this statement is to accompany the technical drawings and details showing the proposed Surface Water drainage system as part of the planning application for this development.

Scope

- 1.2 This Sustainable Drainage Strategy (SDS) outlines the key drainage principles and requirements for the proposed development at 57 Queensway , Bognor Regis, PO21 1QW. It provides a summary of the sustainable drainage system (SuDS) design, based on the specific site conditions and relevant guidelines, including Building Regulations Approved Document Part H and CIRIA C753: The SuDS Manual 2015. As the project progresses and new information becomes available, this strategy will be updated to reflect ongoing changes and the development of the detailed design.

Site Characteristics

- 2.1 The site background is clearly identified through answers to the questions in table 1 below.

Table 1: Site Characteristics . See appendix B for support documentation

TOPIC	QUESTION	ANSWER
Protected species or habitat	Is the site near to designated sites and priority habitats?	No
Flood Plain	Is the site located in the flood plain?	No
Soils and Geology	Soil permeability? - See appendix B for results	No
Space constraints	Space for SuDS components?	No
Topography	Sited on a flat site?	Yes
	Sited on a steep slope (5-15%)	No
	Sited on a very steep slope (>15%)	No
Groundwater	Is the site at groundwater flood risk?	No
Contaminated land	Are there contaminated soils on site?	Yes, refer to GE22978/RSVP
Source Protection Zone	Is the site within a SPZ 3?	No
Runoff characteristics	Is the development in a high risk flooding area?	No

Existing and Proposed Site

- 2.2 The distribution of catchment areas for existing and proposed site is as per table 2 below. See appendix A for details. Areas have been increased by 10% in calculations (Appendix C) to account for urban creep.

Table 2 : Existing and Proposed catchment areas in hectares

Description	Existing Site	Proposed Site
Impermeable Areas	0.028	0.038
Permeable Areas	Connected to Drainage	0.000
	Self Draining Areas	0.013
Areas Draining Away from drainage System	0.047	0.024
Total Development Area	0.075	0.075

- 2.3 It has been assumed that the positively drained areas will have different runoff coefficients depending on the type of surface as follow:

Impermeable Surface	1.0
Permeable Surfaces	0.5
Grass Areas	0.3

Evaluation of Discharge Point

3.1 The SuDS design takes into account Building Regulations Section H3 and the National Planning Practice Guidance. The aim is to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

3.2 The discharge point has been evaluated following the NPPG and Building regulations. The findings are in table 3 below.

Table 3: Drainage Hierarchy evaluation

Superficial geology classification	The British Geological Society records show that the superficial deposits are River Terrace Deposits (Undifferentiated) - Sand, Silt and Clay.
Bedrock geology classification	The British Geological Society records of the site show that it is located within the London Clay Formation - Clay, Silt and Sand.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of naturally wet soils.
Groundwater	The British Geological Survey's flood risk susceptibility maps show that the development has potential for groundwater flooding below ground level. Groundwater levels would tend to vary seasonally and are influenced by ground and meteorological conditions and proximity to water features.
Is infiltration feasible?	Infiltration is not possible on this site due to lack of space for SuDS components
Is a discharge to a watercourse feasible?	There is no watercourse near the site.
Is a discharge to a surface water sewer feasible?	There is a surface water sewer in the proximity to the site. It is possible to connect to the surface water sewer, and it is proposed to discharge into this surface water sewer. Southern Water have confirmed they are able to accept discharge rate of 6 l/s. The design proposes to control rates to 1 l/s
Is a discharge to a combined sewer feasible?	There is a combined water sewer in the proximity to the site. It is possible to connect to the combined water sewer. It is not proposed to discharge into the combined water sewer.

Existing and Proposed Peak Run-off Calculations

- 4.1 The current site is a Brownfield. The peak runoff rate for the existing site was calculated as per table 4 and discharge rates as per table 5.

Table 4: Peak run-off rate calculation method for existing site

Method Used	Calculation Method
	Report 124 Flood Estimation for Small Catchments method has been used to estimate the site peak flow rates
✗	This is a brownfield site, runoff rates are calculated in accordance with best practice simulation modelling and using the modified rational method
	This is a brownfield site where the pre-development drainage isn't known. The runoff rates are calculated using the Greenfield model with soil type 5

- 4.2 The runoff flow produced by the development will be controlled as per table 5.

Table 5: Runoff discharge rate control

Control Used	Description of runoff discharge
	Water will be discharged into the ground via a SuDS as described in table 6 below
	The peak discharge rate has been reduced to Greenfield Qbar flow
	The peak discharge rate has been taken as 0.7 l/s as it is not possible to reduce it to the Greenfield Qbar rate
	The peak discharge rate has been reduced to Brownfield pre-development 1 in 1 flow
✗	The peak discharge rate has been reduced by 85% from the existing Brownfield pre-development 1 in 2 flow rate

Run-off flows

- 4.3 The size of the SuDS has been calculated for all events up to the 1 in 100 including an allowance for climate change of 45%. As per tables above, it is proposed to discharge at a rate of 2.4 l/s. See table 6 for values and appendix C for calculations.

Table 6: Peak discharge rates for SuDS

Return Period Event	Discharge Rate (l/s)			Infiltration Rate (m/hr)
	Existing Greenfield	Existing Brownfield	Proposed	
Qbar	0.50	N/A	N/A	0.0000
1 in 1	0.40	4.70	0.4	0.0000
1 in 2	0.40	6.00	0.4	0.0000
1 in 30	0.90	11.00	0.6	0.0000
1 in 30 + CC	N/A	N/A	0.7	0.0000
1 in 100	1.20	13.90	0.7	0.0000
1 in 100 + CC	N/A	N/A	0.8	0.0000

Proposed Sustainable Drainage System

- 5.1 The following sustainable drainage systems have been used for this site. The drainage design uses these drainage system through out the site. See table 7 for details.

Table 7: Evaluation of SuDS and Proposed Drainage System

<i>Most Sustainable</i>	SuDS Technique	Feasible	Proposed	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living Roofs					
	Green Roof	No	No	X	X	X
	Green Blue Roof	No	No	X	X	X
	Basins and Ponds			X	X	X
	Rainwater Gardens	No	No	X	X	X
	Rainwater Planters	Yes	Yes	X	X	X
	Constructed Wetlands	No	No	X	X	X
	Balancing Pond	No	No	X	X	X
	Detention Basins	No	No	X	X	X
	Retention Ponds	No	No	X	X	X
	Filters and Swales					
	Filter Strips	No	No	X	X	X
	Swales	No	No	X	X	X
	Infiltration Devices					
	Soakaways Crates	No	No	X	X	X
	Deep Boreholes	No	No	X	X	X
	Infiltration Trenches	No	No	X	X	X
	Infiltration Basin	No	No	X	X	X
	Permeable Surfaces			X	X	
	Permeable Surfaces	Yes	Yes	X	X	
	Filter Drains	No	No	X	X	
	Tanked System					
	Storage Crates	Yes	Yes	X		
	Oversized Tanks	Yes	No	X		
	Oversized Pipes	Yes	No	X		
	Blue Roof	No	No	X		
	Water Harvesting	Yes	Yes	X		
<i>Least Sustainable</i>						

- 5.2 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.
- 5.3 The drainage calculations demonstrate:
 - No surcharge occurs for the 1 in 30 year + 45% climate change storm events.
 - Any flooding for the 1 in 100 year + 45% climate change event can be safely contained on site
- 5.4 The proposed drainage strategy presents one possible solution to demonstrate that the development can be sustainably drained, to comply with the requirements of the NPPF. Other solutions may be feasible and may prove to be better suited to the site. These will become apparent during the detailed design stage. The strategy above should not therefore be interpreted as the definitive scheme solution.

Management of Exceedance Flows

- 5.5 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP + CC(1 in 100 years). However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded. Surface water will flow to the lowest points within the site. The flood risk to the buildings would therefore remain low. See appendix D.

Water Quality Assessment

- 5.6 The pollution hazard indices for this development has been taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2. The tables below shows the mitigation measure for the highest pollution hazard indices presented in the development.

Table 8: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4
Residential roofs	Very low	0.2	0.2	0.05
TOTAL		0.7	0.6	0.45

Table 9: SuDS Mitigation Indices for worst case**

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7
ACO-QuadraCeptor	0.4	0.4	0.4
TOTAL	1.1	1	1.1

** Values already reduced as per CIRIA C753

Table 10: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
TOTAL		0.2	0.2	0.05

Table 11: SuDS Mitigation Indices for worst case**

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Bioretention system	0.8	0.8	0.8
TOTAL	0.8	0.8	0.8

** Values already reduced as per CIRIA C753

- 5.7 It is demonstrated that the proposed sustainable systems exceeds the required pollution indices and provides sufficient treatment as part of the surface water management train in accordance with the 2015 SuDS Manual (CIRIA C753)

Maintenance and Management plan responsibility

- 6.1 The SuDS will be maintained by The Owner the property

Maintenance and Management plan for proposed SuDS

- 6.2 The maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined above. The maintenance for SuDS structures are as follow:

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures	
Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly
Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	Annually
Undertake inspection after leaf fall in autumn	
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	Frequency
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
Repair physical damage if necessary.	As required

Operation and maintenance requirements for pervious pavements		
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 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 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Operation and maintenance requirements for attenuation storage tanks		
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

Operation and maintenance requirements for RWH systems		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

Operation and maintenance requirements for bioretention systems		
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

Appendix A

Drawing Scale Bar		Drawing Scale Bar	
Drawing scale	Line length	Drawing scale	Line length
1:5 = 0.25 metres		1:200 = 10.0 metres	
1:10 = 0.5 metres		1:250 = 12.5 metres	
1:20 = 1.0 metres		1:500 = 25.0 metres	
1:25 = 1.25 metres		1:1000 = 50.0 metres	
1:50 = 2.5 metres		1:1250 = 62.5 metres	
1:100 = 5.0 metres		1:2500 = 125 metres	
Measure length of line above for checking of scale			

GENERAL NOTES

KEY

- PERMEABLE SELF DRAINING
- IMPERMEABLE
- STUDY AREA

Rev Details Date By Ctd

Drawing Status: PRELIMINARY



Client:

Project:

57 Queensway , Bognor Regis, PO21 1QW

Drawing:

Existing and Proposed Areas
Permeable and Impermeable

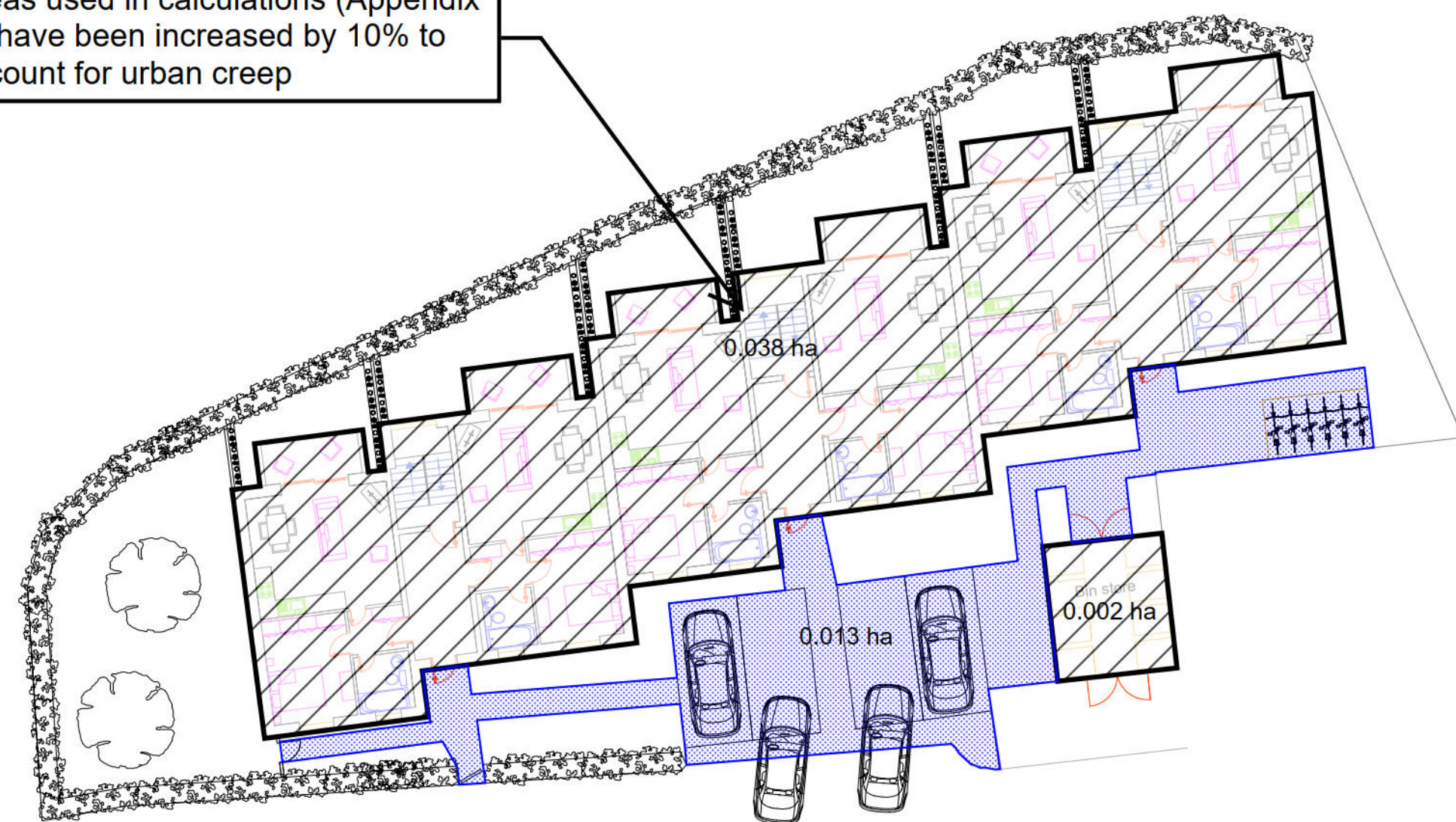
Print Size: A1 Project No: U0560 Drawing No: 002 Revision: P1

The whole area within the red line boundary is impermeable, however for the purposes of the calculations it is assumed only the buildings are positively drained



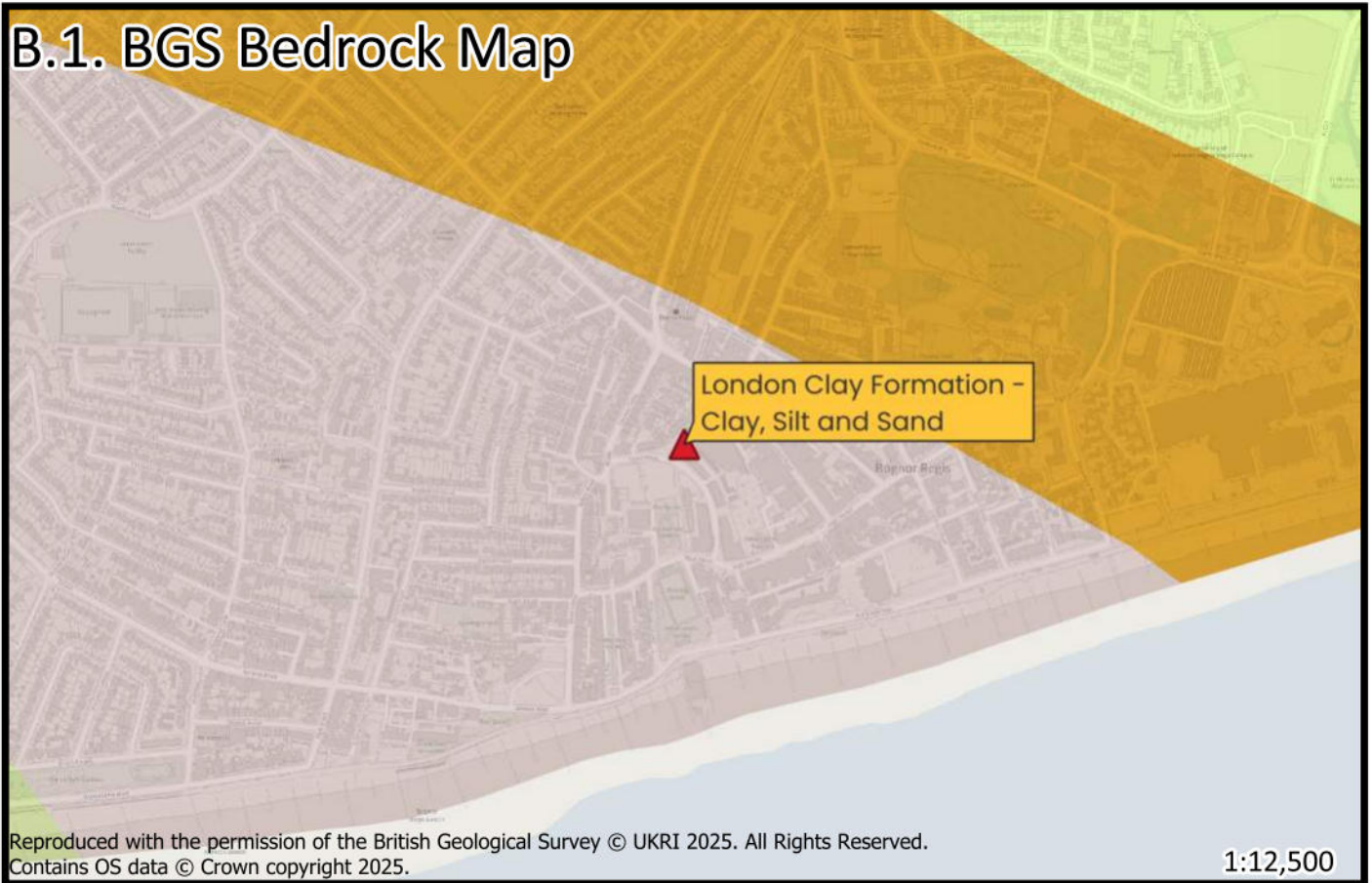
EXISTING SITE
1:200

Areas used in calculations (Appendix C) have been increased by 10% to account for urban creep



PROPOSED SITE
1:200

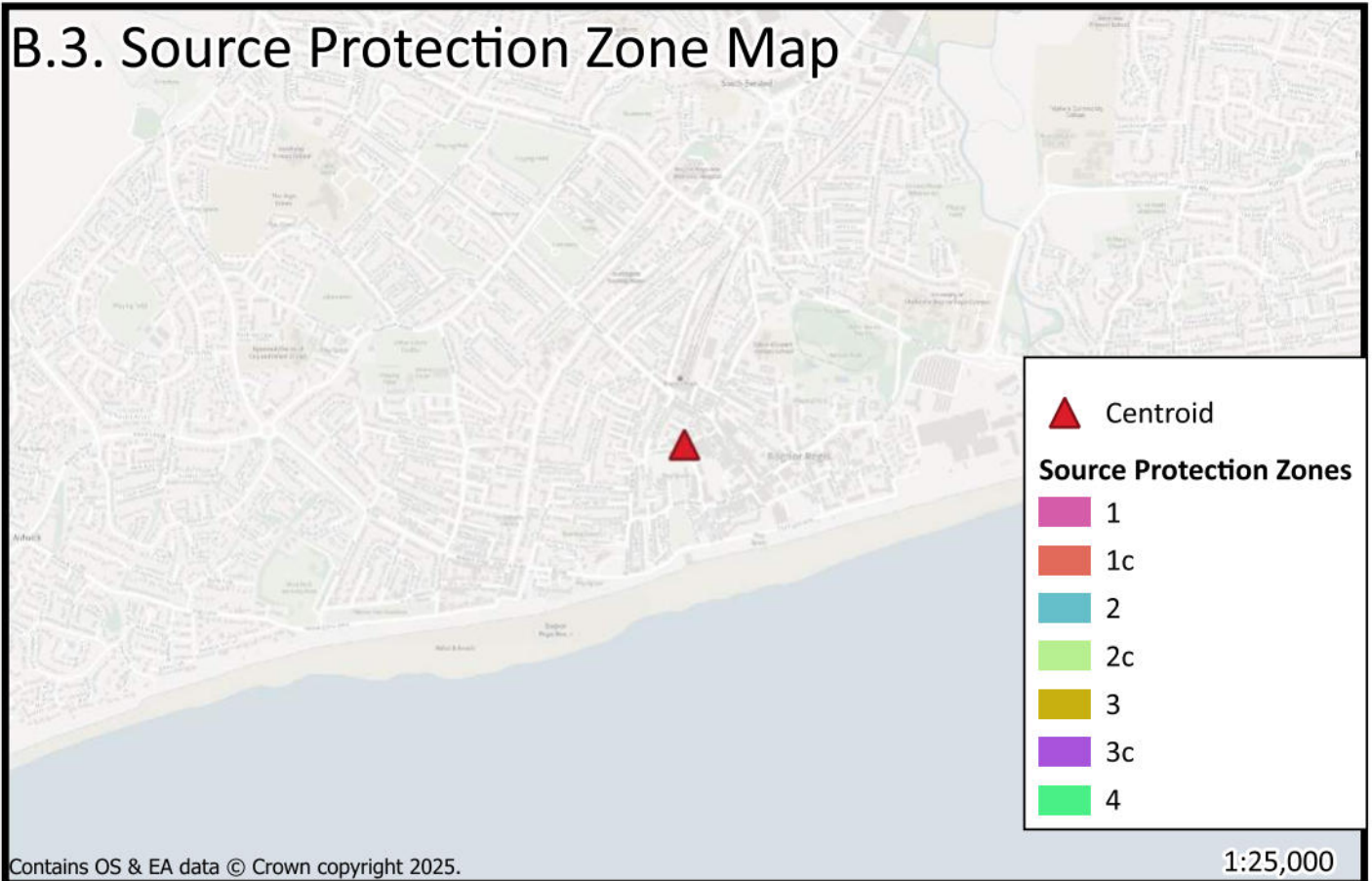
B.1. BGS Bedrock Map



B.2. BGS Superficial Deposits Map



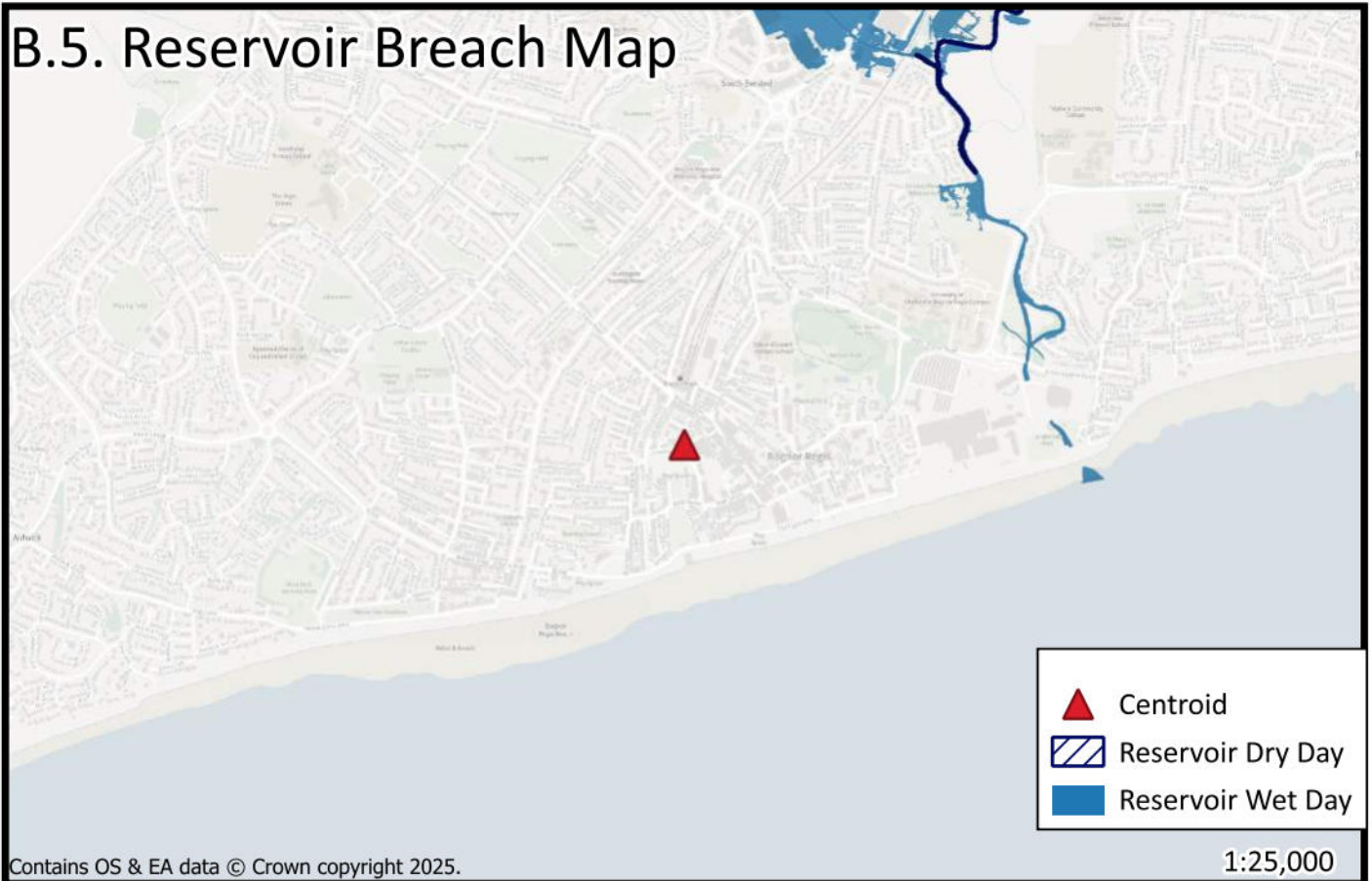
B.3. Source Protection Zone Map



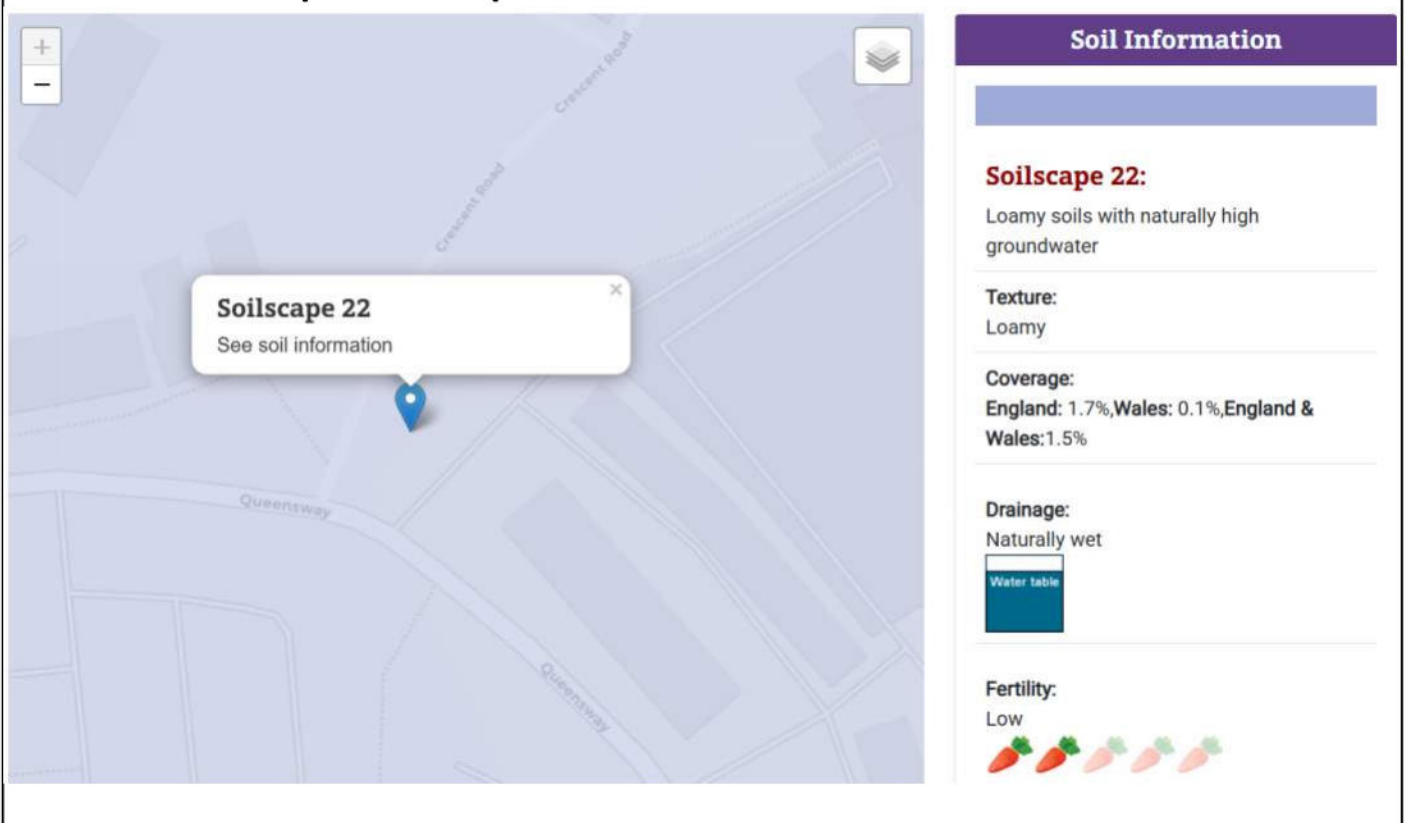
B.4. Nearby Waterbodies Map



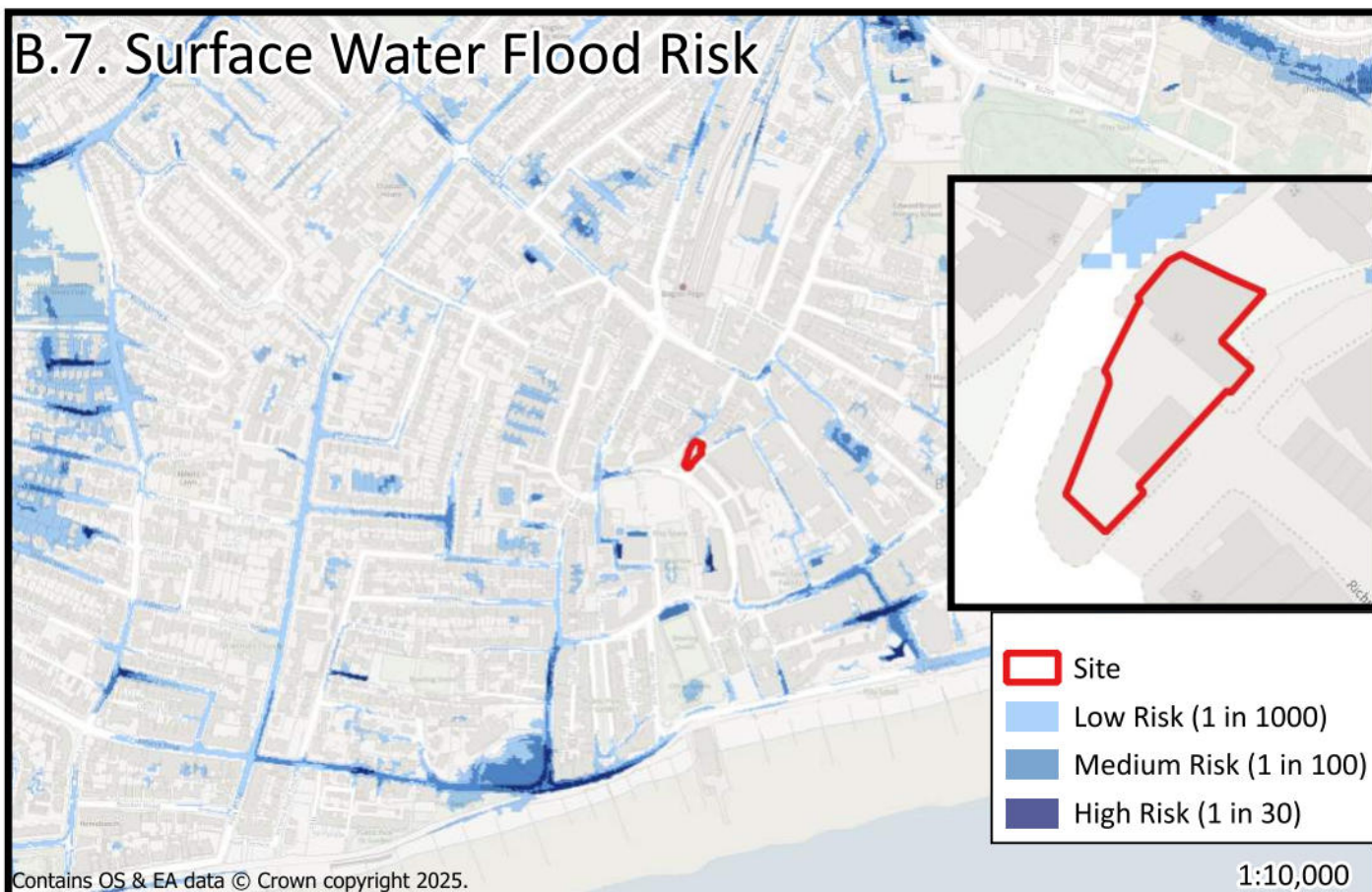
B.5. Reservoir Breach Map



B.6. Soilsapes Map



B.7. Surface Water Flood Risk



B.9. MAGIC

Aquifer Designation Map (Bedrock) (England)

Typology	Unproductive
----------	--------------

Aquifer Designation Map (Superficial Drift) (England)

Typology	Secondary A
----------	-------------

SSSI Impact Risk Zones - for LPAs to determine likely impacts on terrestrial SSSIs and when to consult Natural England

GUIDANCE - How to use the Impact Risk Zones
HYPERLINK

[/Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf](#)
[https://irz.geodata.org.uk/IRZ/step2.html?](https://irz.geodata.org.uk/IRZ/step2.html?irzcode=0303000211100-es=11401&location=492999.99012_%20(IRZ%20polygon%20centre))
[irzcode=0303000211100-es=11401&location=492999.99012_%20\(IRZ%20polygon%20centre\)](https://irz.geodata.org.uk/IRZ/step2.html?irzcode=0303000211100-es=11401&location=492999.99012_%20(IRZ%20polygon%20centre))

Areas of Outstanding Natural Beauty (England)

No Features found

Local Nature Reserves (England) - points

No Features found

Local Nature Reserves (England)

No Features found

Moorland Line (England)

No Features found

National Nature Reserves (England) - points

No Features found

National Nature Reserves (England)

No Features found

Ramsar Sites (England) - points

No Features found

Ramsar Sites (England)

No Features found

Sites of Special Scientific Interest (England) - points

No Features found

Sites of Special Scientific Interest (England)

No Features found

Special Areas of Conservation (England) - points

No Features found

Special Areas of Conservation (England)

No Features found

Possible Special Areas of Conservation (England) - points

No Features found

Possible Special Areas of Conservation (England)

No Features found

Special Protection Areas (England) - points

No Features found

Special Protection Areas (England)

No Features found

Potential Special Protection Areas (England) - points

No Features found

Potential Special Protection Areas (England)

No Features found

Biosphere Reserves (England) - points

No Features found

Biosphere Reserves (England)

No Features found

Less Favoured Areas (England)

No Features found

Nitrate Vulnerable Zones 2017 Designations (England)
No Features found

Wild Bird General Licence Protected Sites Condition Zone (England)
No Features found

Green Belt (England)
No Features found

National Forest (England)
No Features found

Source Protection Zones merged (England)
No Features found

B.10. BGS Groundwater Susceptibility Map



Flood map for planning

Your reference
U0560

Location (easting/northing)
493419/99195

Created
30 Jan 2025 10:18

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

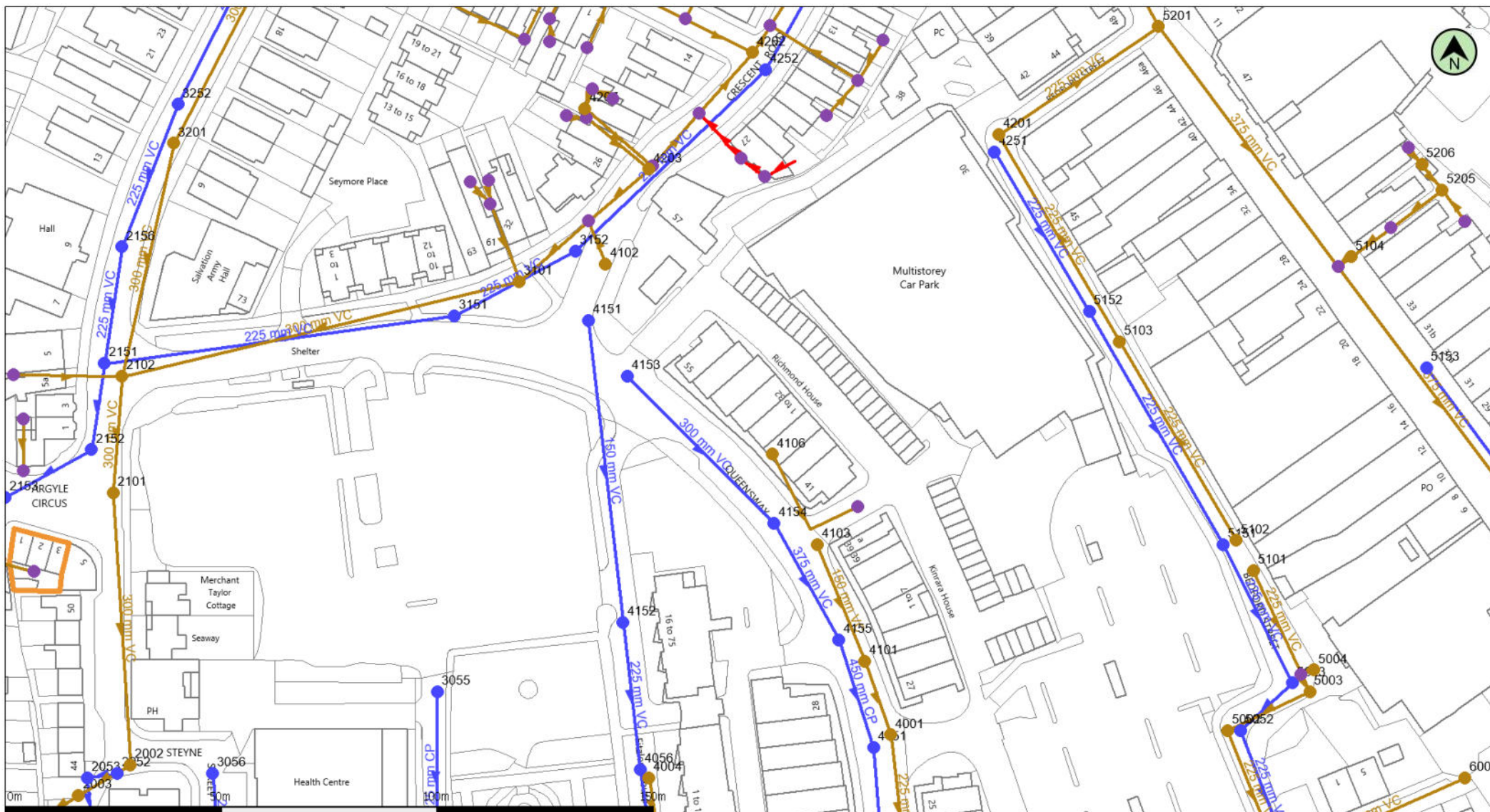
The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>





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Date: 29/01/25

Scale: 1:1250

Map Centre: 493439,99159

Data updated: 21/01/25

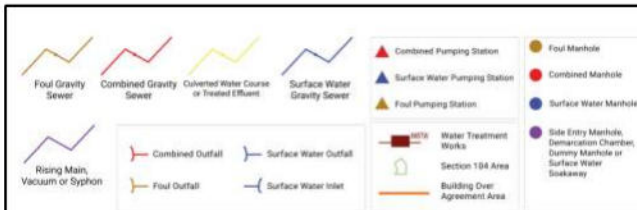
Our Ref: 1674175 - 1

Wastewater Plan A4
Powered by digdat

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 2025 Ordnance Survey AC0000808122. 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.



arge@rida-reports.co.uk

U560





Chloe Detanger
81 St Clements St
Littlehampton
Oxford
OX4 1AW

Your ref
23176

Our ref
DSA000049075

Date
3rd of December 2025

Contact
Tel 0330 303 0119

Dear Chloe Detanger,
Level 1 Capacity Check Enquiry: 57 Queensway, Hughes Jay & Panter Ltd, 57 Queensway, Bognor Regis, PO21 1QW.

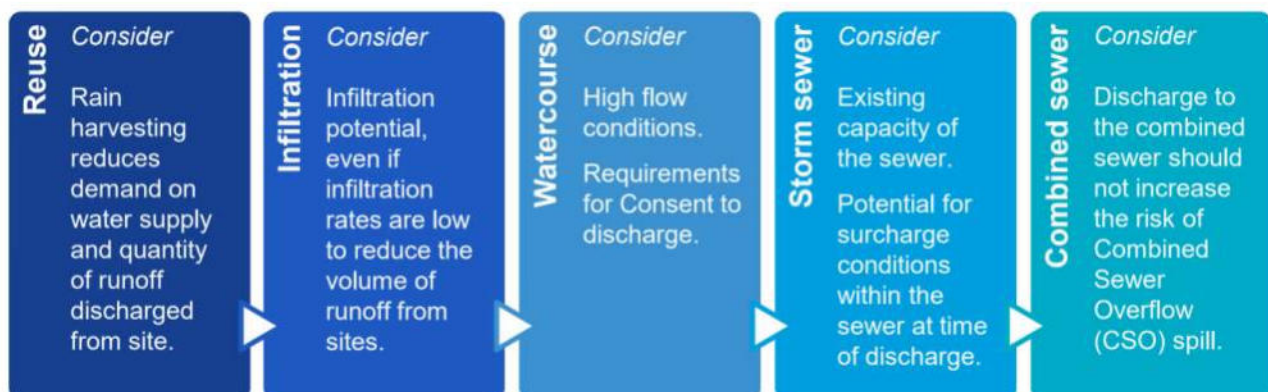
We have completed the capacity check for the above development site and the results are as follows:

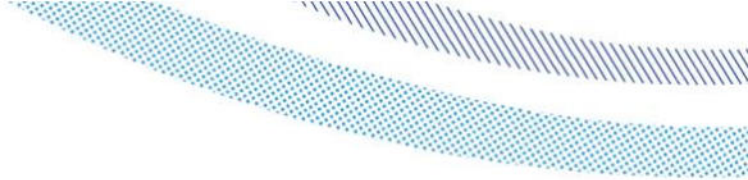
Surface Water

The enquiry has been assessed to determine the capacity available for **6 l/s** at manhole reference **SZ93994153 Grid Reference: 493410, 99167**.

There is currently adequate capacity in the local surface water/foul sewerage network to accommodate a surface water flow of 6 l/s for the above development at manhole reference **SZ93994153 Grid Reference: 493410, 99167**.

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.





Guidance on Building Regulations is here: [gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h](https://www.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. **Any revisions in flow rate or alternative point of connection will require a new Pre-Planning Application to be submitted.**

Please get in touch via the Get Connected customer dashboard if you have any queries.

Yours sincerely,

Future Growth Planning Team
Developer Services

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

Appendix C

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.0
Summer CV	1.000	2 year (l/s)	0.0
Winter CV	1.000	30 year (l/s)	0.0
Analysis Speed	Normal	100 year (l/s)	0.0
Skip Steady State	x	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	45	0	0
100	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.075	Betterment (%)	0
SAAR (mm)	704	QBar	0.5
Soil Index	5	Q 1 year (l/s)	0.4
SPR	0.53	Q 2 year (l/s)	0.4
Region	7	Q 30 year (l/s)	0.9
Growth Factor 1 year	0.85	Q 100 year (l/s)	1.2
Growth Factor 2 year	0.88		



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	4.7
Summer CV	1.000	2 year (l/s)	6.0
Winter CV	1.000	30 year (l/s)	11.0
Analysis Speed	Normal	100 year (l/s)	13.9
Skip Steady State	x	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	45	0	0
100	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Betterment (%)	0
Brownfield Method	MRM	Q 1 year (l/s)	4.7
Contributing Area (ha)	0.030	Q 2 year (l/s)	6.0
PIMP (%)	100	Q 30 year (l/s)	11.0
CV	1.000	Q 100 year (l/s)	13.9
Time of Concentration (mins)	6.00		



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
North	0.022	6.00	6.700	450	70.755	76.542	1.350
South	0.022	6.00	6.700	450	7.730	75.246	1.350
Proposed paving	0.014	6.00	6.700		70.508	49.649	1.300
S05			6.700	450	48.434	57.437	1.901
Tank			6.700		36.122	47.898	2.050
Outfall - MH4153			6.740	450	28.074	17.862	2.338

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	South	Tank	39.421	0.600	5.350	4.956	0.394	100.0	150	6.65	50.0
1.000	North	S05	35.000	0.600	5.350	5.000	0.350	100.0	150	6.58	50.0
2.000	Proposed paving	S05	15.000	0.600	5.400	4.799	0.601	25.0	100	6.16	50.0
1.001_1	S05	Tank	15.000	0.600	4.799	4.650	0.149	100.7	150	6.83	50.0
1.001	Tank	Outfall - MH4153	25.000	0.600	4.650	4.402	0.248	100.8	150	7.25	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.005	17.8	4.0	1.200	1.594	0.022	0.0	48	0.813
1.000	1.005	17.8	4.0	1.200	1.550	0.022	0.0	48	0.813
2.000	1.551	12.2	2.5	1.200	1.801	0.014	0.0	31	1.223
1.001_1	1.001	17.7	6.5	1.751	1.900	0.036	0.0	63	0.926
1.001	1.001	17.7	10.5	1.900	2.188	0.058	0.0	83	1.041

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.4
Summer CV	1.000	2 year (l/s)	0.4
Winter CV	1.000	30 year (l/s)	0.9
Analysis Speed	Normal	100 year (l/s)	1.2
Skip Steady State	x	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	45	0	0
100	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.075	Betterment (%)	0
SAAR (mm)	704	QBar	0.5
Soil Index	5	Q 1 year (l/s)	0.4
SPR	0.53	Q 2 year (l/s)	0.4
Region	7	Q 30 year (l/s)	0.9
Growth Factor 1 year	0.85	Q 100 year (l/s)	1.2
Growth Factor 2 year	0.88		

Node Tank Online Orifice Control

Flap Valve	x	Invert Level (m)	4.650	Diameter (m)	0.019
Downstream Link	1.001	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	4.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	24.5	0.0	0.400	24.5	0.0	0.800	24.5	0.0	0.801	0.0	0.0

Node Proposed paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.400	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	216	Depth (m)	0.300
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	13.000		

Approval Settings

Node Size	✓	Backdrops	✓
Node Losses	✓	Minimum Backdrop Height (m)	
Link Size	✓	Maximum Backdrop Height (m)	1.500
Minimum Diameter (mm)	150	Full Bore Velocity	✓
Link Length	✓	Minimum Full Bore Velocity (m/s)	
Maximum Length (m)	100.000	Maximum Full Bore Velocity (m/s)	3.000
Coordinates	✓	Proportional Velocity	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Minimum Proportional Velocity (m/s)	0.750
Cover Depth	✓	Maximum Proportional Velocity (m/s)	3.000
Minimum Cover Depth (m)		Surcharged Depth	✓
Maximum Cover Depth (m)	3.000	Return Period (years)	

Approval Settings

Maximum Surcharged Depth (m)	0.100	Discharge Rates	✓
Flooding	✓	Discharge Volume	✓
Return Period (years)	30	100 year 360 minute (m ³)	
Time to Half Empty	x		

Results for 1 year Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.391	0.041	2.9	0.0066	0.0000	OK
15 minute summer	South	11	5.391	0.041	2.9	0.0065	0.0000	OK
30 minute summer	Proposed paving	22	5.420	0.020	1.8	0.5171	0.0000	OK
480 minute summer	S05	320	4.911	0.112	1.0	0.0179	0.0000	OK
480 minute summer	Tank	320	4.911	0.261	1.5	6.0818	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	2.9	0.738	0.162	0.1363	
15 minute summer	South	3.000	Tank	2.9	0.740	0.161	0.1524	
30 minute summer	Proposed paving	2.000	S05	1.0	0.568	0.085	0.0340	
15 minute summer	S05	1.001_1	Tank	3.7	0.912	0.209	0.1352	
480 minute summer	Tank	Orifice	Outfall - MH4153	0.4				10.6

Results for 2 year Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.398	0.048	3.8	0.0076	0.0000	OK
15 minute summer	South	11	5.397	0.047	3.8	0.0075	0.0000	OK
30 minute summer	Proposed paving	21	5.423	0.023	2.3	0.6531	0.0000	OK
360 minute summer	S05	264	4.980	0.181	1.4	0.0287	0.0000	SURCHARGED
360 minute summer	Tank	264	4.980	0.330	2.0	7.6714	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	3.8	0.796	0.212	0.1659	
15 minute summer	South	3.000	Tank	3.8	0.799	0.212	0.1854	
30 minute summer	Proposed paving	2.000	S05	1.4	0.619	0.117	0.0531	
15 minute summer	S05	1.001_1	Tank	4.9	0.918	0.275	0.1613	
360 minute summer	Tank	Orifice	Outfall - MH4153	0.4				10.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.418	0.068	7.2	0.0108	0.0000	OK
15 minute summer	South	11	5.417	0.067	7.2	0.0106	0.0000	OK
30 minute summer	Proposed paving	21	5.435	0.035	4.4	1.0997	0.0000	OK
240 minute winter	S05	228	5.288	0.489	2.3	0.0777	0.0000	SURCHARGED
240 minute winter	Tank	228	5.288	0.638	3.7	14.8386	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	7.2	0.945	0.404	0.2657	
15 minute summer	South	3.000	Tank	7.2	0.952	0.403	0.2966	
30 minute summer	Proposed paving	2.000	S05	3.1	0.597	0.257	0.0768	
15 minute summer	S05	1.001_1	Tank	9.7	0.940	0.549	0.2641	
240 minute winter	Tank	Orifice	Outfall - MH4153	0.6				12.9

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	North	336	5.499	0.149	1.6	0.0237	0.0000	OK
360 minute winter	South	336	5.499	0.149	1.6	0.0237	0.0000	OK
360 minute winter	Proposed paving	336	5.499	0.099	1.3	3.6135	0.0000	OK
360 minute winter	S05	336	5.499	0.700	2.6	0.1113	0.0000	SURCHARGED
360 minute winter	Tank	336	5.499	0.849	3.8	18.6316	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.5	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	10.5	1.036	0.590	0.3538	
15 minute summer	South	3.000	Tank	10.5	1.045	0.589	0.3944	
30 minute summer	Proposed paving	2.000	S05	4.8	0.744	0.395	0.0834	
15 minute summer	S05	1.001_1	Tank	13.1	0.965	0.740	0.2641	
360 minute winter	Tank	Orifice	Outfall - MH4153	0.7				19.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	North	304	5.437	0.087	1.4	0.0139	0.0000	OK
360 minute winter	South	304	5.437	0.087	1.4	0.0139	0.0000	OK
30 minute summer	Proposed paving	21	5.441	0.041	5.7	1.3378	0.0000	OK
360 minute winter	S05	304	5.437	0.638	2.3	0.1015	0.0000	SURCHARGED
360 minute winter	Tank	304	5.437	0.787	3.4	18.3218	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.5	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	9.3	1.007	0.522	0.3224	
15 minute summer	South	3.000	Tank	9.3	1.015	0.522	0.3596	
30 minute summer	Proposed paving	2.000	S05	4.2	0.669	0.348	0.0812	
15 minute summer	S05	1.001_1	Tank	12.0	0.953	0.681	0.2641	
360 minute winter	Tank	Orifice	Outfall - MH4153	0.7				18.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	North	336	5.813	0.463	2.0	0.0736	0.0000	SURCHARGED
360 minute winter	South	336	5.813	0.463	2.0	0.0736	0.0000	SURCHARGED
360 minute winter	Proposed paving	336	5.813	0.413	3.5	11.4667	0.0000	SURCHARGED
360 minute winter	S05	336	5.813	1.014	3.3	0.1612	0.0000	SURCHARGED
360 minute winter	Tank	336	5.813	1.163	4.8	18.6316	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.402	0.000	0.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	1.000	S05	13.5	1.092	0.758	0.4990	
15 minute summer	South	3.000	Tank	13.4	1.103	0.758	0.5007	
15 minute summer	Proposed paving	2.000	S05	5.9	0.878	0.484	0.0898	
15 minute summer	S05	1.001_1	Tank	16.5	1.003	0.931	0.2641	
360 minute winter	Tank	Orifice	Outfall - MH4153	0.8				21.6

Appendix D

Drawing scale	Line length	Drawing scale	Line length
1:5	= 0.25 metres	1:200	= 10.0 metres
1:10	= 0.5 metres	1:250	= 12.5 metres
1:20	= 1.0 metres	1:500	= 25.0 metres
1:25	= 1.25 metres	1:1000	= 50.0 metres
1:50	= 2.5 metres	1:1250	= 62.5 metres
1:100	= 5.0 metres	1:2500	= 125 metres
Measure length of line above for checking of scale			

GENERAL NOTES

1. All dimensions are in millimetres and levels in m AOD unless stated otherwise.
2. Do not scale. If in any doubt, consult Engineer.
3. Read in conjunction with the architects and engineers schedule drawings.
4. Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.
5. The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.
6. All existing below ground drainage within the site boundary is to be surveyed, abandoned and removed prior to construction of the building.

Rev	Details	Date	By	Chd

Drawing Status: **PRELIMINARY**

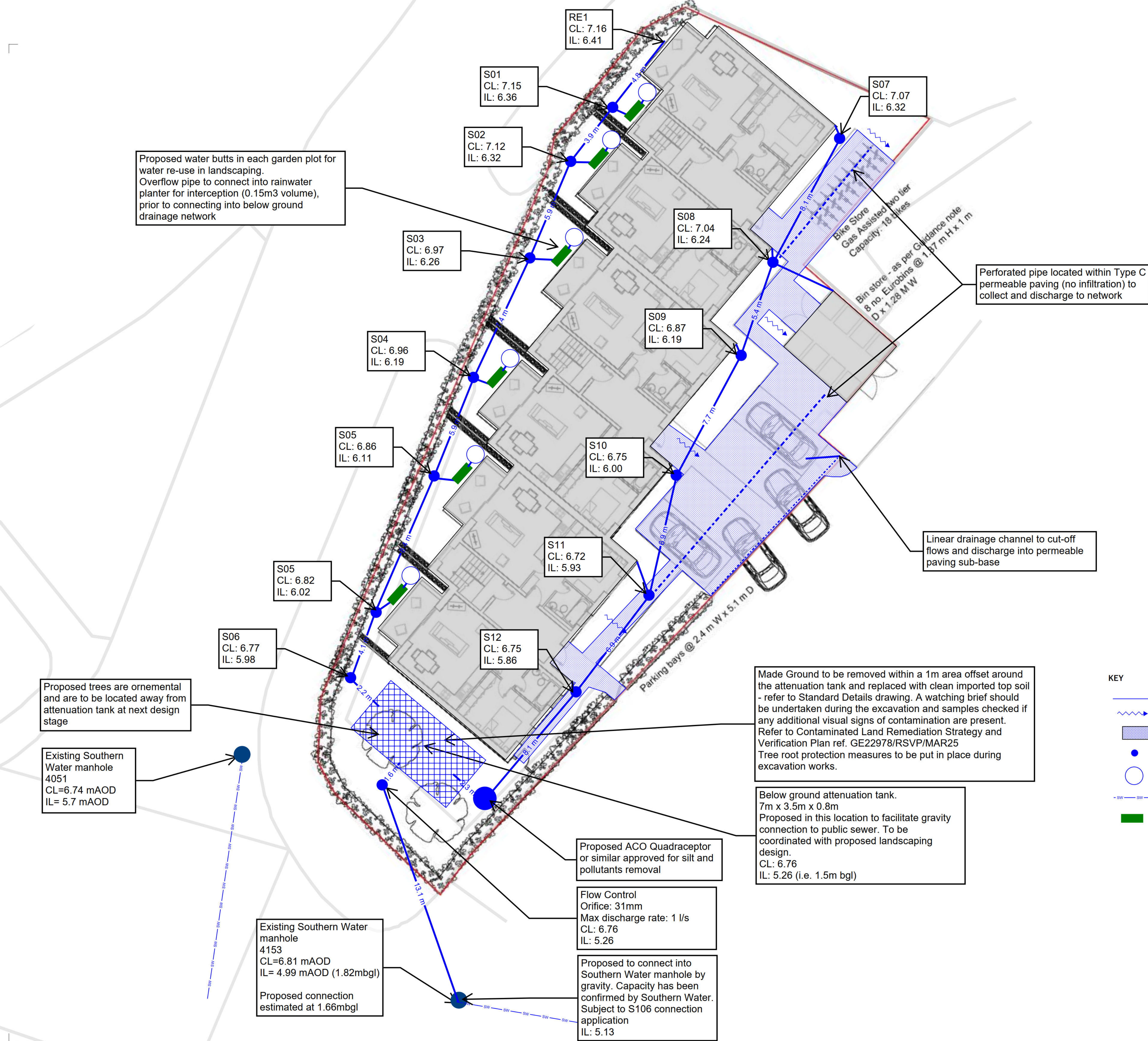


Client: _____

Project: **57 Queensway , Bognor Regis, PO21 1QW**

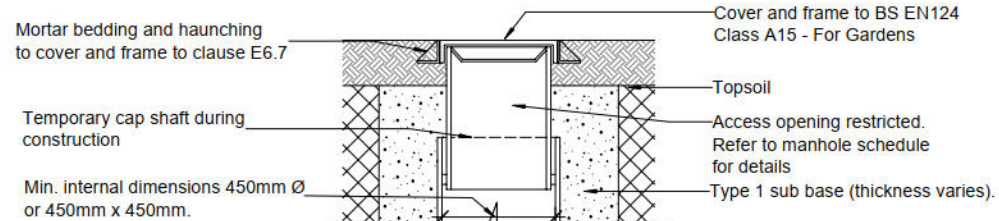
Drawing: **Proposed Drainage Strategy**

Print Size: **A1** Scale: **1:100** Project No: **U0560** Drawing No: **001** Revision: **P2**



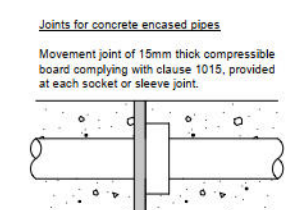
KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface Type C (no infiltration)
- Silt Trap
- Rainwater butt / harvester
- Existing Surface Water Sewer Pipe
- Rainwater planter



Sited in private garden - No loading

1. Refer to drawing 8193 for base layouts.



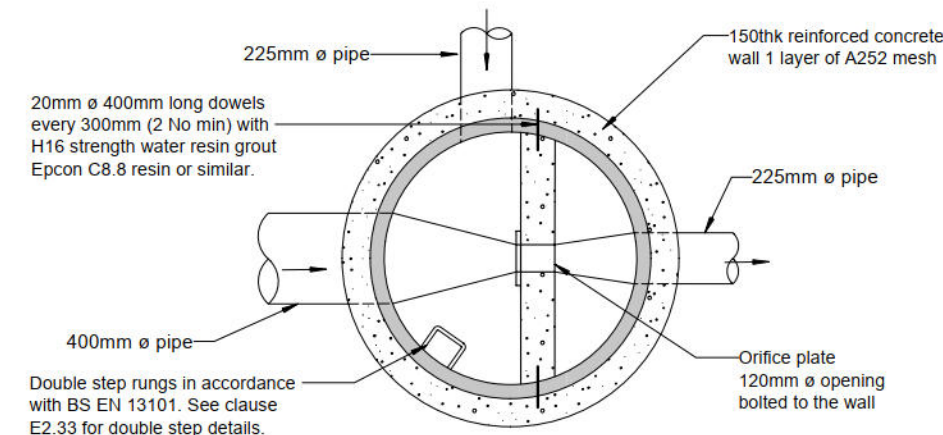
Concrete Protection for Pipes Laid at Shallow Depths
Cover < 600mm

The diagram shows a cross-section of a pipe installation. The pipe is surrounded by a 150mm concrete slab with 1 layer A363 mesh. The concrete is supported by a compressible material. The backfill is shown above the concrete slab. The minimum bearing on the compressible material is indicated as 300mm on both sides of the pipe.

Technical drawing of a precast concrete manhole section, showing various components and dimensions. The drawing includes a cross-section of the manhole structure, with labels for different parts and their specifications.

Labels and Dimensions:

- Mortar bedding & haunching to cover & frame to Clause E6.7.
- Minimum 2 courses of class B engineering bricks or precast concrete cover frame seating rings.
- 150mm approx precast slab.
- 675mm maximum to first step rising from cover level.
- Chamber height (not less than 900mm).
- Lifting eyes in PC rights to be pointed.
- The bottom chamber section to be built into base concrete min. 75mm.
- High strength concrete topping to be brought up to a dense smooth face neatly shaped and finished to all branch connections (min. thickness 20mm).
- Inverts to be formed using channel pieces.
- GL Refer to GA.
- 600mm sq clear opening cover complying with BS 1232 & BS 7960; see clause E2.34.
- Minimum clear access 600mm. Precast concrete manhole sections and cover to be bedded with mortar, plasticised or elastomeric seal conforming to BS EN 19187 & BS 5911-3; see clause E2.29.
- In situ concrete to be GEN 3 (designed to BRE specific design 1 concrete in aggressive condition). Concrete surround 150mm thick.
- Benching steps to be 110 to 130.
- Construction joint.
- Distance between top of pipe and underside of precast section to be 50mm (min) to 300mm (max).
- Orifice plate fixed to wall.
- 250mm to underside of channel.



1. Refer to 8187 Rocker Pipe details.

2. The precast concrete rings and weir could be replaced for HDPE chambers such as SEL-1.5m diameter chamber. See www.sel.co.uk or e-mail sales@selenvironmental.com for further details.

Rainwater downpipe to Architects specifications

Rodding point to be installed at all RWP connections

Rainwater pipe adaptor to specifications of manufacturer

F.F.L.

150

G.L.

Pipe cut to suit

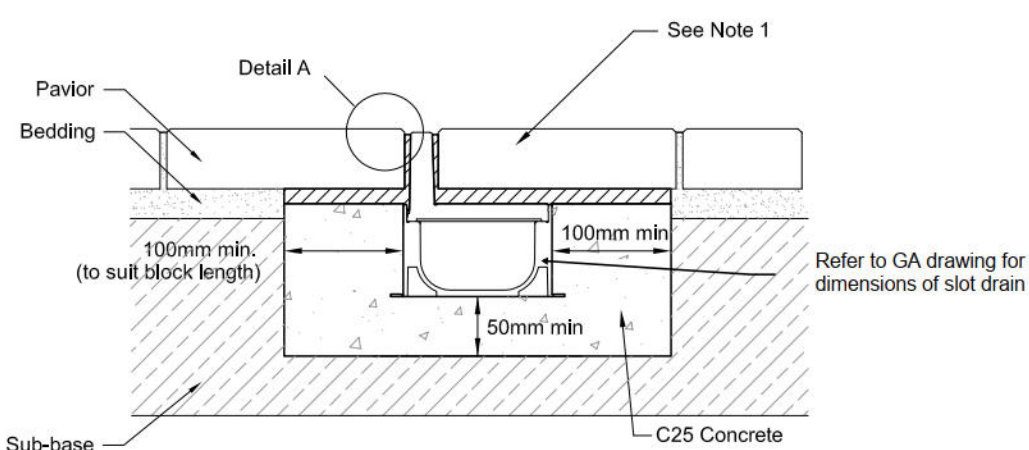
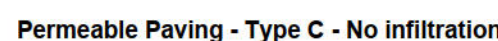
D. See Note 3

Refer to GA all levels, pipe location & material

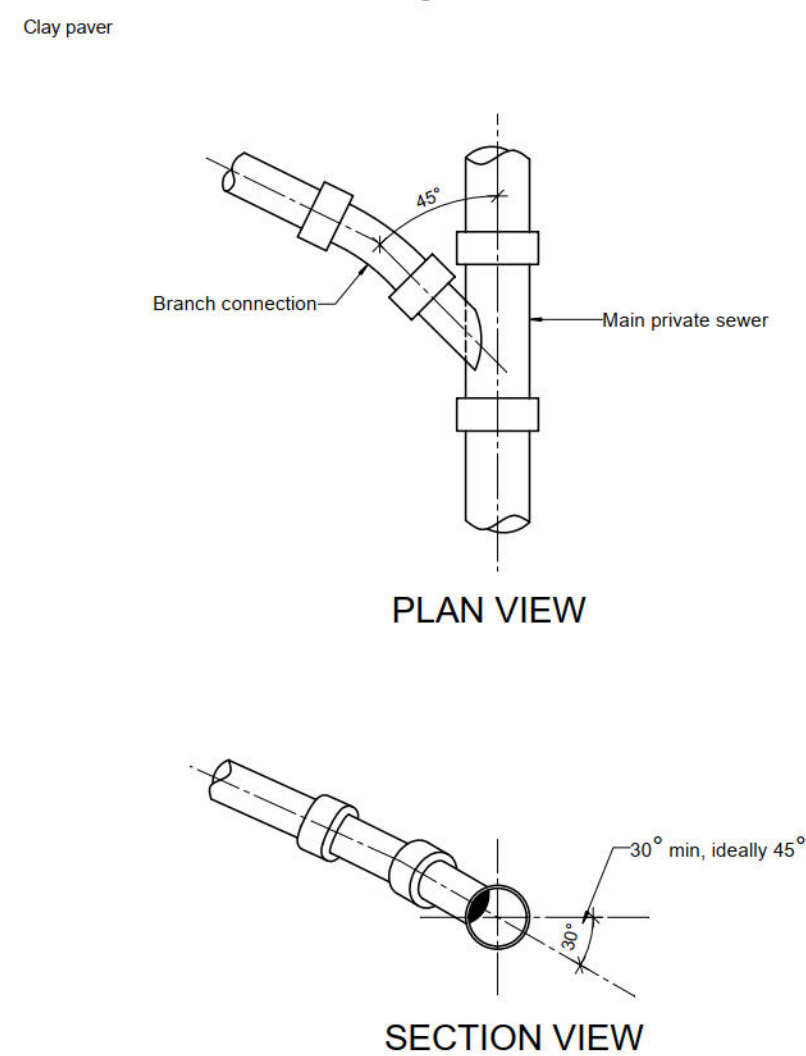
Maximum 600mm

Nominal 90° rest bend to radius to centreline (min 200mm)

8251 - External Rainwater Pipe Connection Detail



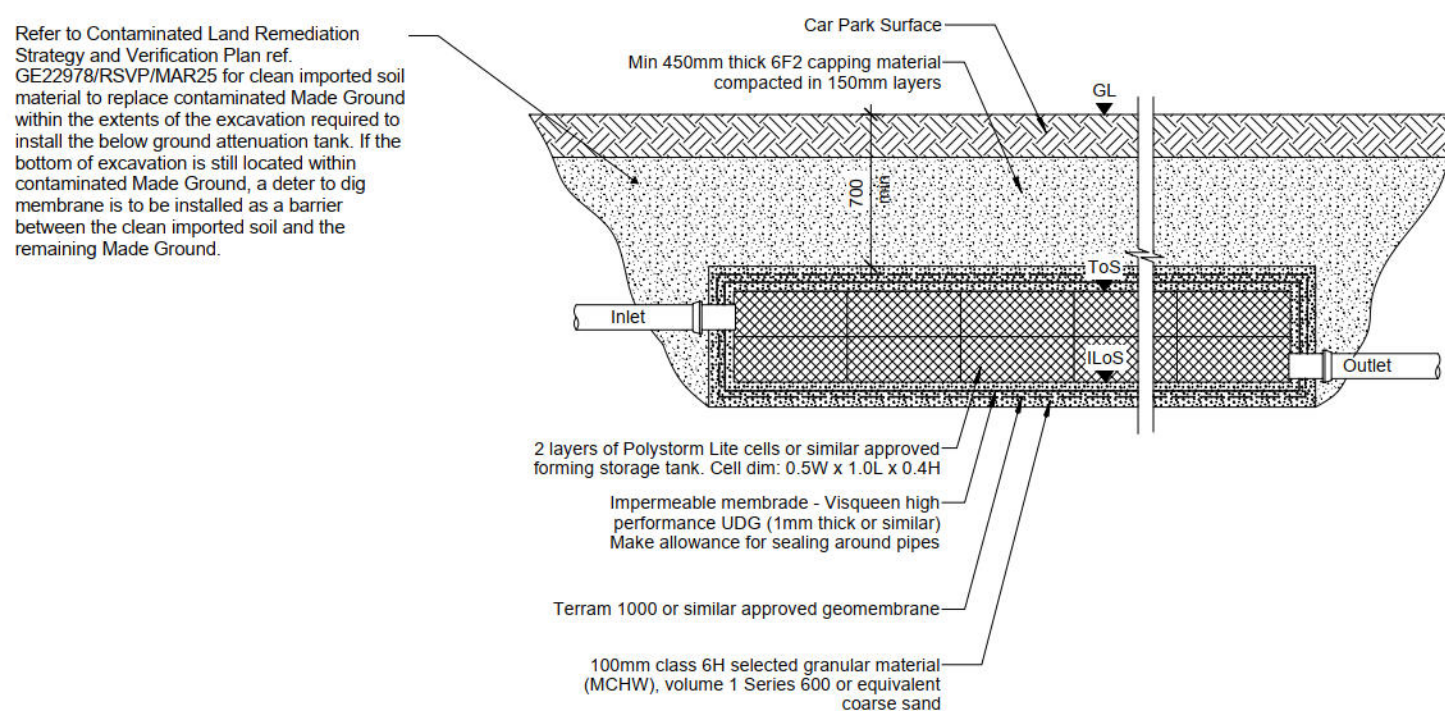
Slot Drainage Channel



1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°

2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connections should be made using 45° angle, or 90° angle, curved square junctions.
3. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting and jointing with flexible repair couplings or slip couplers.

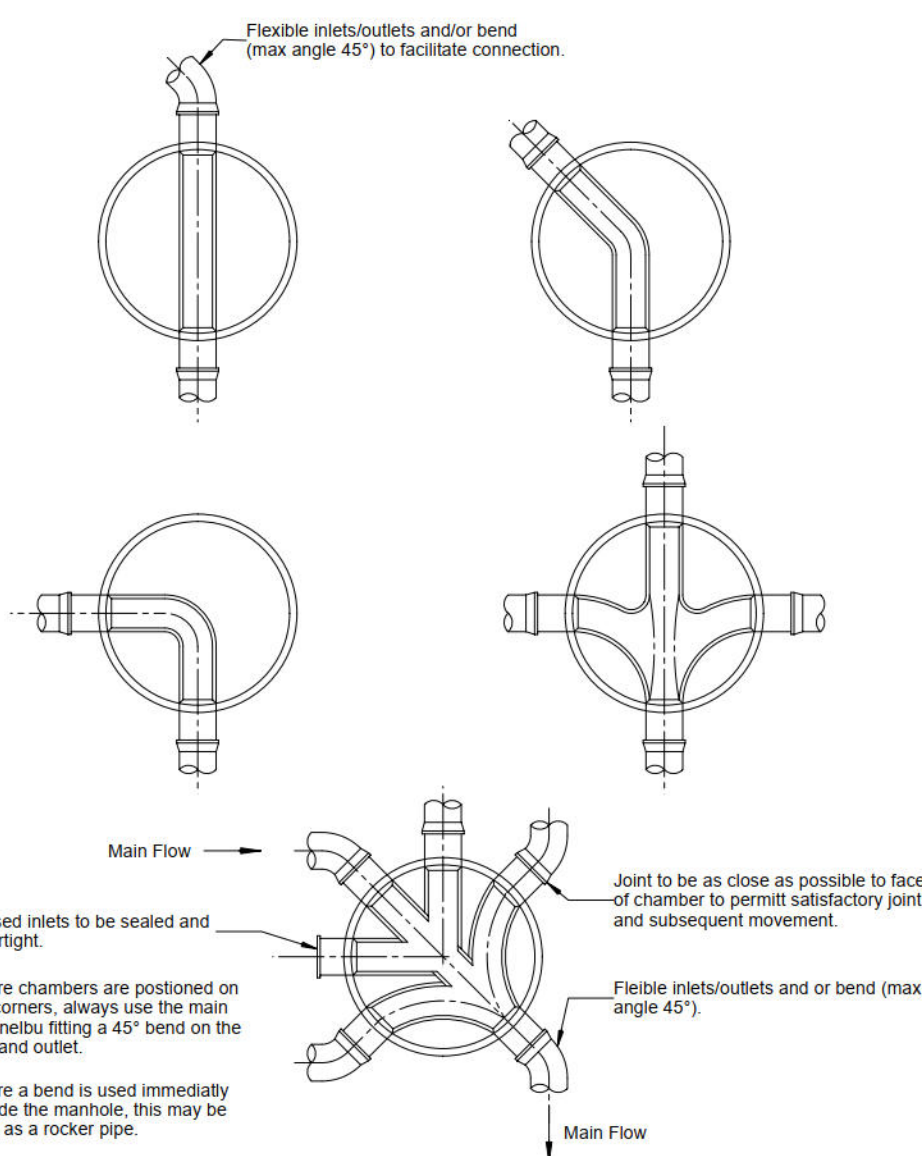
Lateral Connection to private sewer



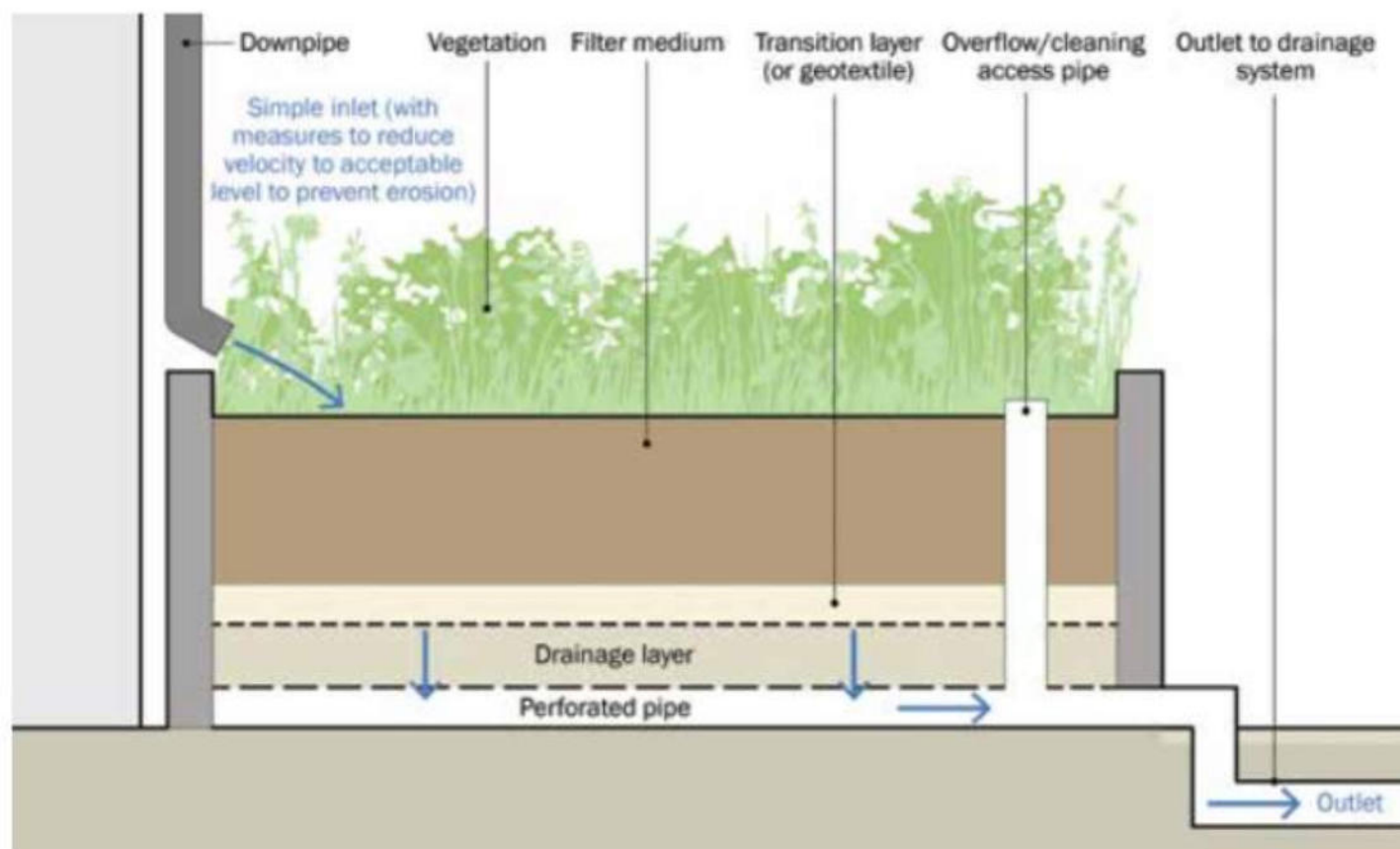
1. Permeable modular storage cell with 95% minimum void ratio. Ultimate compressive strength of 400kN/m² minimum. Resistant to chemicals likely to be found in rain water and durability of a minimum of 40 years.

2. Dimensions as applicable to the manufacturers recommendations for given storage requirement UNO.
3. Air Vents should be provided as per suppliers recommendations
4. See GA drgs for pipe sizes and layout and IL, ILoS, ToS, GL levels.

Cellular Attenuation System - Landscape Area



Chamber Type 3 Base Layouts



Rainwater Planter

Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

Drawing Scale Bar

Drawing scale	Line length	Drawing scale	Line length
1:5 = 0.25 metres		1:200 = 10.0 metres	
1:10 = 0.5 metres		1:250 = 12.5 metres	
1:20 = 1.0 metres		1:500 = 25.0 metres	
1:25 = 1.25 metres		1:1000 = 50.0 metres	
1:50 = 2.5 metres		1:2500 = 62.5 metres	
1:100 = 5.0 metres		1:5000 = 125 metres	

Measure length of line above for checking of scale



GENERAL NOTES

Rev	Details	Date	By	Ch
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Drawing Status:

PRELIMINARY



Client

Project:

[U0560] 57 Queensway , Bognor Regis, PO21 1QW

Drawing

Standard Details

Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	NTS	U0560	006	P2



Rainwater Butt