Drainage Strategy

22&24 St.Annes Road, London Colney, AL2 1LJ

Reference: 497 -Rev - V1

Date: jun-24

Appendices

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[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?	Yes
Soils and Geology	Soil permeability? - See appendix B for results	No
Space constraints	Space for SuDS components?	Yes
Topography	Sited on a flat site?	No
	Sited on a steep slope (5-15%)	Yes
	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?	Unknown
Source Protection Zone	Is the site within a SPZ 3?	Yes
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		0.030	0.039
Permeable Areas	Connected to Drainage	0.000	0.000
	Self Draining Areas	0.025	0.035
Areas Draining Away from drainage System		0.065	0.046
	Total Development Area	0.120	0.120

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 And Gravel.
Bedrock geology classification	The British Geological Society records of the site show that it is located within the Lewes Nodular Chalk Formation And Seaford Chalk Formation (Undifferentiated) - Chalk.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of freely draining 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 no surface water sewer in the proximity to the site.
Is a discharge to a combined sewer possible?	There is a combined water sewer in the proximity to the site. It is 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 40%. As per tables above, it is proposed to discharge at a rate of 2.8 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	0.20	N/A	N/A	0.0000
1 in 1	0.20	5.50	2.8	0.0000
1 in 2	0.20	7.00	2.8	0.0000
1 in 30	0.50	13.00	2.8	0.0000
1 in 30 + CC	N/A	N/A	2.8	0.0000
1 in 100	0.70	16.60	2.8	0.0000
1 in 100 + CC	N/A	N/A	2.8	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: Proposed Drainage System

SuDS Proposed	Feasible	Proposed
Use of green roofs	No	No
Store rainwater for later use	No	No
Use infiltration techniques, for instance soakaways, permeable surfaces	No	No
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	No	No
Discharge rainwater to the combined sewer	Yes	Yes

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 + 40% 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

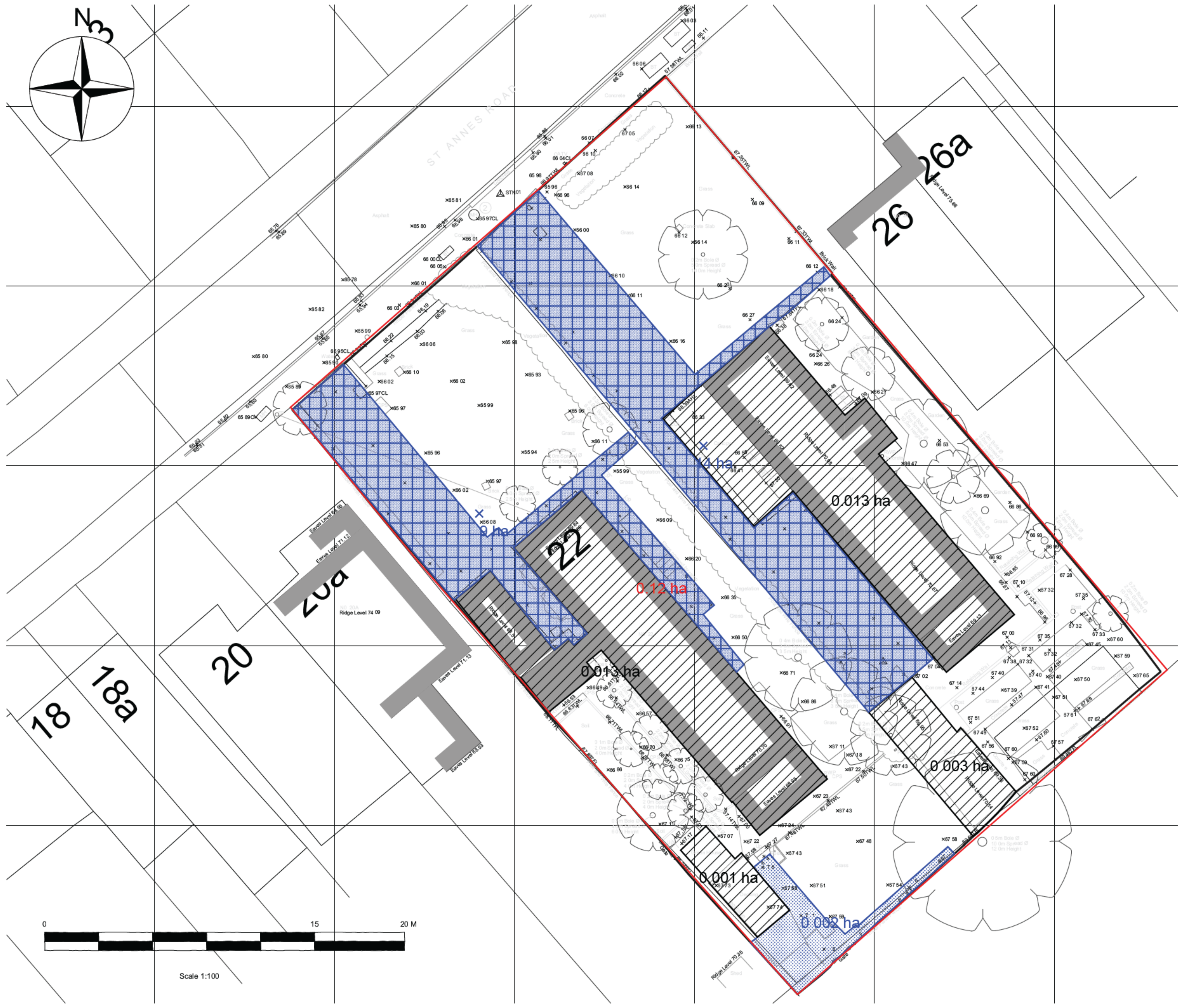
Maintenance and Management plan for proposed SuDS

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:

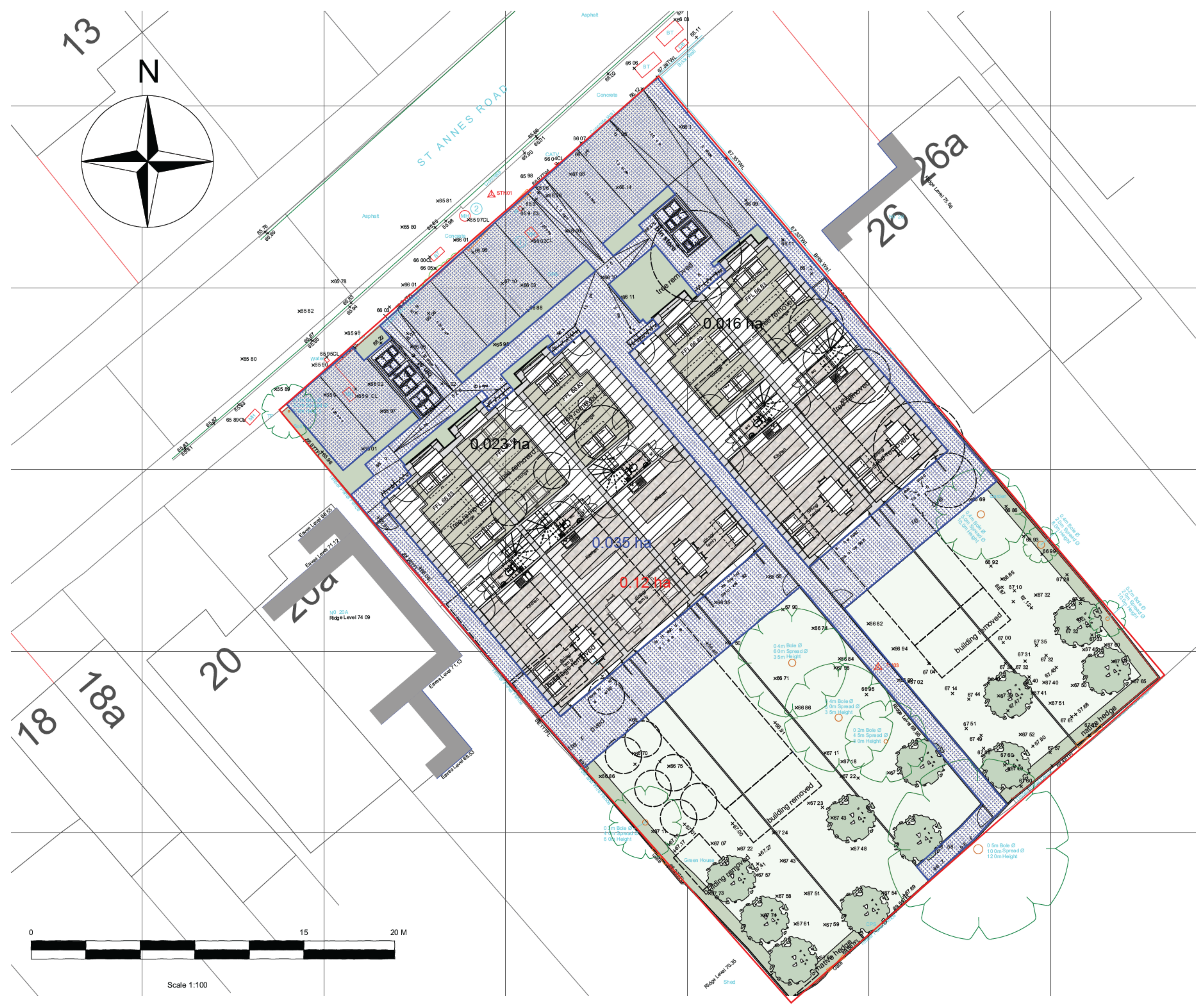
INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	**Frequency**
Inlets, outlets and surface control structures	
Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Strim vegetation 1m min. surround to structures and keep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



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 AREAS
- IMPERMEABLE AREAS
- STUDY AREA

Rev	Details	Date	By	Chk

Drawing Status:
PRELIMINARY

URBANWATER

Client:

Project:
22&24 St.Annes Road, London Colney, AL2 1LJ

Drawing:
Existing and Proposed Areas
Permeable and Impermeable

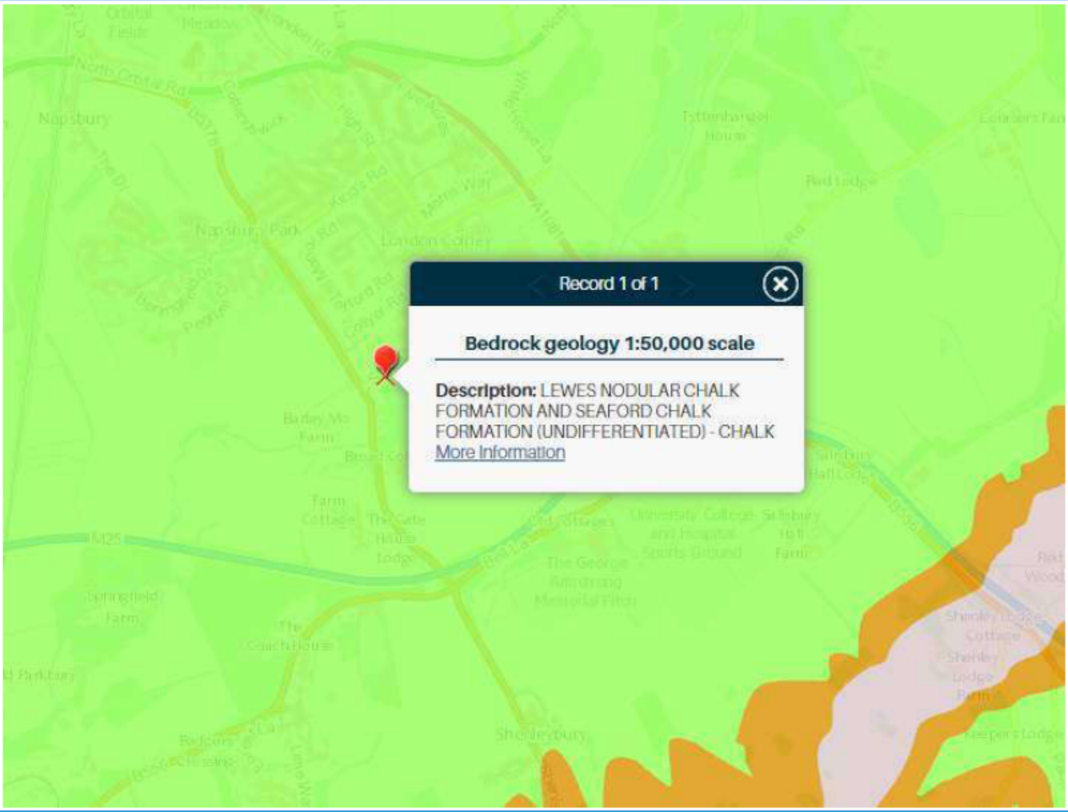
Print Size:	Project No:	Drawing No:	Revision:
A1	0497	002	P1

Appendix B

SITE GEOLOGY

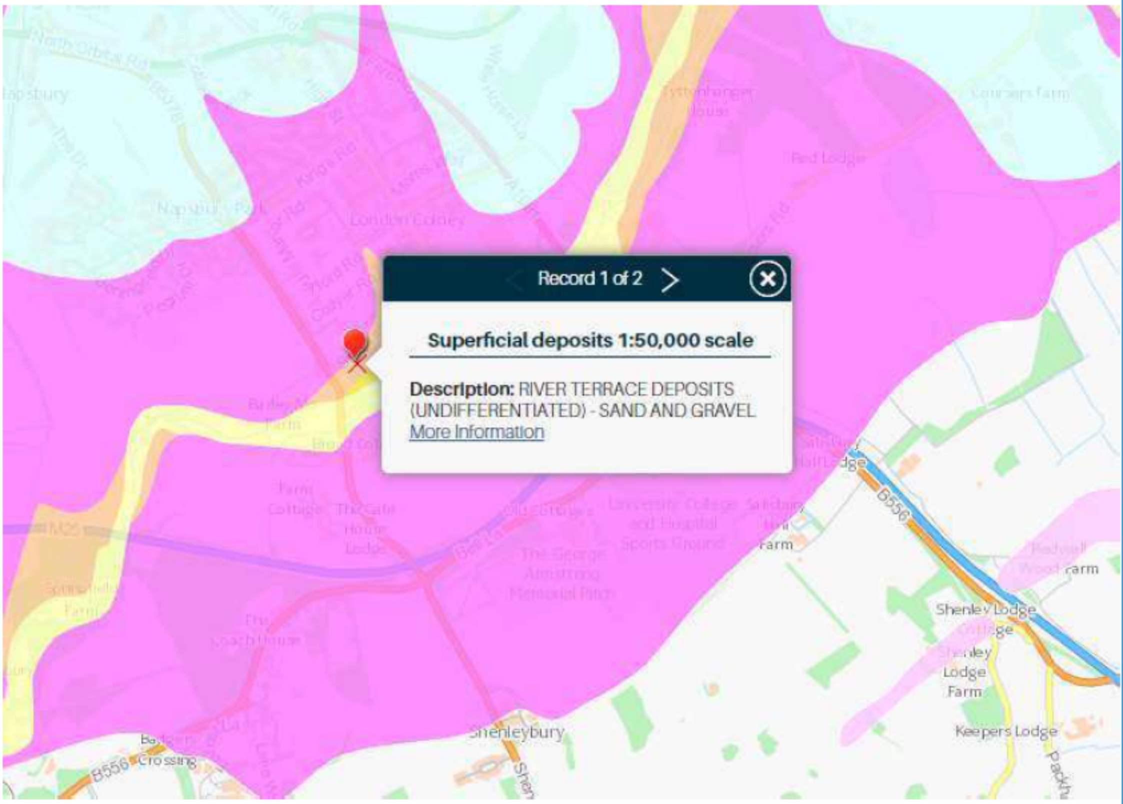
GEOINDEX ONSHORE

GEOLOGY - BEDROCK - LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED) - CHALK



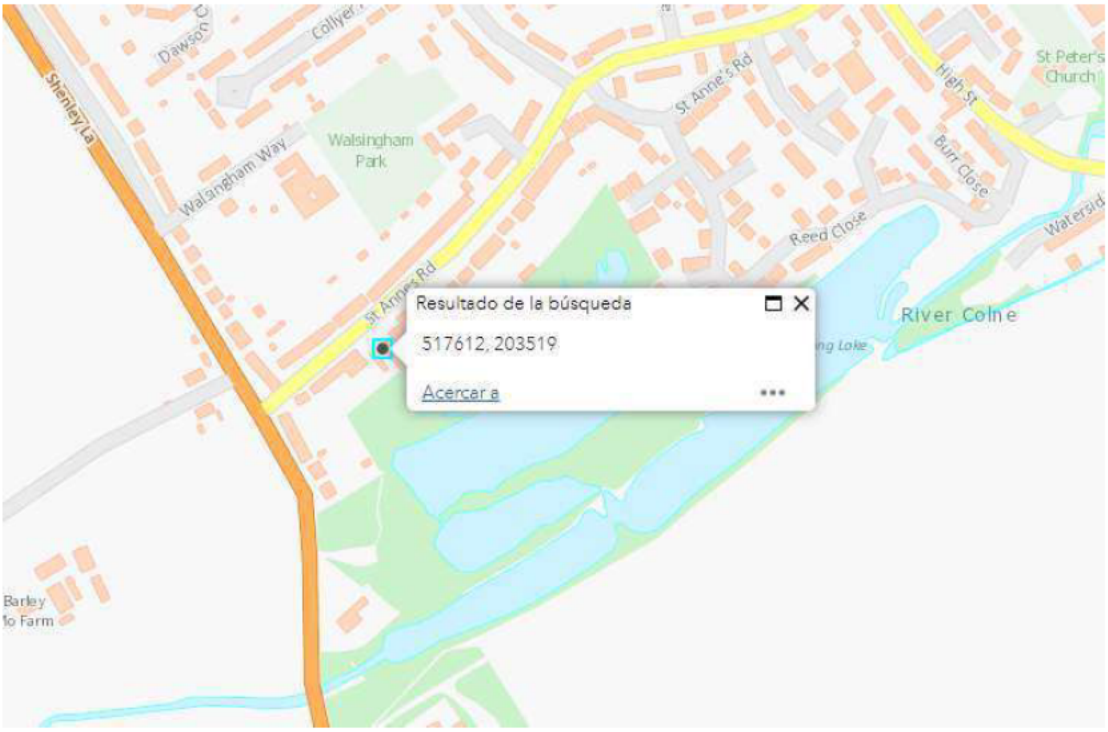
GEOINDEX ONSHORE

GEOLOGY - SUPERFICIAL DEPOSITS - RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL



SITE HYDROGEOLOGY

Environment Agency Main River Map



Flood risk from reservoirs

Extent of flooding

When river levels are normal

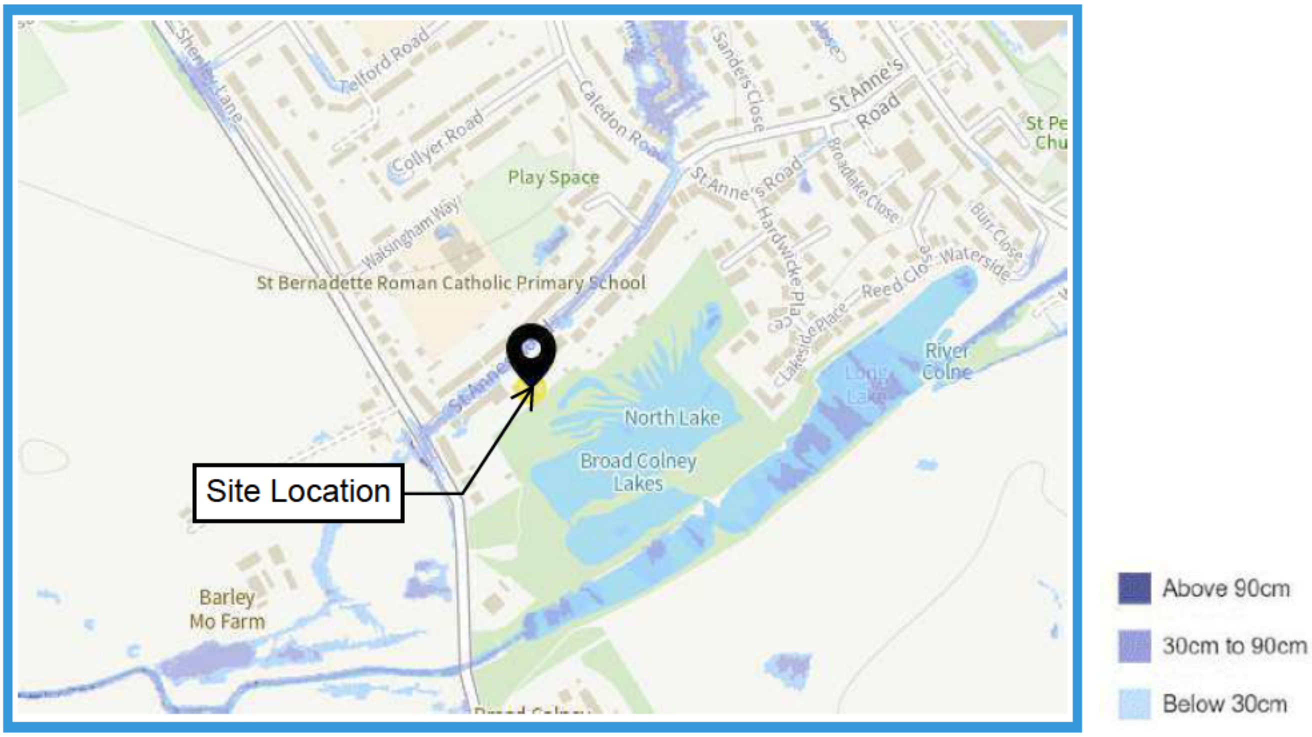
When there is also flooding from rivers

SITE SURFACE WATER FLOOD RISK

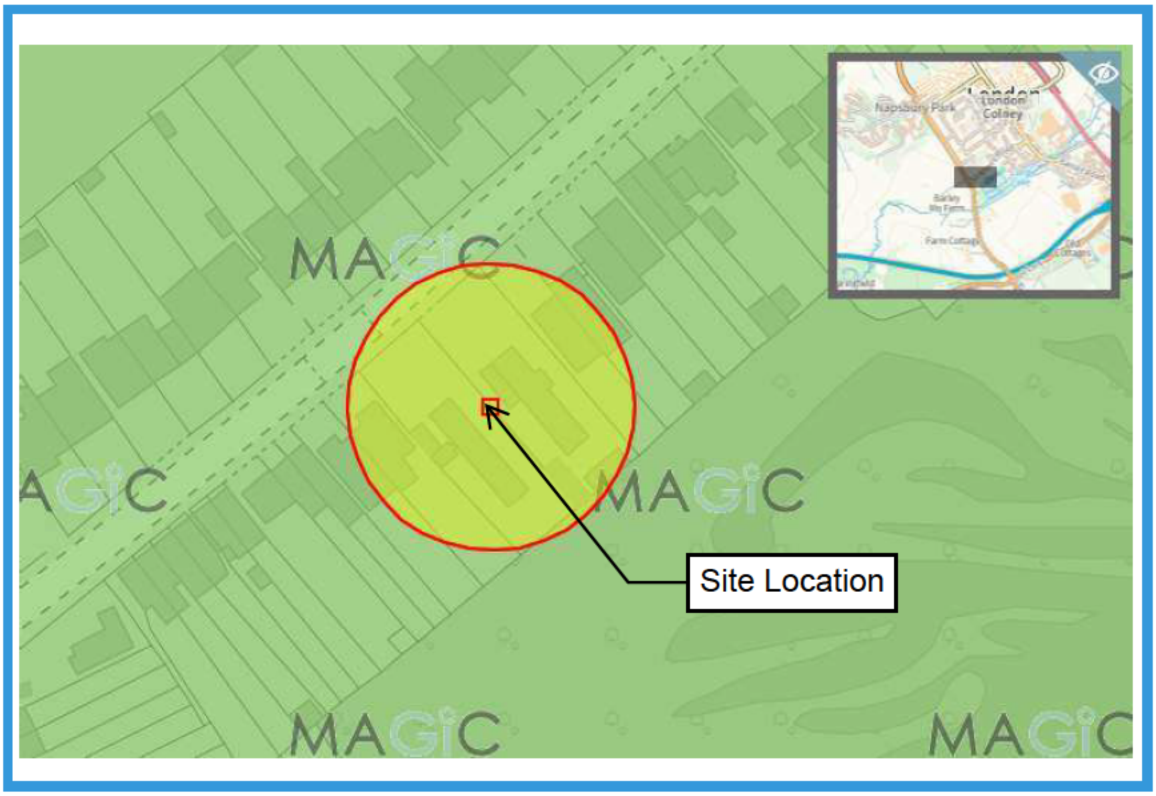
Flood risk from surface water

Extent of flooding

High risk means a chance of flooding greater than 3.3% (1:30)
Medium risk means a chance of flooding of btw 1% (1:100) and 3.3%
Low risk means a chance of flooding of btw 0.1% (1:1000) and 1%
Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding



MAGIC RESULTS



Site Check Results

Site Check Report Report generated on Mon Jun 17 2024
You selected the location: Centroid Grid Ref: TL17610351
The following features have been found in your search area:

Source Protection Zones merged (England)

Zone	3
Zone	2

Aquifer Designation Map (Bedrock) (England)

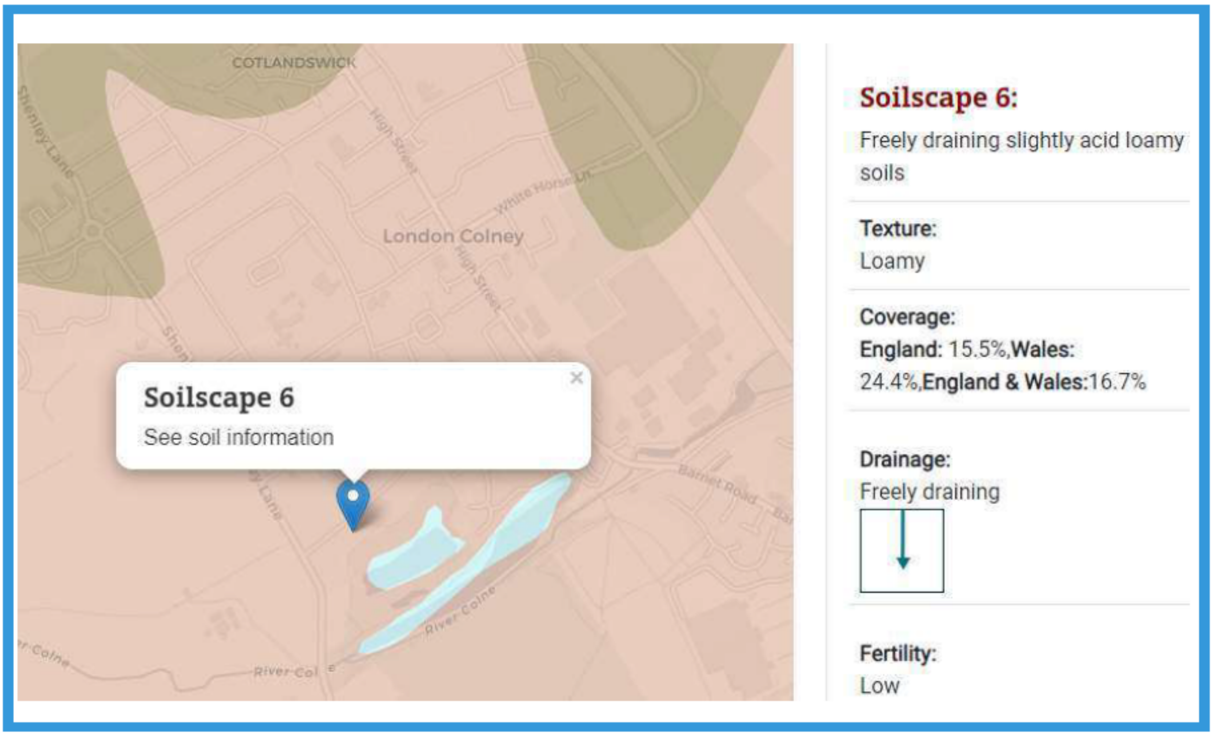
Typology	Principal

Aquifer Designation Map (Superficial Drift) (England)

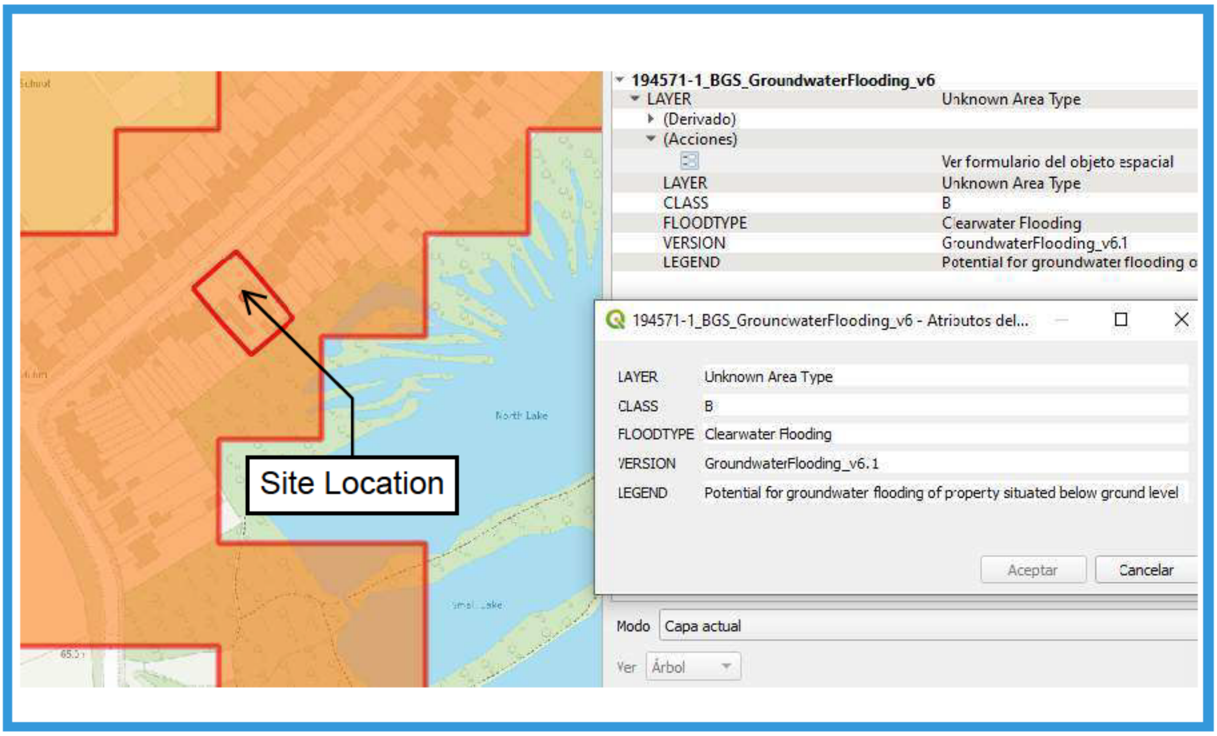
Typology	Secondary A

OK Cancel Export to CSV Print

SOILSCAPES MAP



GROUND WATER FLOOD RISK



Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**517612/203517**	**18 Jun 2024 5:15**

Your selected location is in flood zone 3, an area with a high probability of flooding.

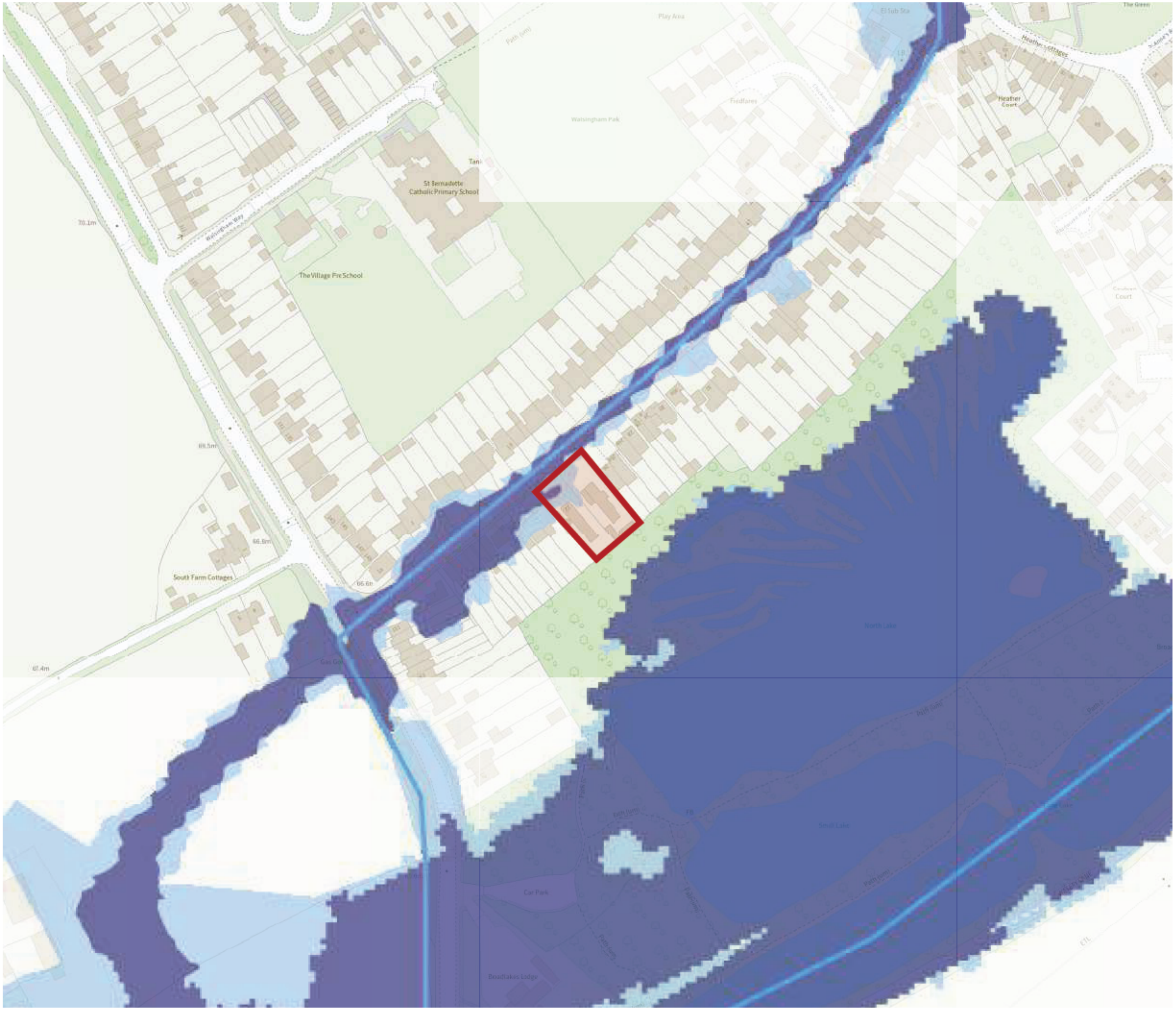
This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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.



<Unspecified>

517612/203517

1:2500

18 Jun 2024 5:15

0 20 40 60m

Site Check Report Report generated on Mon Jun 17 2024
You selected the location: Centroid Grid Ref: TL17610351
The following features have been found in your search area:

SSSI Impact Risk Zones - to assess planning applications for likely impacts on SSSIs/SACs/SPAs & Ramsar sites (England)

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?	2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:
All Planning Applications	
Infrastructure	Airports, helipads and other aviation proposals.
Wind & Solar Energy	
Minerals, Oil & Gas	Oil & gas exploration/extraction.
Rural Non Residential	
Residential	
Rural Residential	
Air Pollution	Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 750m², manure stores > 3500t.
Combustion	
Waste	
Composting	
Discharges	
Water Supply	
Notes 1	
Notes 2	
GUIDANCE - How to use the Impact Risk Zones	/Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf

Source Protection Zones merged (England)

Zone	3
Zone	2

Aquifer Designation Map (Bedrock) (England)

Typology	Principal

Aquifer Designation Map (Superficial Drift) (England)

Typology	Secondary A

Soilscape (England)

Reference	6
Name	FREELY DRAINING SLIGHTLY ACID LOAMY SOILS
Main Surface Texture Class	LOAMY
Natural Drainage Type	FREELY DRAINING
Natural Fertility	LOW
Characteristic Semi-natural Habitats	NEUTRAL AND ACID PASTURES AND DECIDUOUS WOODLANDS; ACID COMMUNITIES SUCH AS BRACKEN AND GORSE IN THE UPLANDS
Main Land Cover	ARABLE AND GRASSLAND
Hyperlink	/Metadata_for_magic/soilscape_summary.pdf

Areas of Outstanding Natural Beauty (England)
No Features found

Limestone Pavement Orders (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

National Parks (England)
No Features found

Ramsar Sites (England) - points
No Features found

Ramsar Sites (England)
No Features found

Proposed Ramsar Sites (England) - points
No Features found

Proposed Ramsar Sites (England)
No Features found

Sites of Special Scientific Interest Units (England) - points
No Features found

Sites of Special Scientific Interest Units (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

Appendix C

GREENFIELD

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.2
Summer CV	1.000	2 year (l/s)	0.2
Winter CV	1.000	30 year (l/s)	0.5
Analysis Speed	Normal	100 year (l/s)	0.7
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	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.120	Betterment (%)	0
SAAR (mm)	673	QBar	0.2
Soil Index	2	Q 1 year (l/s)	0.2
SPR	0.30	Q 2 year (l/s)	0.2
Region	6	Q 30 year (l/s)	0.5
Growth Factor 1 year	0.85	Q 100 year (l/s)	0.7
Growth Factor 2 year	0.88		

BROWNFIELD

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m^3/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	5.5
Summer CV	1.000	2 year (l/s)	7.0
Winter CV	1.000	30 year (l/s)	13.0
Analysis Speed	Normal	100 year (l/s)	16.6
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	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Betterment (%)	0
Brownfield Method	MRM	Q 1 year (l/s)	5.5
Contributing Area (ha)	0.030	Q 2 year (l/s)	7.0
PIMP (%)	100	Q 30 year (l/s)	13.0
CV	1.000	Q 100 year (l/s)	16.6
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 Soffits
M5-60 (mm)	20.000	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	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100	150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Development	0.043	6.00	66.100	1200	0.047	50.000	0.700
Tank			66.000		26.620	50.000	1.100
Outfall			66.000	1200	50.396	50.350	1.500

Links (Input)

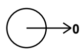
Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Development	Tank	20.000	0.600	65.400	64.900	0.500	40.0	150	6.21	50.0
1.001	Tank	Outfall	20.000	0.600	64.900	64.500	0.400	50.0	150	6.44	50.0

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	20.000	40.0	150	Circular	66.100	65.400	0.550	66.000	64.900	0.950
1.001	20.000	50.0	150	Circular	66.000	64.900	0.950	66.000	64.500	1.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Development	1200	Manhole	Adoptable	Tank		Junction	
1.001	Tank		Junction		Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Development	0.047	50.000	66.100	0.700	1200	 0	1.000	65.400	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Tank	26.620	50.000	66.000	1.100		1	1.000	64.900	150
						0	1.001	64.900	150
Outfall	50.396	50.350	66.000	1.500	1200	1	1.001	64.500	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)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	5.5
Summer CV	1.000	2 year (l/s)	7.0
Winter CV	1.000	30 year (l/s)	13.0
Analysis Speed	Normal	100 year (l/s)	16.6
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	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

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

Node Tank Online Orifice Control

Flap Valve	x	Invert Level (m)	64.900	Diameter (m)	0.035
Downstream Link	1.001	Design Depth (m)	1.100	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.8		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	64.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	192

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	54.0	0.0	0.200	54.0	0.0	0.400	54.0	0.0	0.401	0.0	0.0

Approval Settings

Node Size	x	Coordinates	x	Full Bore Velocity	x	Time to Half Empty	✓
Node Losses	x	Crossings	x	Proportional Velocity	x	Return Period (years)	10
Link Size	x	Cover Depth	x	Surcharged Depth	x	Discharge Rates	x
Link Length	x	Backdrops	x	Flooding	x	Discharge Volume	x

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	2 year 600 minute winter	7.576	3.033
1 year 15 minute winter	76.857	30.991	2 year 720 minute summer	9.878	2.647
1 year 30 minute summer	71.439	20.215	2 year 720 minute winter	6.639	2.647
1 year 30 minute winter	50.133	20.215	2 year 960 minute summer	8.113	2.136
1 year 60 minute summer	48.435	12.800	2 year 960 minute winter	5.374	2.136
1 year 60 minute winter	32.179	12.800	2 year 1440 minute summer	5.891	1.579
1 year 120 minute summer	30.053	7.942	2 year 1440 minute winter	3.959	1.579
1 year 120 minute winter	19.966	7.942	30 year 15 minute summer	268.706	76.035
1 year 180 minute summer	23.233	5.979	30 year 15 minute winter	188.566	76.035
1 year 180 minute winter	15.102	5.979	30 year 30 minute summer	174.929	49.499
1 year 240 minute summer	18.475	4.882	30 year 30 minute winter	122.757	49.499
1 year 240 minute winter	12.274	4.882	30 year 60 minute summer	116.589	30.811
1 year 360 minute summer	14.169	3.646	30 year 60 minute winter	77.459	30.811
1 year 360 minute winter	9.210	3.646	30 year 120 minute summer	70.438	18.615
1 year 480 minute summer	11.185	2.956	30 year 120 minute winter	46.797	18.615
1 year 480 minute winter	7.431	2.956	30 year 180 minute summer	53.298	13.715
1 year 600 minute summer	9.182	2.511	30 year 180 minute winter	34.645	13.715
1 year 600 minute winter	6.274	2.511	30 year 240 minute summer	41.604	10.995
1 year 720 minute summer	8.203	2.199	30 year 240 minute winter	27.641	10.995
1 year 720 minute winter	5.513	2.199	30 year 360 minute summer	31.221	8.034
1 year 960 minute summer	6.768	1.782	30 year 360 minute winter	20.295	8.034
1 year 960 minute winter	4.483	1.782	30 year 480 minute summer	24.324	6.428
1 year 1440 minute summer	4.949	1.326	30 year 480 minute winter	16.160	6.428
1 year 1440 minute winter	3.326	1.326	30 year 600 minute summer	19.756	5.404
2 year 15 minute summer	141.566	40.058	30 year 600 minute winter	13.498	5.404
2 year 15 minute winter	99.345	40.058	30 year 720 minute summer	17.490	4.687
2 year 30 minute summer	91.753	25.963	30 year 720 minute winter	11.754	4.687
2 year 30 minute winter	64.388	25.963	30 year 960 minute summer	14.215	3.743
2 year 60 minute summer	61.301	16.200	30 year 960 minute winter	9.416	3.743
2 year 60 minute winter	40.727	16.200	30 year 1440 minute summer	10.161	2.723
2 year 120 minute summer	37.449	9.897	30 year 1440 minute winter	6.829	2.723
2 year 120 minute winter	24.880	9.897	30 year +40% CC 15 minute summer	376.189	106.449
2 year 180 minute summer	28.672	7.378	30 year +40% CC 15 minute winter	263.992	106.449
2 year 180 minute winter	18.637	7.378	30 year +40% CC 30 minute summer	244.900	69.298
2 year 240 minute summer	22.636	5.982	30 year +40% CC 30 minute winter	171.860	69.298
2 year 240 minute winter	15.039	5.982	30 year +40% CC 60 minute summer	163.225	43.136
2 year 360 minute summer	17.235	4.435	30 year +40% CC 60 minute winter	108.443	43.136
2 year 360 minute winter	11.203	4.435	30 year +40% CC 120 minute summer	98.613	26.061
2 year 480 minute summer	13.550	3.581	30 year +40% CC 120 minute winter	65.516	26.061
2 year 480 minute winter	9.003	3.581	30 year +40% CC 180 minute summer	74.617	19.202
2 year 600 minute summer	11.088	3.033	30 year +40% CC 180 minute winter	48.503	19.202

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 240 minute summer	58.245	15.393
30 year +40% CC 240 minute winter	38.697	15.393
30 year +40% CC 360 minute summer	43.710	11.248
30 year +40% CC 360 minute winter	28.413	11.248
30 year +40% CC 480 minute summer	34.053	8.999
30 year +40% CC 480 minute winter	22.624	8.999
30 year +40% CC 600 minute summer	27.658	7.565
30 year +40% CC 600 minute winter	18.898	7.565
30 year +40% CC 720 minute summer	24.485	6.562
30 year +40% CC 720 minute winter	16.456	6.562
30 year +40% CC 960 minute summer	19.901	5.240
30 year +40% CC 960 minute winter	13.183	5.240
30 year +40% CC 1440 minute summer	14.225	3.812
30 year +40% CC 1440 minute winter	9.560	3.812
100 year 15 minute summer	348.738	98.681
100 year 15 minute winter	244.728	98.681
100 year 30 minute summer	228.965	64.789
100 year 30 minute winter	160.677	64.789
100 year 60 minute summer	153.288	40.510
100 year 60 minute winter	101.841	40.510
100 year 120 minute summer	92.562	24.461
100 year 120 minute winter	61.496	24.461
100 year 180 minute summer	69.806	17.964
100 year 180 minute winter	45.376	17.964
100 year 240 minute summer	54.269	14.342
100 year 240 minute winter	36.055	14.342
100 year 360 minute summer	40.484	10.418
100 year 360 minute winter	26.315	10.418
100 year 480 minute summer	31.414	8.302
100 year 480 minute winter	20.871	8.302
100 year 600 minute summer	25.431	6.956
100 year 600 minute winter	17.376	6.956
100 year 720 minute summer	22.452	6.017
100 year 720 minute winter	15.089	6.017
100 year 960 minute summer	18.166	4.784
100 year 960 minute winter	12.033	4.784
100 year 1440 minute summer	12.896	3.456
100 year 1440 minute winter	8.667	3.456
100 year +40% CC 15 minute summer	488.233	138.153
100 year +40% CC 15 minute winter	342.620	138.153
100 year +40% CC 30 minute summer	320.551	90.705
100 year +40% CC 30 minute winter	224.948	90.705
100 year +40% CC 60 minute summer	214.603	56.713
100 year +40% CC 60 minute winter	142.577	56.713
100 year +40% CC 120 minute summer	129.587	34.246
100 year +40% CC 120 minute winter	86.094	34.246
100 year +40% CC 180 minute summer	97.729	25.149
100 year +40% CC 180 minute winter	63.526	25.149
100 year +40% CC 240 minute summer	75.977	20.078
100 year +40% CC 240 minute winter	50.477	20.078
100 year +40% CC 360 minute summer	56.677	14.585
100 year +40% CC 360 minute winter	36.841	14.585
100 year +40% CC 480 minute summer	43.979	11.622
100 year +40% CC 480 minute winter	29.219	11.622
100 year +40% CC 600 minute summer	35.604	9.738
100 year +40% CC 600 minute winter	24.327	9.738
100 year +40% CC 720 minute summer	31.433	8.424
100 year +40% CC 720 minute winter	21.125	8.424
100 year +40% CC 960 minute summer	25.432	6.697
100 year +40% CC 960 minute winter	16.847	6.697
100 year +40% CC 1440 minute summer	18.055	4.839
100 year +40% CC 1440 minute winter	12.134	4.839

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	65.456	0.056	6.8	0.0635	0.0000	OK
180 minute summer	Tank	120	64.989	0.089	2.6	4.5598	0.0000	OK
15 minute summer	Outfall	1	64.500	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	6.9	1.883	0.244	0.0910	
180 minute summer	Tank	Orifice	Outfall	0.7				7.2

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	65.463	0.063	8.8	0.0718	0.0000	OK
120 minute summer	Tank	88	65.010	0.110	4.3	5.6649	0.0000	OK
15 minute summer	Outfall	1	64.500	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	8.9	1.955	0.315	0.1186	
120 minute summer	Tank	Orifice	Outfall	0.8				7.9

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	65.489	0.089	16.7	0.1004	0.0000	OK
180 minute summer	Tank	128	65.118	0.218	5.9	11.1877	0.0000	SURCHARGED
15 minute summer	Outfall	1	64.500	0.000	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	16.8	2.123	0.597	0.2291	
180 minute summer	Tank	Orifice	Outfall	1.1				16.5

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	65.511	0.110	23.4	0.1250	0.0000	OK
120 minute winter	Tank	110	65.215	0.315	7.8	16.1809	0.0000	SURCHARGED
15 minute summer	Outfall	1	64.500	0.000	1.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	23.5	2.173	0.834	0.2957	
120 minute winter	Tank	Orifice	Outfall	1.4				19.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	65.505	0.105	21.7	0.1183	0.0000	OK
180 minute summer	Tank	132	65.194	0.294	7.8	15.0971	0.0000	SURCHARGED
15 minute summer	Outfall	1	64.500	0.000	1.1	0.0000	0.0000	OK

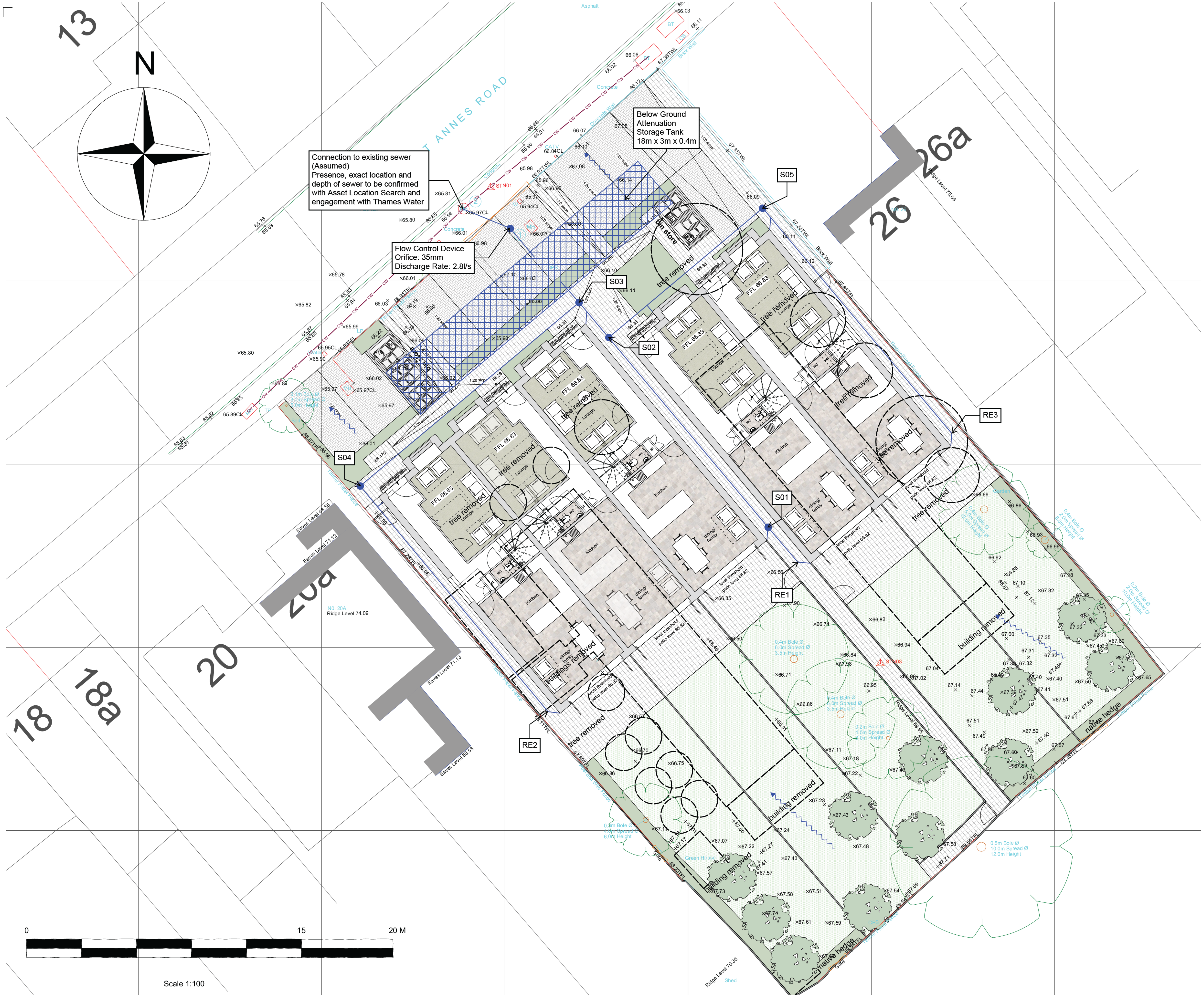
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	21.8	2.166	0.774	0.2791	
180 minute summer	Tank	Orifice	Outfall	1.3				20.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	12	65.670	0.270	30.4	0.3054	0.0000	SURCHARGED
180 minute summer	Tank	128	65.665	0.765	10.9	20.5457	0.0000	SURCHARGED
15 minute summer	Outfall	1	64.500	0.000	1.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Tank	29.6	2.181	1.051	0.3521	
180 minute summer	Tank	Orifice	Outfall	2.2				27.9

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 as per architect's details Sub-base 350mm Type 3
- Silt Trap
- Existing Combined Water Sewer Pipe

Rev	Details	Date	By	Chk
P2	Updated Design	22.08.24	AGC	ARD

Drawing Status:
PRELIMINARY

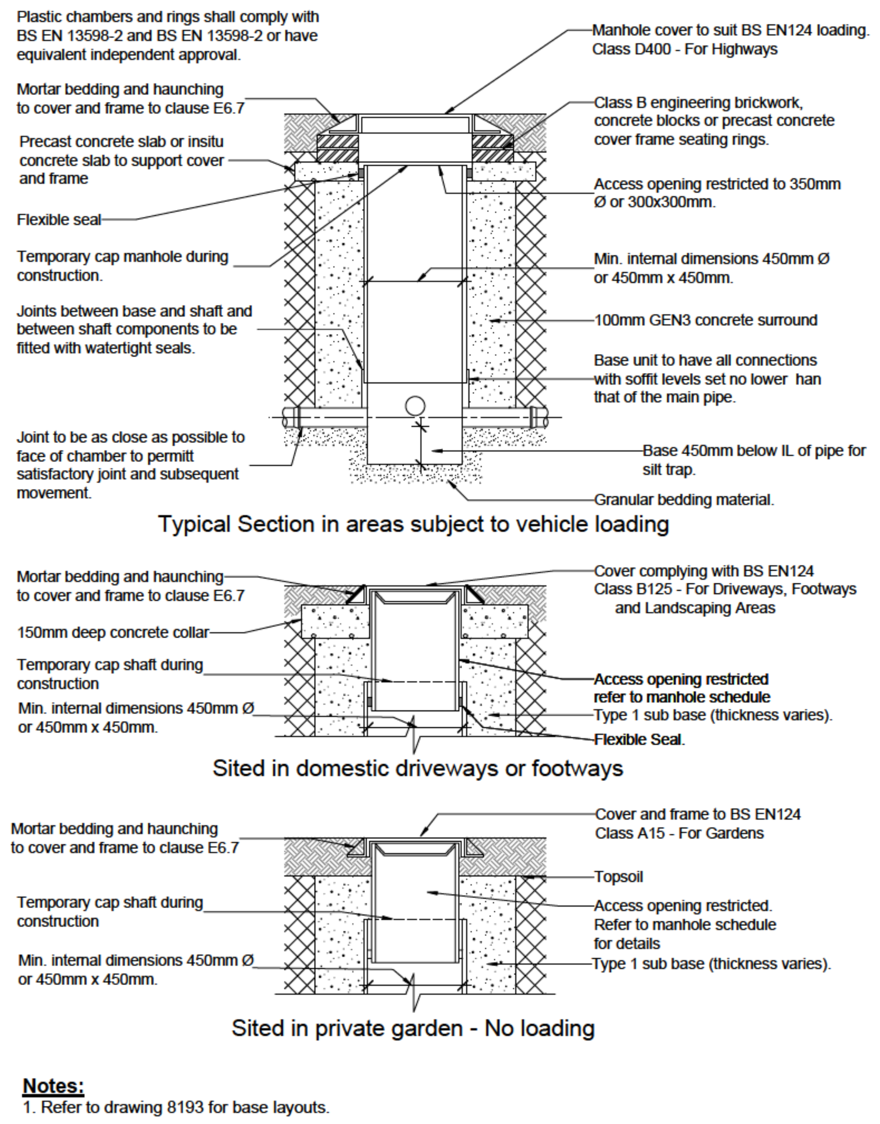
URBANWATER

Client:

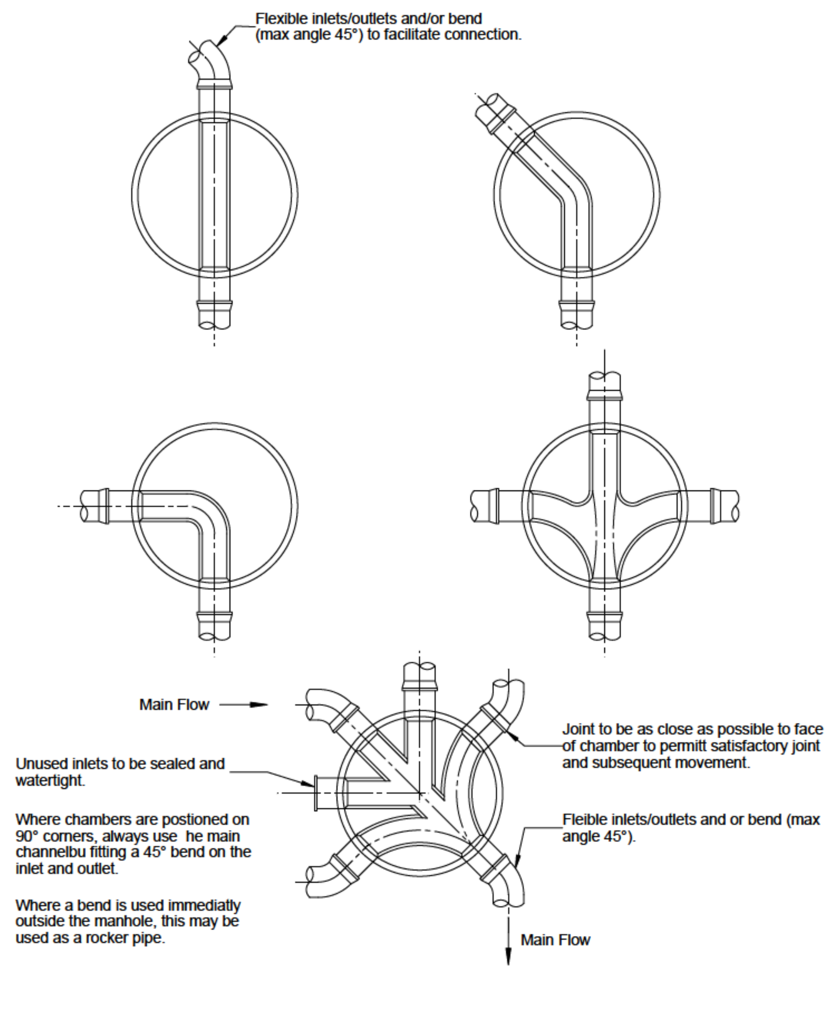
Project:
22&24 St.Annes Road, London Colney, AL2 1LJ

Drawing:
Proposed Drainage Strategy

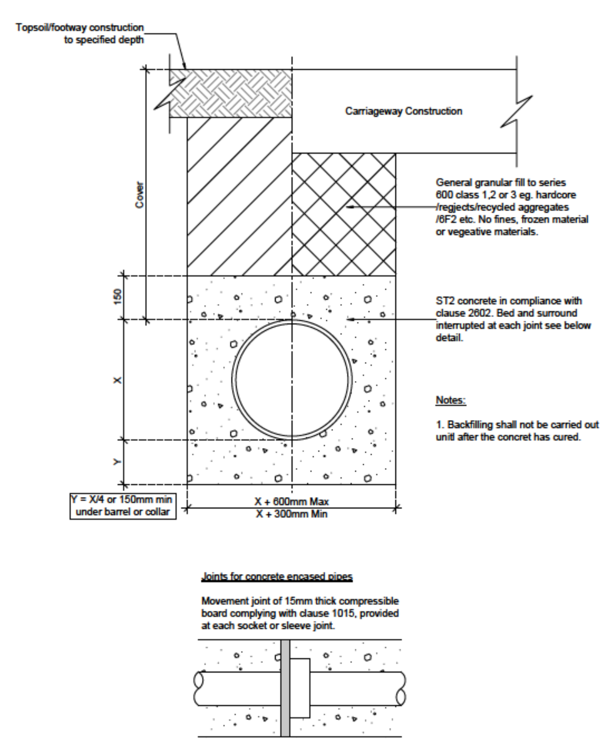
Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	1:100	0497	003	P2



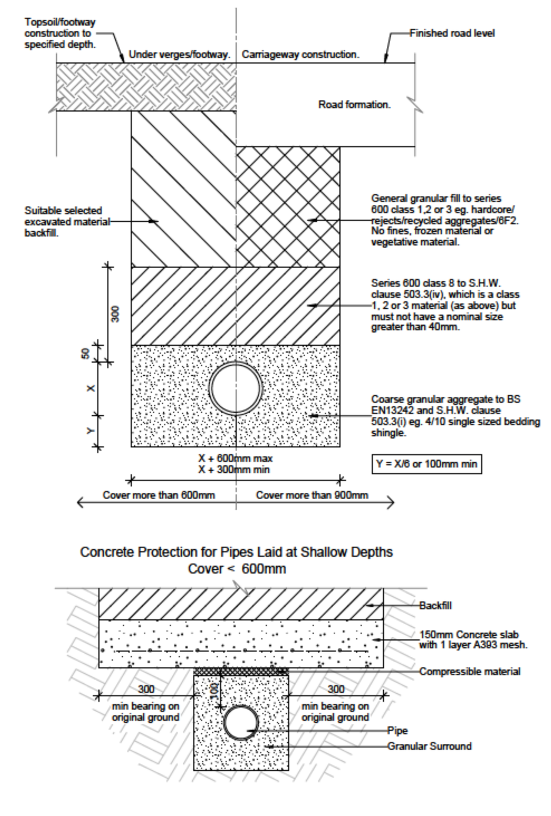
Silt Trap Plastic



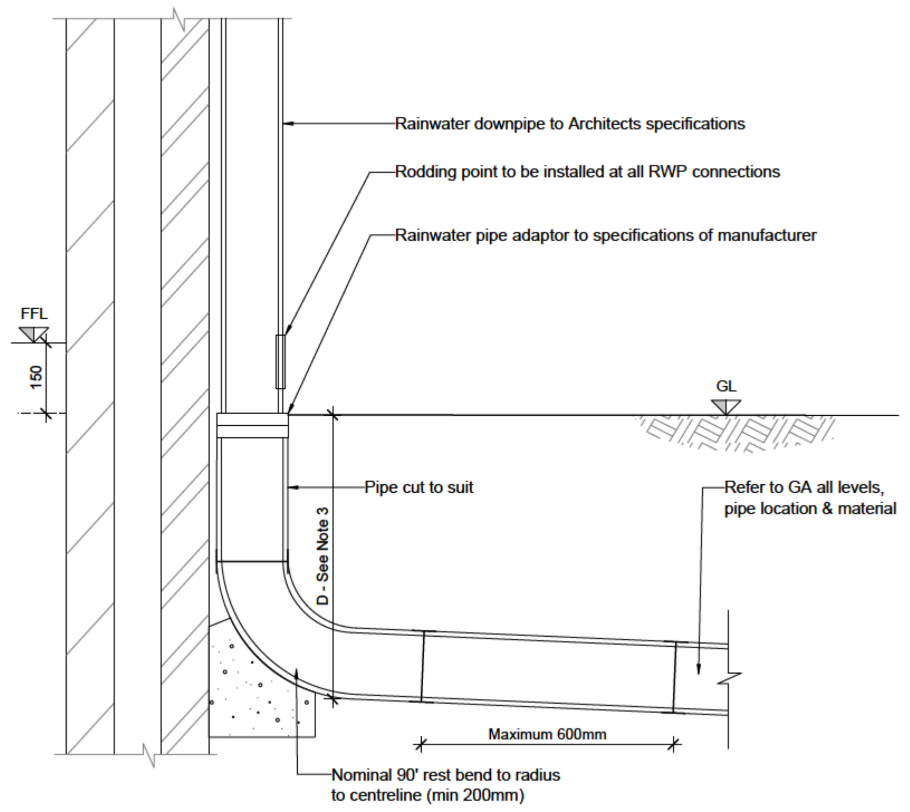
Chamber Type 3 Base Layouts



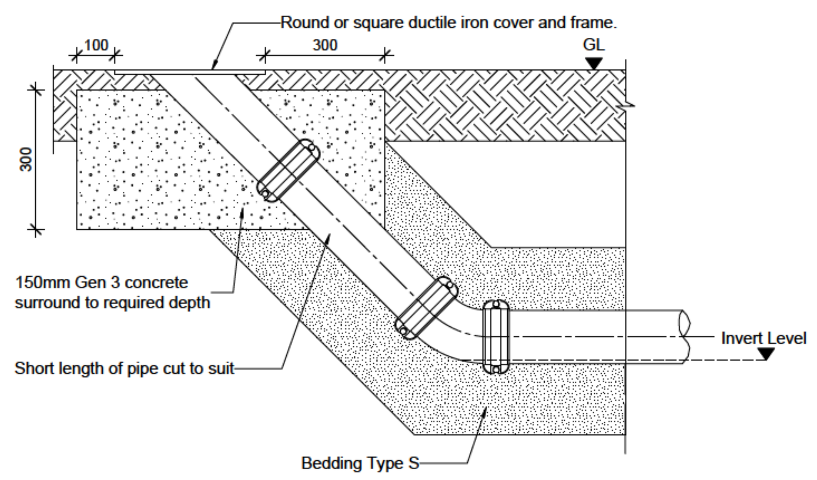
Pipe Bedding Detail Type Z



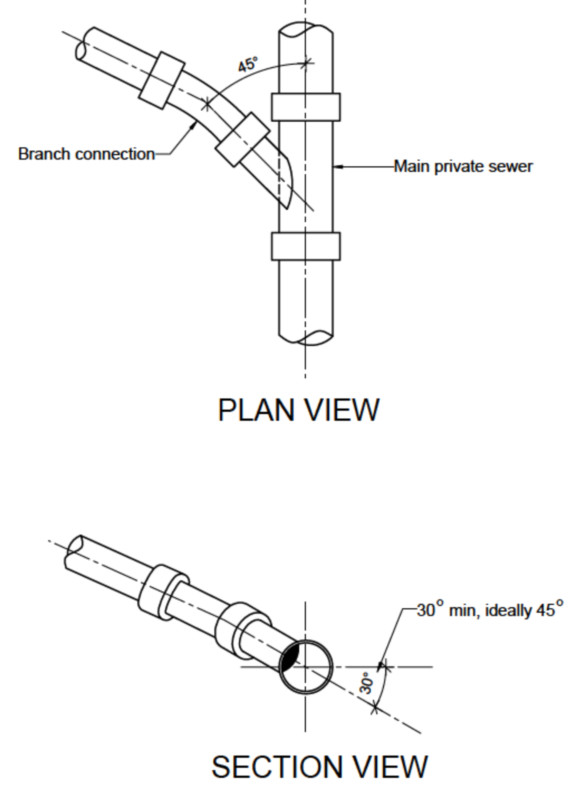
Pipe Bedding Detail Type S



8251 - External Rainwater Pipe Connection Detail



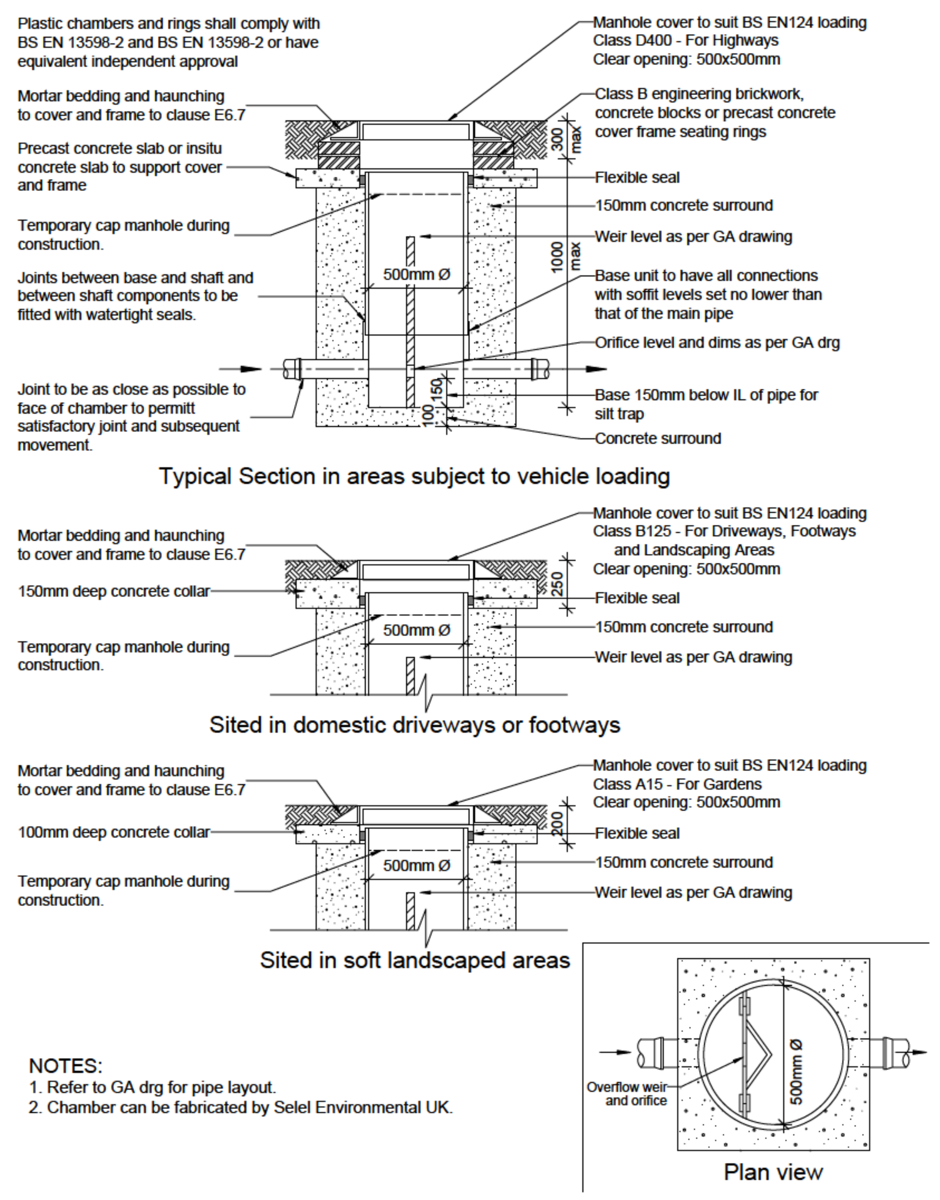
External Rodding Eye Detail



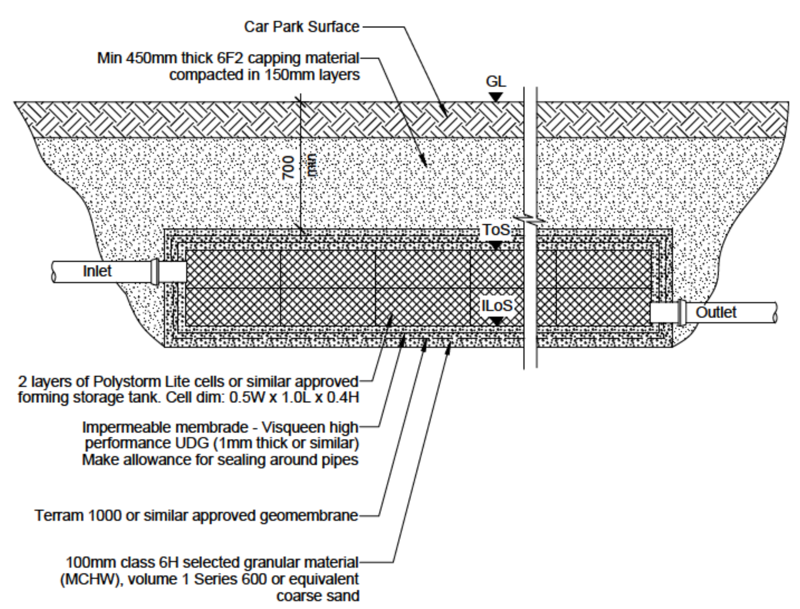
NOTES:

1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more han 60°.
2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connec ions 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 fit ing and jointing with flexible repair couplings or slip couplers.

Lateral Connection to private sewer



Flow Control -Orifice Plate - Plastic - Type 3



NOTES:

1. Permeable modular storage cell with 95% minimum void ratio. Ul imate 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 he 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

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

Rev	Details	Date	By	Ch'd

Drawing Status:

PRELIMINARY

URBANWATER

Client:

Project:

22&24 St.Annes Road, London Colney, AL2 1LJ

Drawing:

Standard Details

Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	NTS	0497	006	P1