Drainage Strategy

57 Queensway , Bognor Regis, PO21 1QW

Reference: 560 -Rev - V1

Date: Mar-25

Appendices

London Office
5th Floor, 167, 169 Great Portland St,
London W1W 5PF

Oxford Office
Oxford Innospace, Old Music Hall, 106-108
Cowley Road, Oxford, OX4 1JE

[redacted]

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.

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?	Yes
Topography	Sited on a flat site?	Yes
	Sited on a steep slope (5-15%)	No
	Sited on a very steep slope (>15%)	Yes
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

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	0.000
	Self Draining Areas	0.000	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 the findings on groundwater and soils within the site.
Is a discharge to a watercourse possible?	There are no watercourses in the proximity to the site.
Is a discharge to a surface water sewer possible?	There is a surface water sewer in the proximity to the site. It is possible to connect to the surface water sewer.
Is a discharge to a combined sewer possible?	There is a combined water sewer in the proximity to the site. It is not possible to connect to 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
X	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
X	The peak discharge rate has been reduced by 60% 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	0.7	0.0000
1 in 2	0.40	6.00	0.8	0.0000
1 in 30	0.90	11.00	1.1	0.0000
1 in 30 + CC	N/A	N/A	1.4	0.0000
1 in 100	1.20	13.90	1.3	0.0000
1 in 100 + CC	N/A	N/A	1.9	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: Proposed Drainage System

SuDS Proposed	Feasible	Proposed
Use of green roofs	No	No
Store rainwater for later use	Yes	No
Use infiltration techniques, for instance soakaways, permeable surfaces	Yes	Yes
Attenuate rainwater in ponds or open water features for gradual release	No	No
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Yes	Yes
Discharge Point Proposed		
Discharge rainwater direct to a watercourse	No	No
Discharge rainwater to a surface water sewer/drain	Yes	Yes
Discharge rainwater to the combined sewer	Yes	No

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 flooding occurs for the 1 in 30 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.

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:

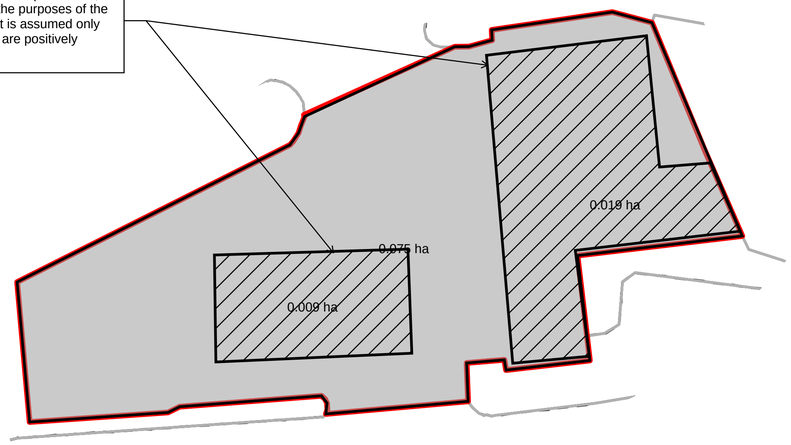
INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	**Frequency**
Inlets, outlets and surface control structures	
Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Strim vegetation 1m min. surround to structures and keep 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. Undertake inspection after leaf fall in autumn	Annually
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 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 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

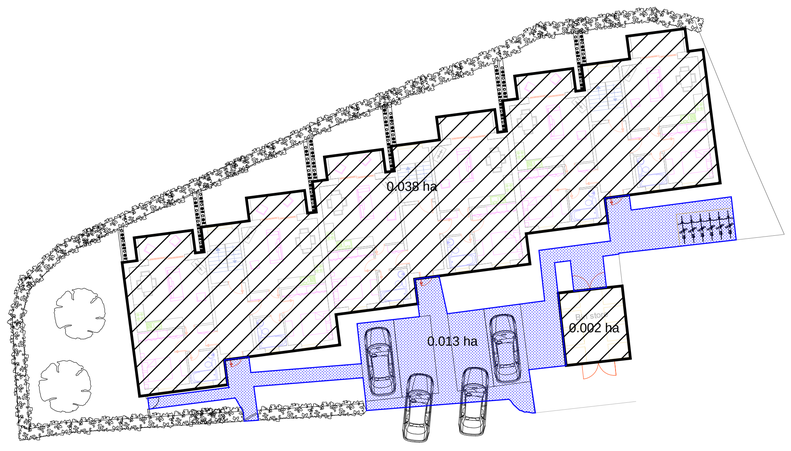
Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris 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

Appendix A

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



PROPOSED SITE
1:200

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	Ch'd

Drawing Status:
PRELIMINARY

URBANWATER

Client:

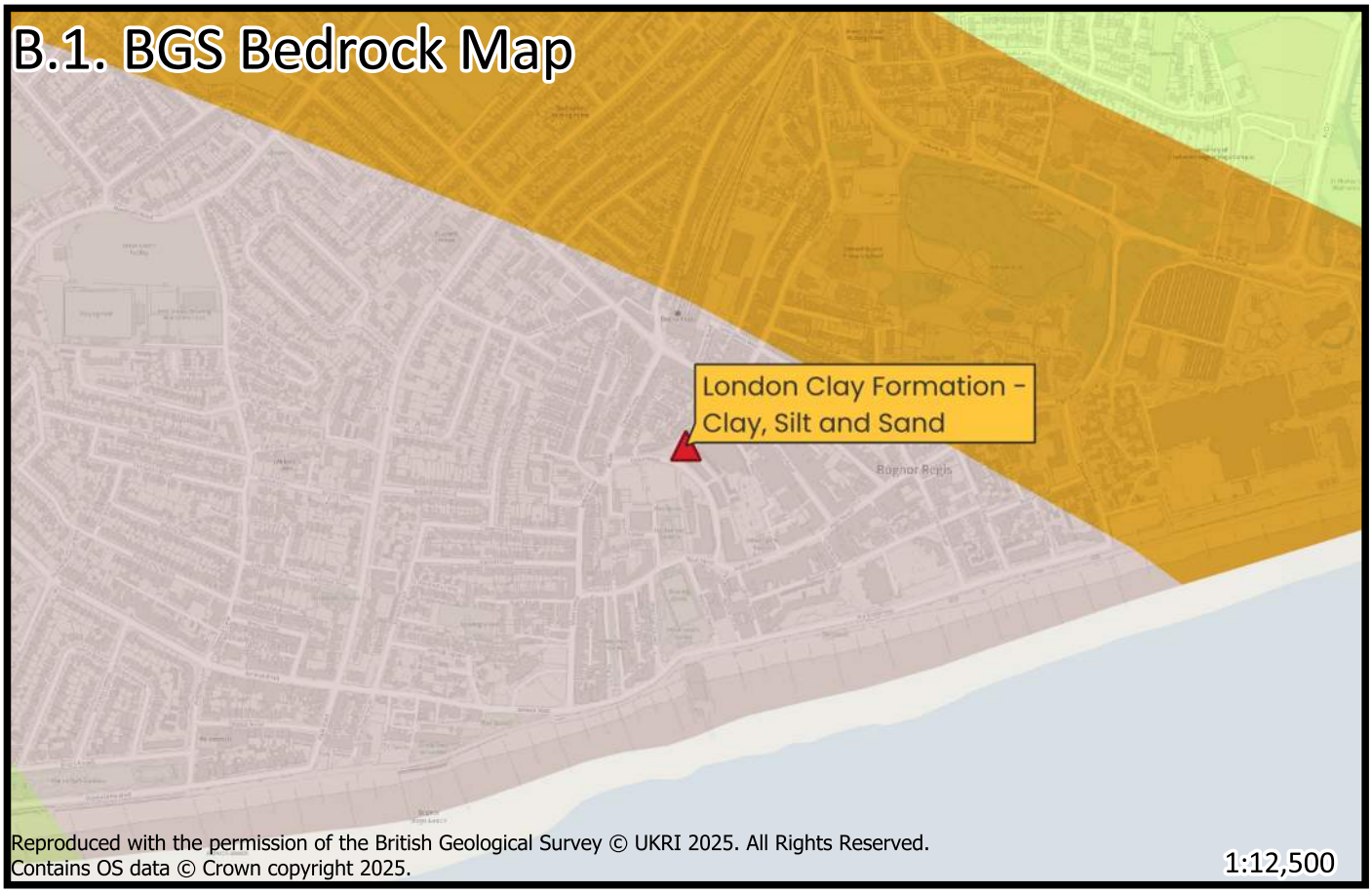
Project:
57 Queensway , Bognor Regis, PO21 1QW

Drawing:
Existing and Proposed Areas
Permeable and Impermeable

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

Appendix B

B.1. BGS Bedrock Map



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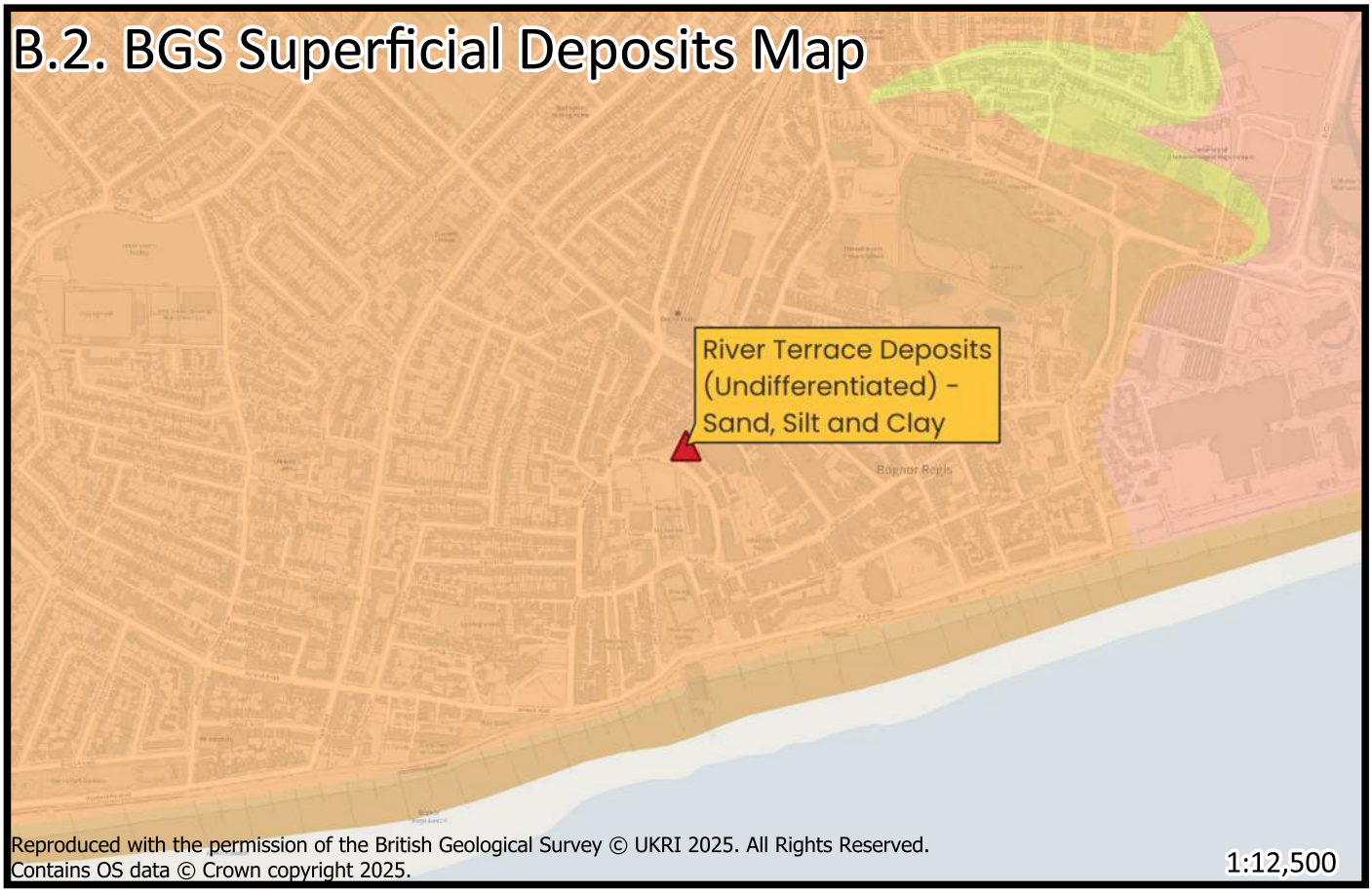
B.2. BGS Superficial Deposits Map



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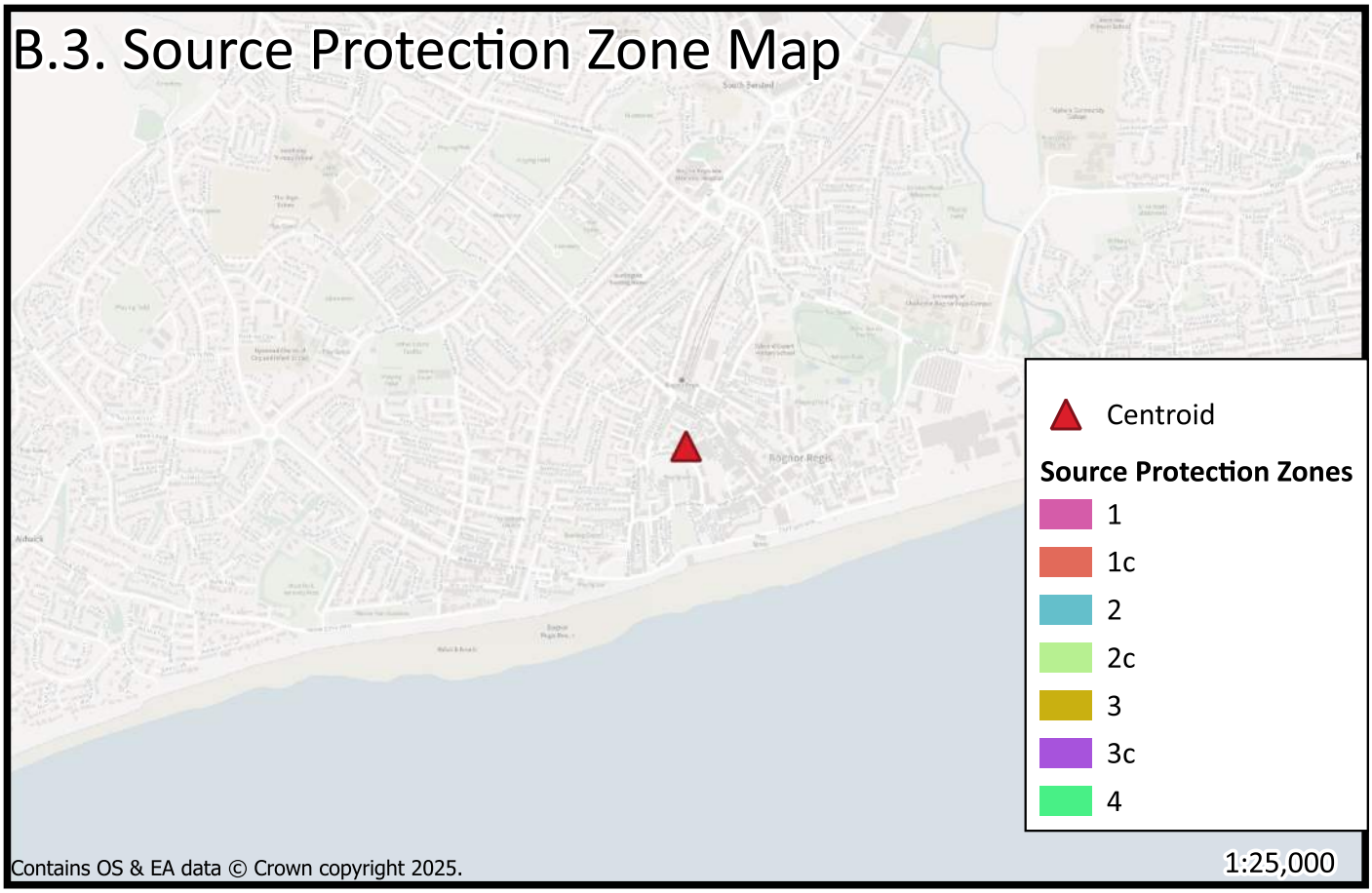
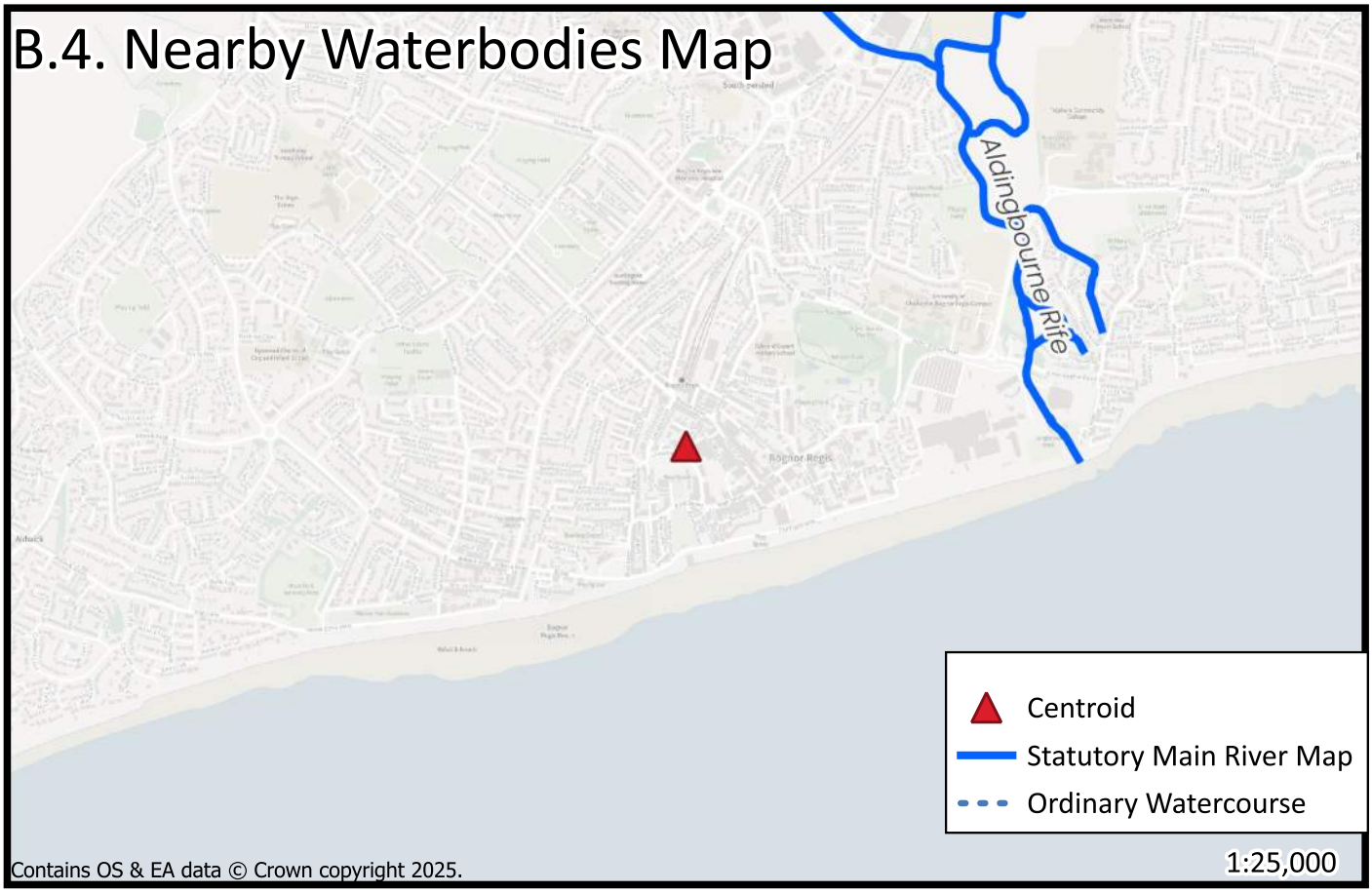
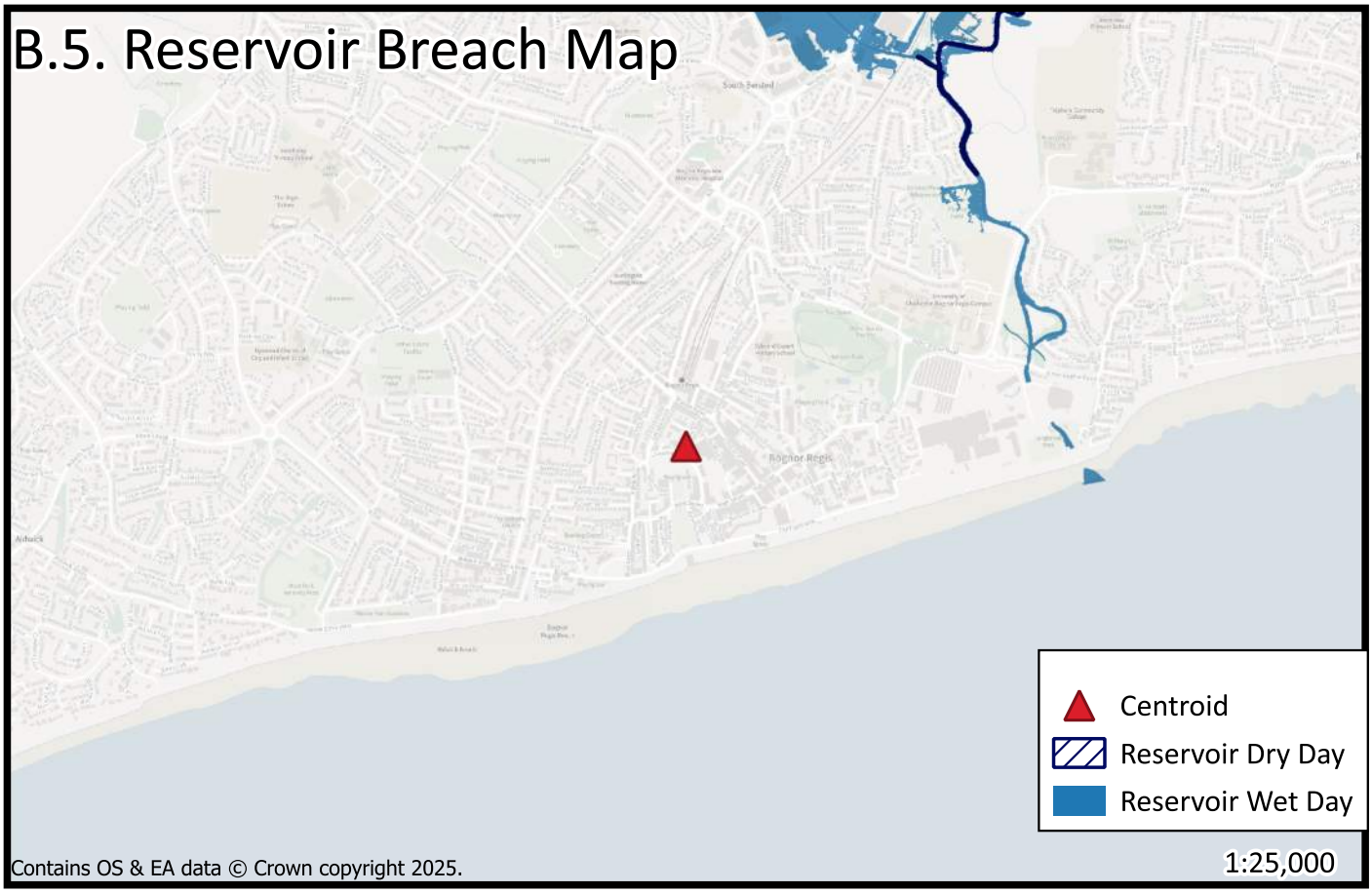
B.3. Source Protection Zone Map



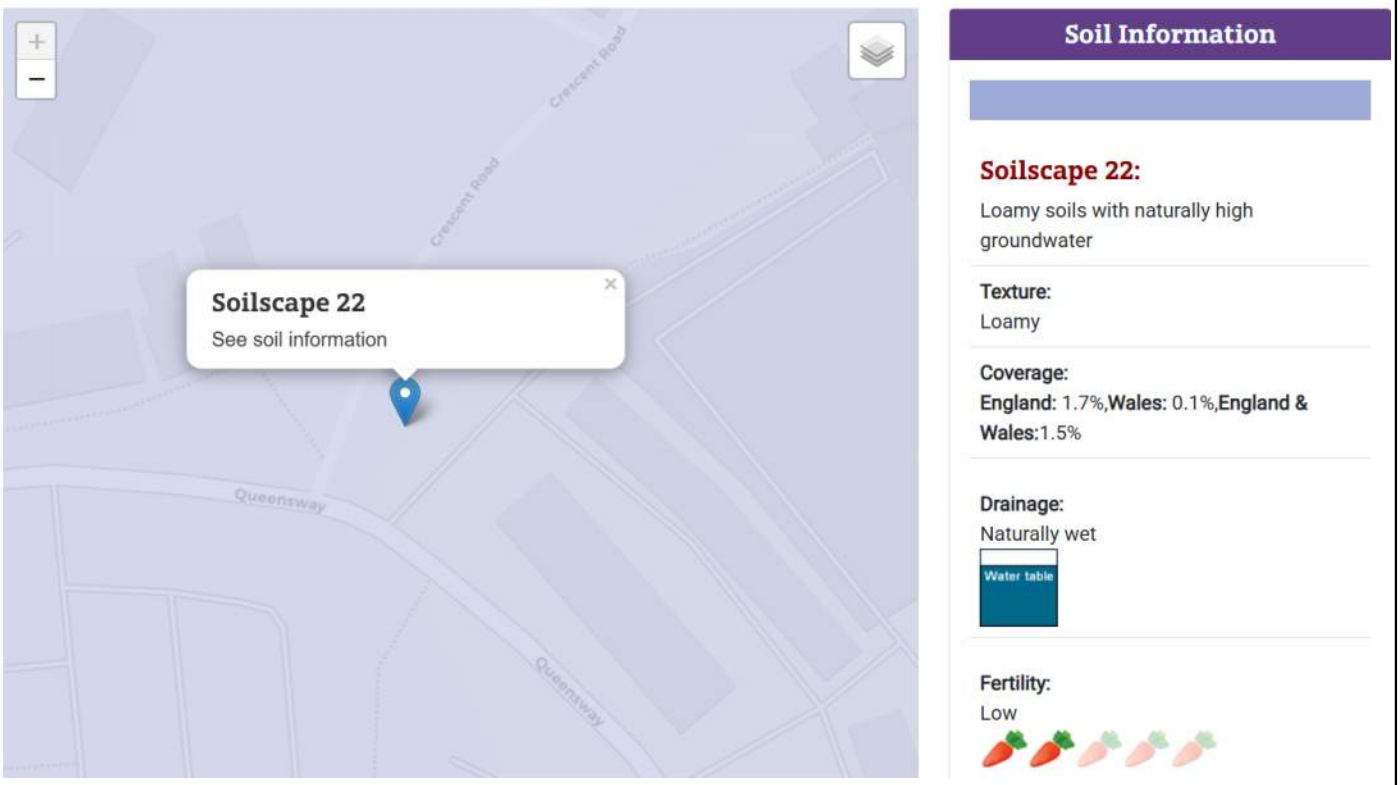
B.4. Nearby Waterbodies Map



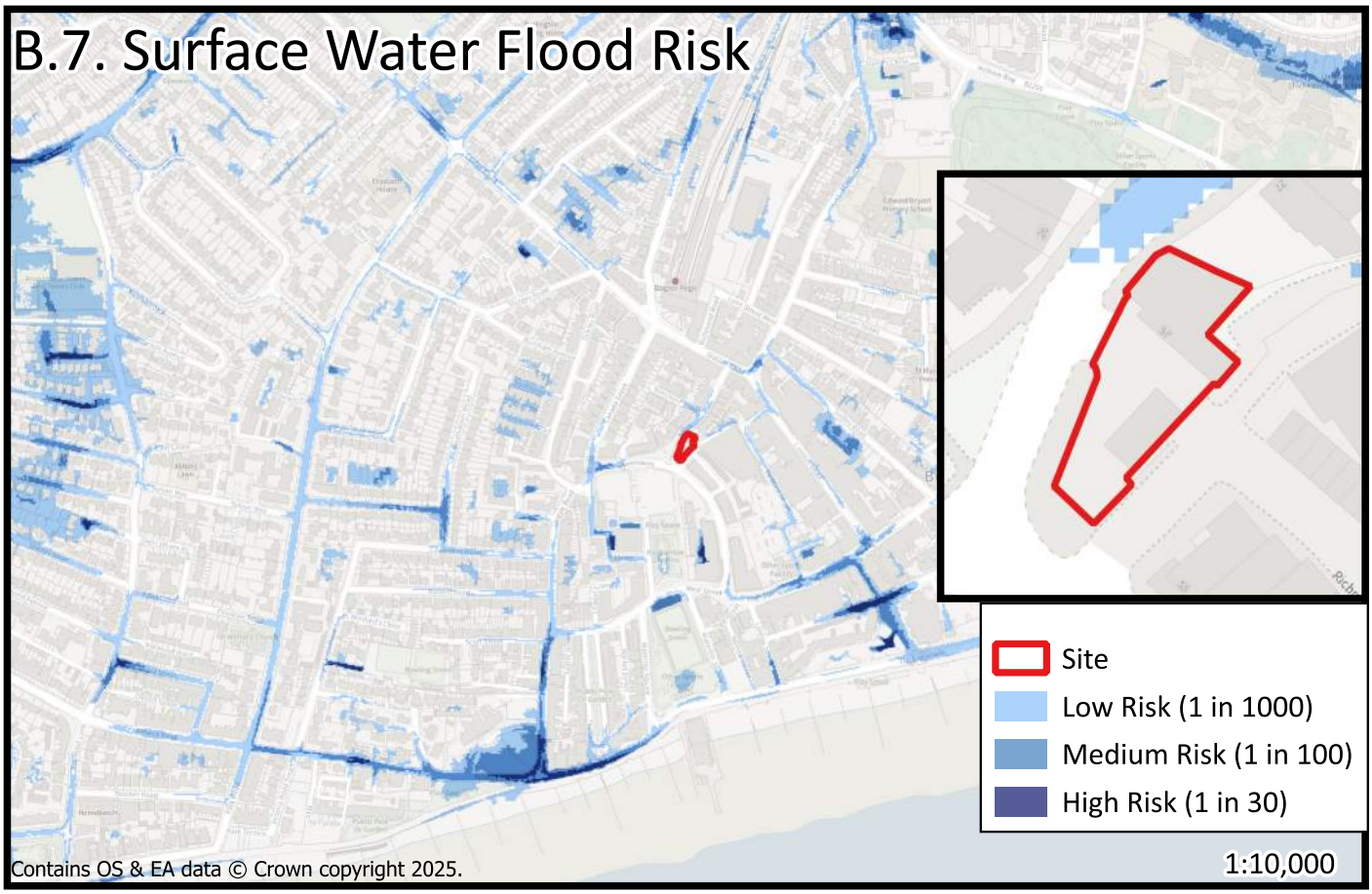
B.5. Reservoir Breach Map



B.6. Soilscapes Map



B.7. Surface Water Flood Risk




South Bersted
Felph
Bognor Regis
0 30 60m
Coords: (493090,99401) Grid Ref:SZ93099940
(c) Crown Copyright and database rights 2025. Ordnance Survey AC0000805307.
Powered by Landmark Solutions.

Site Check Report Report generated on Fri Jan 31 2025
You selected the location: Centroid Grid Ref: SZ93419918
The following features have been found in your search area:

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	/Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf
HYPERLINK	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
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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)
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Green Belt (England)
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National Forest (England)
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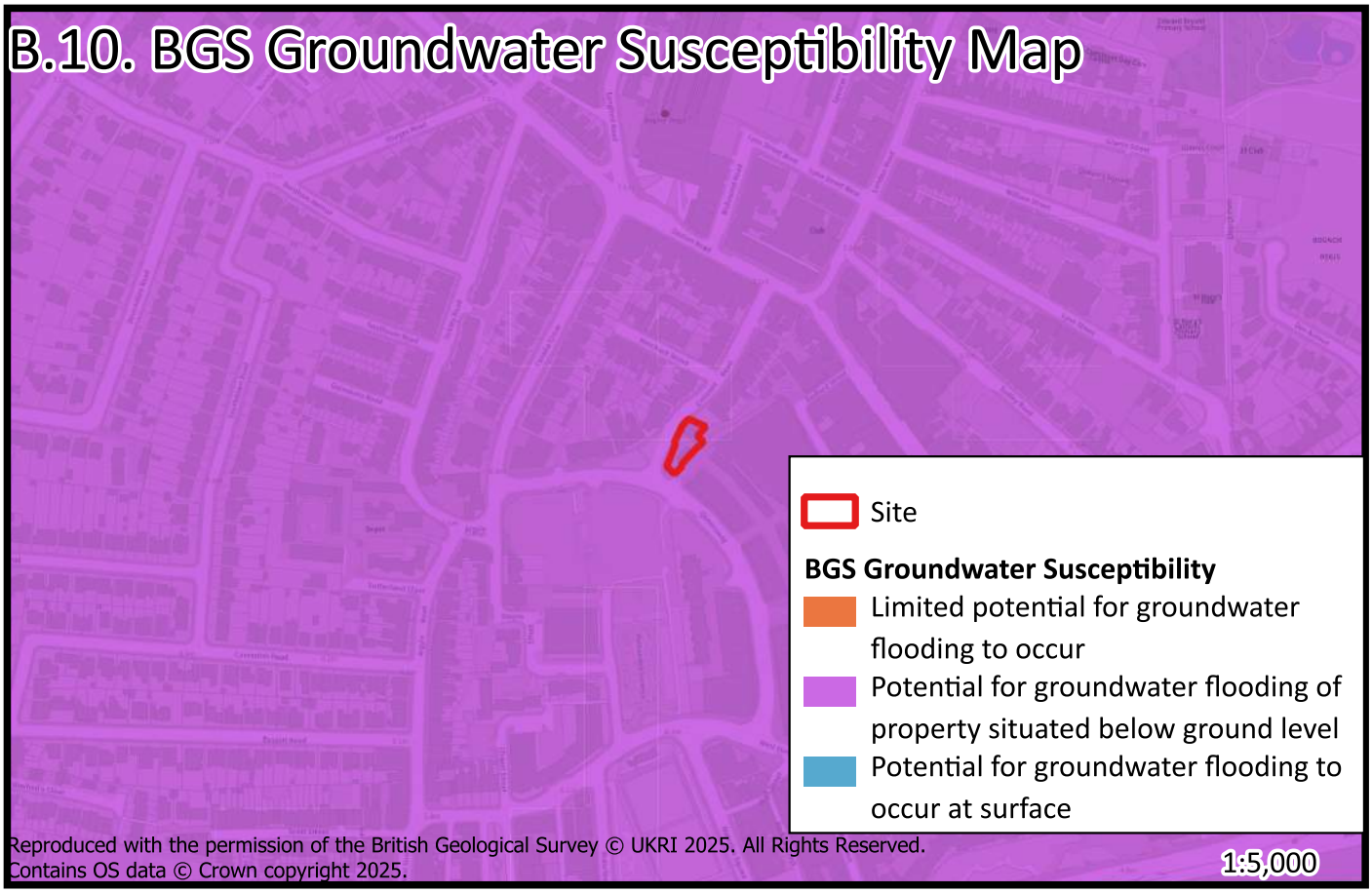
Source Protection Zones merged (England)
No Features found

B.10. BGS Groundwater Susceptibility Map



Flood map for planning

Your reference	Location (easting/northing)	Created
U0560	**493419/99195**	**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 that 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.

Environment Agency

Flood map for planning

Your reference
U0560

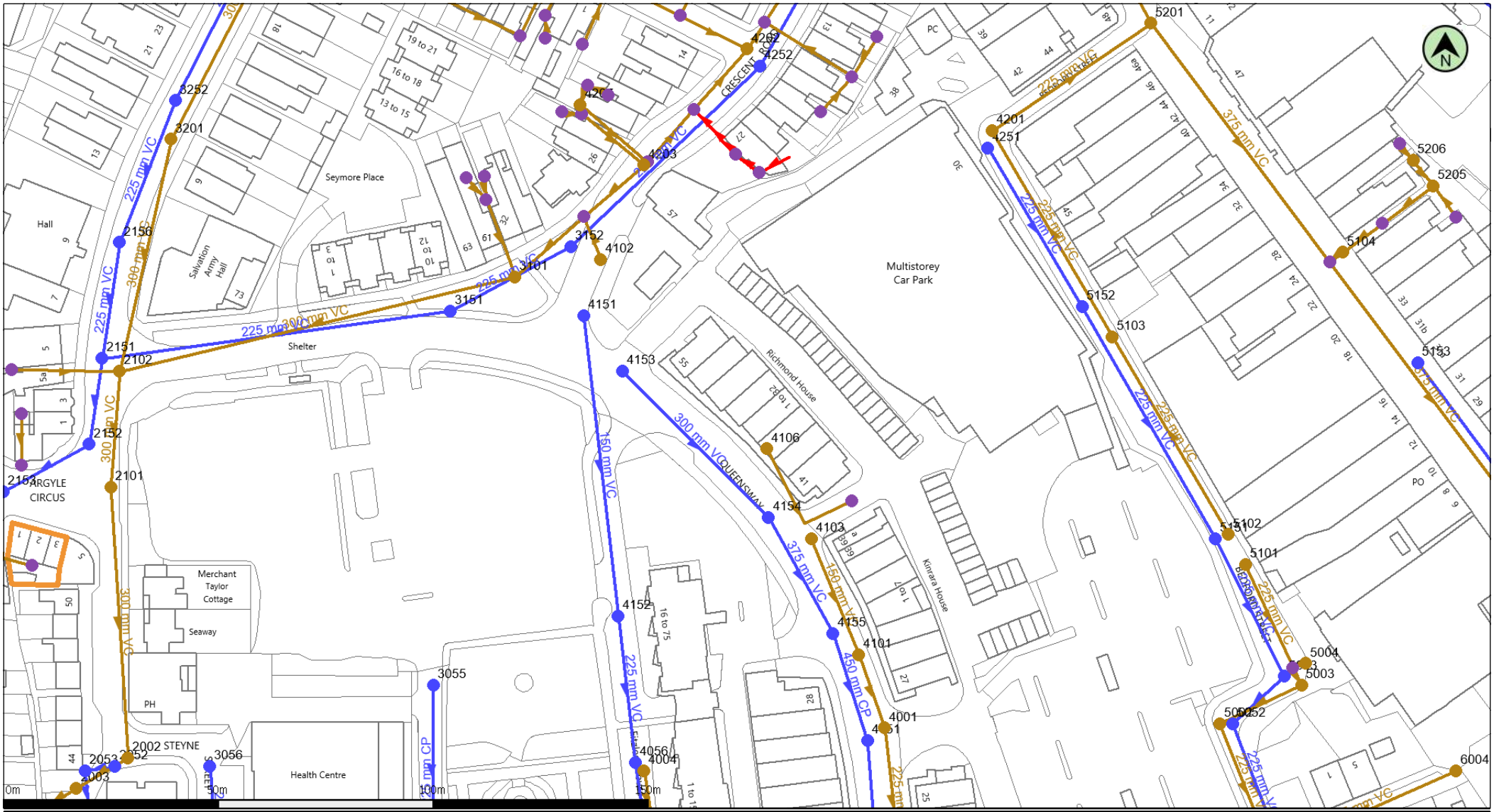
Location (easting/northing)
493419/99195

Scale
1:2500

Created
30 Jan 2025 10:18

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

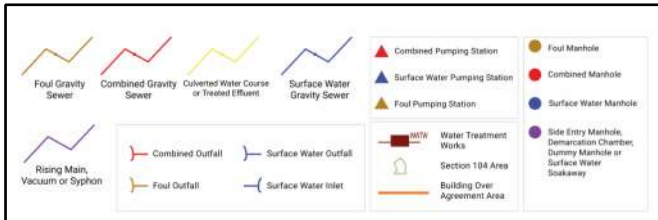


(c) Crown copyright and database rights 2025 Ordnance Survey AC0000808122 | Date: 29/01/25 | Scale: 1:1250 | Map Centre: 493439,99159 | Data updated: 21/01/25 | Our Ref: 1674175 - 1 | Wastewater Plan A4 Powered by digdat

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

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2002	F	6.50	4.51	-
2003	F	6.54	4.51	-
2101	F	6.83	4.80	-
2102	F	6.86	4.88	-
3101	F	6.96	5.19	-
3201	F	7.02	4.99	-
4001	F	6.25	4.45	-
4004	F	6.55	4.15	-
4101	F	6.32	4.64	-
4102	F	6.90	5.76	-
4103	F	6.42	5.11	-
4106	F	0.00	0.00	-
4201	F	6.59	4.64	-
4202	F	7.13	5.05	-
4203	F	7.09	0.00	-
4207	F	0.00	0.00	-
5002	F	5.84	4.32	-
5003	F	5.84	4.56	-
5004	F	5.92	4.90	-
5101	F	5.96	5.34	-
5102	F	5.99	4.95	-
5103	F	6.33	4.80	-
5104	F	0.00	0.00	-
5201	F	6.70	4.34	-
5205	F	0.00	0.00	-
5206	F	0.00	0.00	-
6004	F	5.55	3.92	-
2052	S	6.52	5.11	-
2053	S	6.56	5.10	-
2151	S	6.88	4.91	-
2152	S	6.84	4.80	-
2153	S	6.71	4.69	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2156	S	6.93	5.06	-
3055	S	6.69	5.56	-
3056	S	6.47	5.58	-
3151	S	7.14	5.60	-
3152	S	7.03	5.72	-
3252	S	7.02	5.19	-
4051	S	6.20	4.56	-
4056	S	6.52	4.98	-
4151	S	6.74	5.70	-
4152	S	6.66	5.32	-
4153	S	6.81	4.99	-
4154	S	6.52	4.71	-
4155	S	6.38	4.56	-
4251	S	6.55	4.96	-
4252	S	7.08	5.90	-
5052	S	5.74	4.13	-
5053	S	5.85	4.19	-
5151	S	5.99	4.41	-
5152	S	6.39	4.73	-
5153	S	6.01	4.75	-

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	76.426	1.350
South	0.022	6.00	6.700	450	7.730	75.246	1.350
Tank			6.700		37.556	48.573	2.021
Outfall - MH4153			6.740	450	28.074	17.862	2.602

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)
1.000	South	Tank	40.013	0.600	5.350	4.679	0.671	59.6	150	6.51	50.0
2.000	North	Tank	40.000	0.600	5.350	4.950	0.400	100.0	150	6.66	50.0
1.001	Tank	Outfall - MH4153	25.000	0.600	4.679	4.138	0.541	46.2	150	6.94	50.0

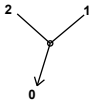
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.305	23.1	4.0	1.200	1.871	0.022	0.0	42	0.977
2.000	1.005	17.8	4.0	1.200	1.600	0.022	0.0	48	0.813
1.001	1.484	26.2	8.0	1.871	2.452	0.044	0.0	57	1.303

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	40.013	59.6	150	Circular	6.700	5.350	1.200	6.700	4.679	1.871
2.000	40.000	100.0	150	Circular	6.700	5.350	1.200	6.700	4.950	1.600
1.001	25.000	46.2	150	Circular	6.700	4.679	1.871	6.740	4.138	2.452

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	South	450	Manhole	Adoptable	Tank		Junction	
2.000	North	450	Manhole	Adoptable	Tank		Junction	
1.001	Tank		Junction		Outfall - MH4153	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
North	70.755	76.426	6.700	1.350	450		0	2.000	5.350	150
South	7.730	75.246	6.700	1.350	450		0	1.000	5.350	150
Tank	37.556	48.573	6.700	2.021			1	2.000	4.950	150
							2	1.000	4.679	150
							0	1.001	4.679	150
Outfall - MH4153	28.074	17.862	6.740	2.602	450		1	1.001	4.138	150

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		

Node Tank Online Orifice Control

Flap Valve	x	Invert Level (m)	4.679	Diameter (m)	0.029
Downstream Link	1.001	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.2		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	4.679
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	188

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	0.400	20.0	0.0	0.800	20.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.62%

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	0.0065	0.0000	OK
15 minute summer	South	9	5.386	0.036	2.9	0.0057	0.0000	OK
120 minute summer	Tank	84	4.840	0.161	3.0	3.0660	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	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	2.000	Tank	2.9	0.740	0.161	0.1546	
15 minute summer	South	1.000	Tank	2.9	0.987	0.126	0.3041	
120 minute summer	Tank	Orifice	Outfall - MH4153	0.7				5.7

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.397	0.047	3.8	0.0075	0.0000	OK
15 minute summer	South	11	5.391	0.041	3.8	0.0065	0.0000	OK
120 minute summer	Tank	86	4.894	0.215	3.6	4.0838	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	0.000	0.7	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	2.000	Tank	3.8	0.799	0.212	0.1880	
15 minute summer	South	1.000	Tank	3.8	0.999	0.165	0.3828	
120 minute summer	Tank	Orifice	Outfall - MH4153	0.8				7.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.417	0.067	7.2	0.0106	0.0000	OK
15 minute summer	South	11	5.407	0.057	7.2	0.0091	0.0000	OK
120 minute summer	Tank	92	5.111	0.432	7.0	8.2111	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	0.000	0.9	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	2.000	Tank	7.2	0.952	0.403	0.3009	
15 minute summer	South	1.000	Tank	7.2	1.015	0.312	0.4764	
120 minute summer	Tank	Orifice	Outfall - MH4153	1.1				13.6

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 98.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.434	0.084	10.5	0.0133	0.0000	OK
15 minute summer	South	11	5.421	0.071	10.5	0.0113	0.0000	OK
180 minute summer	Tank	128	5.334	0.655	7.6	12.4367	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	0.000	1.1	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	2.000	Tank	10.5	1.045	0.589	0.4230	
15 minute summer	South	1.000	Tank	10.5	1.079	0.455	0.5161	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.4				21.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	North	11	5.428	0.078	9.3	0.0123	0.0000	OK
15 minute summer	South	11	5.416	0.066	9.3	0.0105	0.0000	OK
180 minute summer	Tank	132	5.266	0.587	6.8	11.1484	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	0.000	1.1	0.0000	0.0000	OK

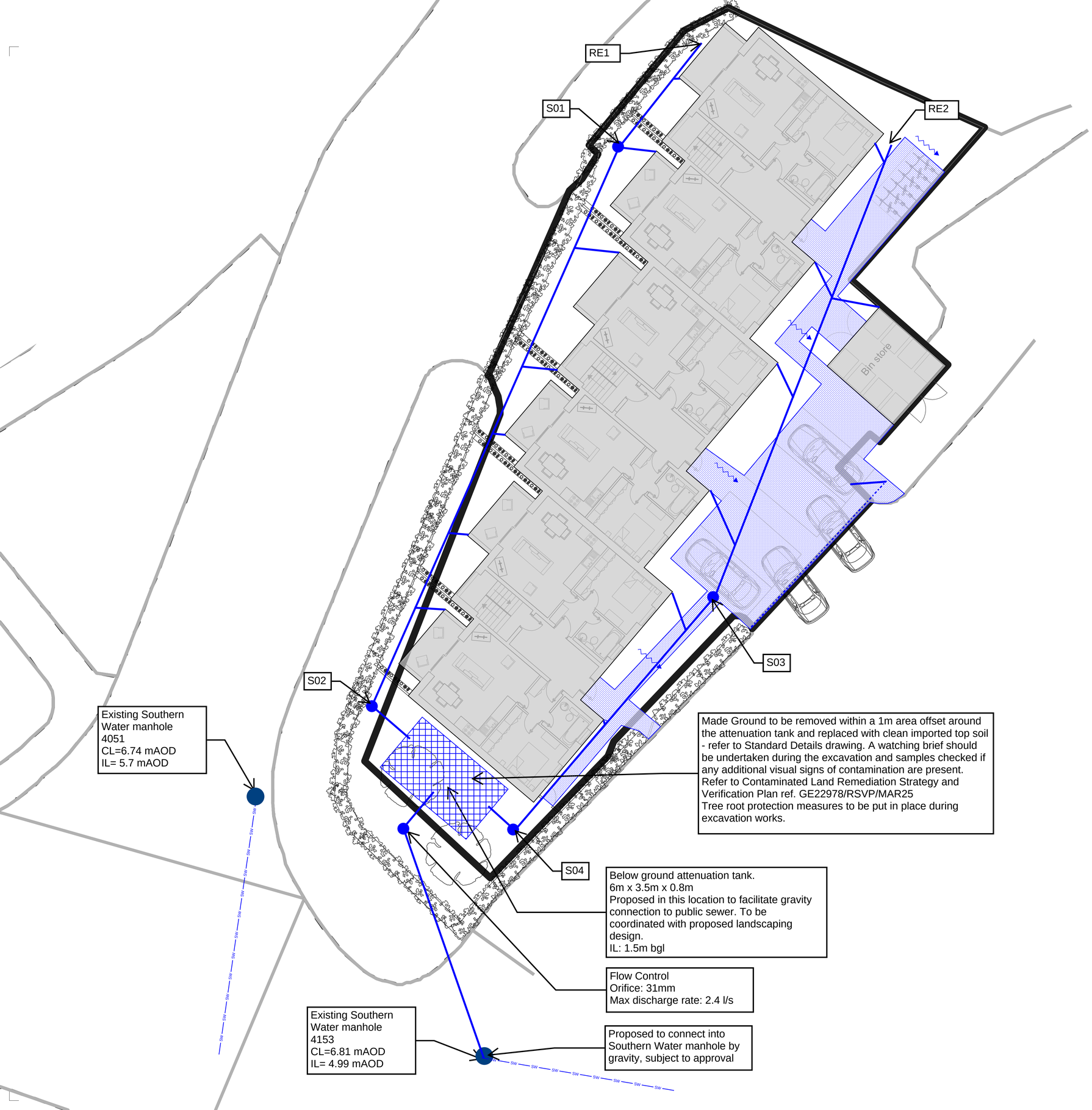
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	North	2.000	Tank	9.3	1.016	0.522	0.3647	
15 minute summer	South	1.000	Tank	9.3	1.061	0.403	0.5020	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.3				19.8

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	North	132	5.858	0.508	5.0	0.0807	0.0000	SURCHARGED
180 minute summer	South	132	5.858	0.508	5.0	0.0807	0.0000	SURCHARGED
180 minute summer	Tank	132	5.857	1.178	10.0	15.2095	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	4.138	0.000	1.3	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	2.000	Tank	13.4	1.104	0.757	0.5577	
15 minute summer	South	1.000	Tank	13.5	1.128	0.586	0.5503	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.9				27.2

Appendix D



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

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.

KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface
- Silt Trap
- Existing Surface Water Sewer Pipe

Rev	Details	Date	By	Chd

Drawing Status: **PRELIMINARY**

URBANWATER

Client:

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

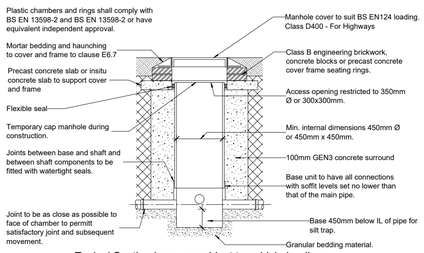
Drawing: Proposed Drainage Strategy

Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	1:100	U0560	001	P1

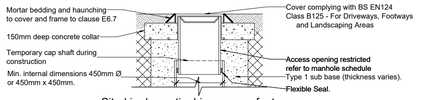
Drawing Scale Bar

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

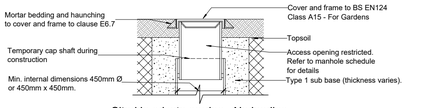
Measure length of line above for checking of scale



Typical Section in areas subject to vehicle loading



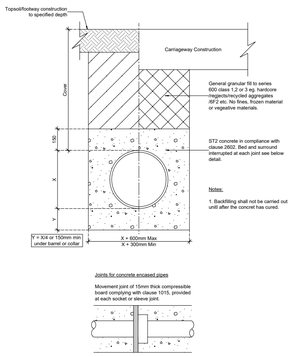
Sited in domestic driveways or footways



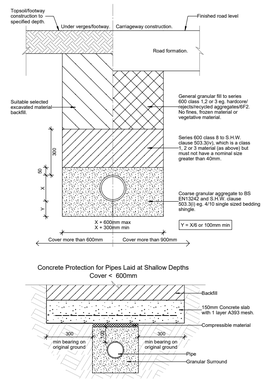
Sited in private garden - No loading

Notes:
1. Refer to drawing 8193 for base layouts.

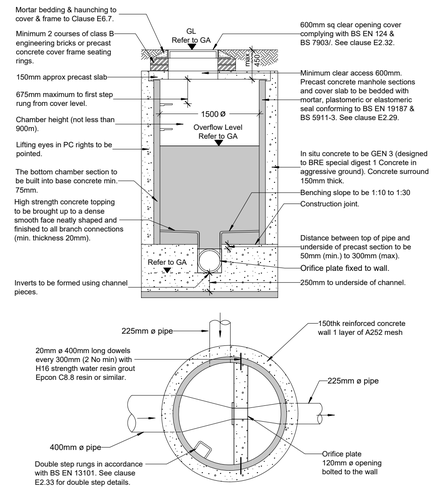
Silt Trap Plastic



Pipe Bedding Detail Type Z



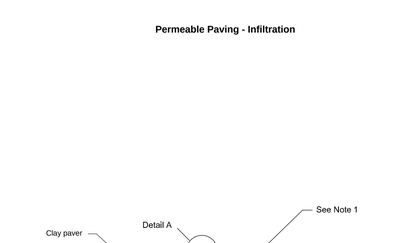
Pipe Bedding Detail Type S



Notes
1. Refer to 8187 Rocker Pipe details.

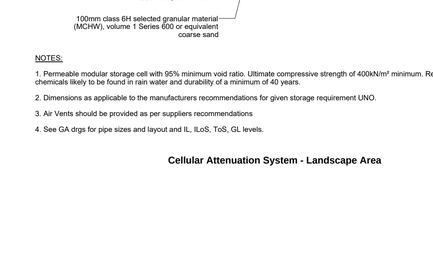
2. The precast concrete rings and weir could be replaced for HDPE chambers such as SEL-1.5m diameter chamber. See www.selel.co.uk or e-mail sales@selenvironmental.com for further details.

Flow Control - Orifice Plate



Permeable Paving - Infiltration

Refer to Contaminated Land Remediation Strategy and Verification Plan ref. GE22978/RSV/PIMAR25 for clean imported soil material to replace contaminated Made Ground within the extents of the excavation required to install the below ground attenuation tank. If the bottom of excavation is still located within contaminated Made Ground, a deter to dig membrane is to be installed as a barrier between the clean imported soil and the remaining Made Ground.



NOTES:

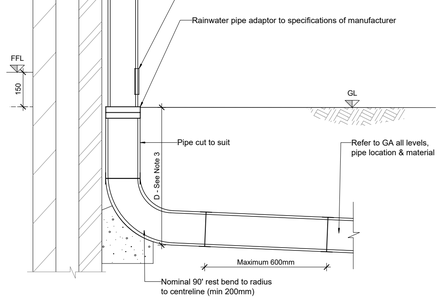
1. Permeable modular storage cell with 95% minimum void ratio. Ultimate compressive strength of 400kN/m² minimum. Resistant to chemicals likely to be found in rain water and durability of a minimum of 40 years.

2. Dimensions as applicable to the manufacturers recommendations for given storage requirement UNO.

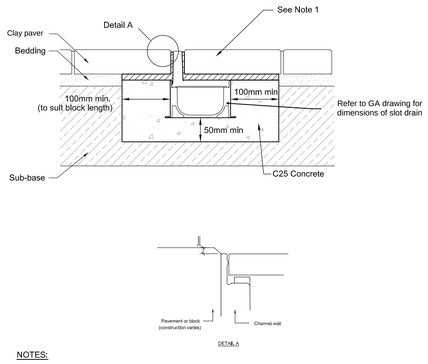
3. Air Vents should be provided as per suppliers recommendations

4. See GA drgs for pipe sizes and layout and IL, ILoS, ToS, GL levels.

Cellular Attenuation System - Landscape Area



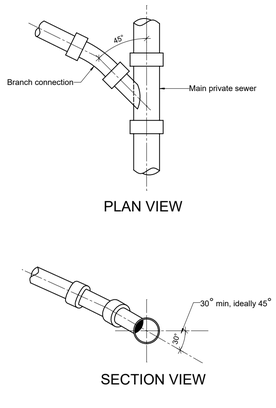
8251 - External Rainwater Pipe Connection Detail



NOTES:

1. First block to be laid as soldier course and bedded in polymer modified cement/sand mortar

Slot Drainage Channel



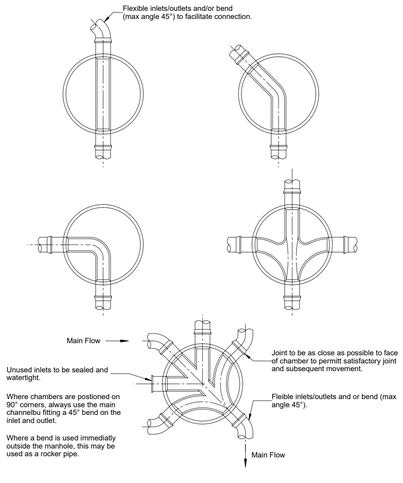
NOTES:

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



Chamber Type 3 Base Layouts

GENERAL NOTES

Rev	Details	Date	By	Ctrd

Drawing Status:

PRELIMINARY

URBANWATER

Client:

Project:

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

Drawing:

Standard Details

Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	NTS	U0560	006	P1