FLOOD RISK ASSESSMENTS & DRAINAGE STRATEGIES

Hamilton, Vine Grove Uxbridge

Reference: 0111 - DD- 001

Mar-24

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Rev 1 Produced by: ARD arge@rida-reports.co.uk

SURFACE & FOUL WATER DRAINAGE STRATEGY

Purpose of this report

1.1 The objective of this report is to identify the drainage regime of the site at a desk top level. Finally, the report proposes a Sustainable Drainage Systems (SuDS) that can be used on this site.

1.2 This report will accompany the planning conditions dischargeing application for the development at the land to the rear of 1 Melbourne Close, BR6 0BJ

1.3 To achieve this objective the following documents have been consulted and/or referenced:

- The National Planning Policy Framework (NPPF)
- CIRIA C753 document The SuDS Manual, 2015
- The CIRIA publication C635 Designing for exceedance
- Aerial photographs and topographical survey of the site
- British Geological Society Records
- Environment Agency flood maps
- Topographical Surveys

Existing and Proposed Site

2.1 The estimated lifetime of this development is: 50 years

2.2 The distribution of catchment areas for existing and proposed site is as per table 1 below. See appendix A for details

Table 1 : Existing and Proposed catchment areas in hectares

Description	Existing Site	Proposed Site
Area draining away from development	0.000	0.030
Area positively drained*	0.000	0.015
Total Development Area**	0.045	0.045

*Positively drained areas do not include permeable areas that discharge directly into the ground

** Only used for the purpose of this report. It does not represent the red line of the planning area

2.3 The new development uses external surfaces that discharge directly into the ground. These surfaces are 0.015 Ha. The following coefficients have been used to the surfaces in the positively drained areas.

Impermeable Surface	1.0
Permeable Surfaces	0.5
Grass Areas	0.3

2.4 The distribution of surfaces within the positively drained areas can be seen in appendix A and are summarised in table 2 below.

Table 2 : Surface Type distribution for positively drained areas in hectares

Description	Existing Site	Proposed Site
Impermeable Surface	0.000	0.010
Permeable Surface*	0.000	0.005
Total Area positively drained	0.000	0.015

Site Characteristics

2.5 The site background is clearly identified through answers to the questions below:

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	Potential for Soil permeability? - See appendix B for soakaway results	Yes
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 ground Water less that 3m bgl?	Unknown
Contaminated land	Are there contaminated soils on site?	No
Existing Infrastructure	Are there underground utilities in the SuDS area?	No
Runoff characteristics	Is the development in a high risk flooding area?	No
Green Roofs	Can the building roof outline allows for greenroofs?	No
Water Harvesting	Is water harvesting a requirement for the development?	No

Evaluation of Discharge Point

2.6 The SuDS design takes into account the National Planning Policy Framework Guidance and Building Regulations Section H3. Rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following in order of priority:

Discharge to:	**Site Assessment**
Adequate infiltration system	The site had good potential for infiltration as it is located in freely draining lime-rich loamy soils. Soakaway tests have been undertaken and confirmed that this is the case. The lowest infiltration rate has been taken as 2.96 x 10-5 m/s
a watercourse	There are not watercourses in the proximity to the site
a surface water sewer	There are public drains in the proximity to the site. However infiltration is possible
a combined sewer system	There are not public drains in the proximity to the site

Peak Run-off Rate

3.1 The peak runoff rate for the existing site was calculated as per table 3. Calculation results are in table 5 and appendix C.

Table 3: Peak run-off rate calculation method for existing site

Method Used	Calculation Method
	This is a Greenfield site, as the proposed development area is less than 50ha, the Institute of Hydrology(IoH). Report124 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
	This is a brownfield site where the pre-development drainage isn't known therefore the runoff rates are calculated using the Greenfield run-off model (above) but using soil type 5 (0.5).

3.2 The runoff flow produced by the development will be controlled as per table 4.

Table 4: 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 pre-development Qbar flow
	The limiting discharge rate requires a flow rate less than 2l/s at discharge point, therefore a rate of 2l/s is used
	The peak discharge rate has been agreed with the local water company to be 1:30 storm event flow rate

Run-off Volumes

3.3 Micro Drainage was used to calculate the size of the attenuation based on the available infiltration rate, the size of the soakaways are calculated for all events up to the 1 in 100 including an allowance for climate change of 40%. See table 5 for value and appendix C for calculations.

Table 5: Peak discharge rates and anticipated attenuation volumes for SuDS

Return Period Event	Runoff Volume (m3)		Peak Discharge Rate (l/s)		Assumed Infiltration Rate (m/hr)	Attenuated Storage Volume (m3)
	Existing	Proposed	Existing	Proposed		
Qbar(1 in 2)			3.80	n/a	0.1067	
1 in 30			6.80	n/a	0.1067	
1 in 100			8.50	n/a	0.1067	
1 in 100 + CC			n/a	n/a	0.1067	10

Sustainable Drainage Systems Assessment

4.1 The overall development will increase the amount of impermeable area, this is because the existing area is a clear garden. However the new building will be discharging into a soakaway.

4.2 It is possible to infiltrate. The site has been divided into two catchments. The building and impermeable areas are discharging directly into a soakaway. The catchment has its relevant drainage model. See table below for distribution of SuDS.

Table 6 - Attenuation volumes provided by SuDS

Sustainability	Sustainable Drainage System Technique	Number	Volume (m3)
Most Sustainable	Living Roofs		
↓	Basins and Ponds		
	Swales		
	Filter Strips		
	Underground Soakaways	1	10.1
	Tree Pit		
	Bio-retention		
	Porous sub-base	1	312
Least sustainable	Water Harvesting Tank		
	Tanked Systems		
	Storage Volume Provided:		**322.10**

4.3 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.

4.4 The drainage calculations demonstrate:
- The post development runoff volumes.
- The soakaway sizes can contain the 1 in 100 year +40% climate change safely.

4.5 The surface water drainage strategy is prepared in outline only to demonstrate that the proposed development can meet national and local requirements. Further development of the strategy may be undertaken at detailed design.

Management of Exceedance Flows

4.6 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP (1 in 100 years), plus climate change allowance event. However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded. See appendix D.

4.7 Surface water will flow to the lowest points within the site located to the front of the property. The flood risk to the buildings would therefore remain low.

Maintenance and Management plan responsibility

5.1 The SuDS will be maintained by The Owner the property

Maintenance and Management plan for proposed SuDS

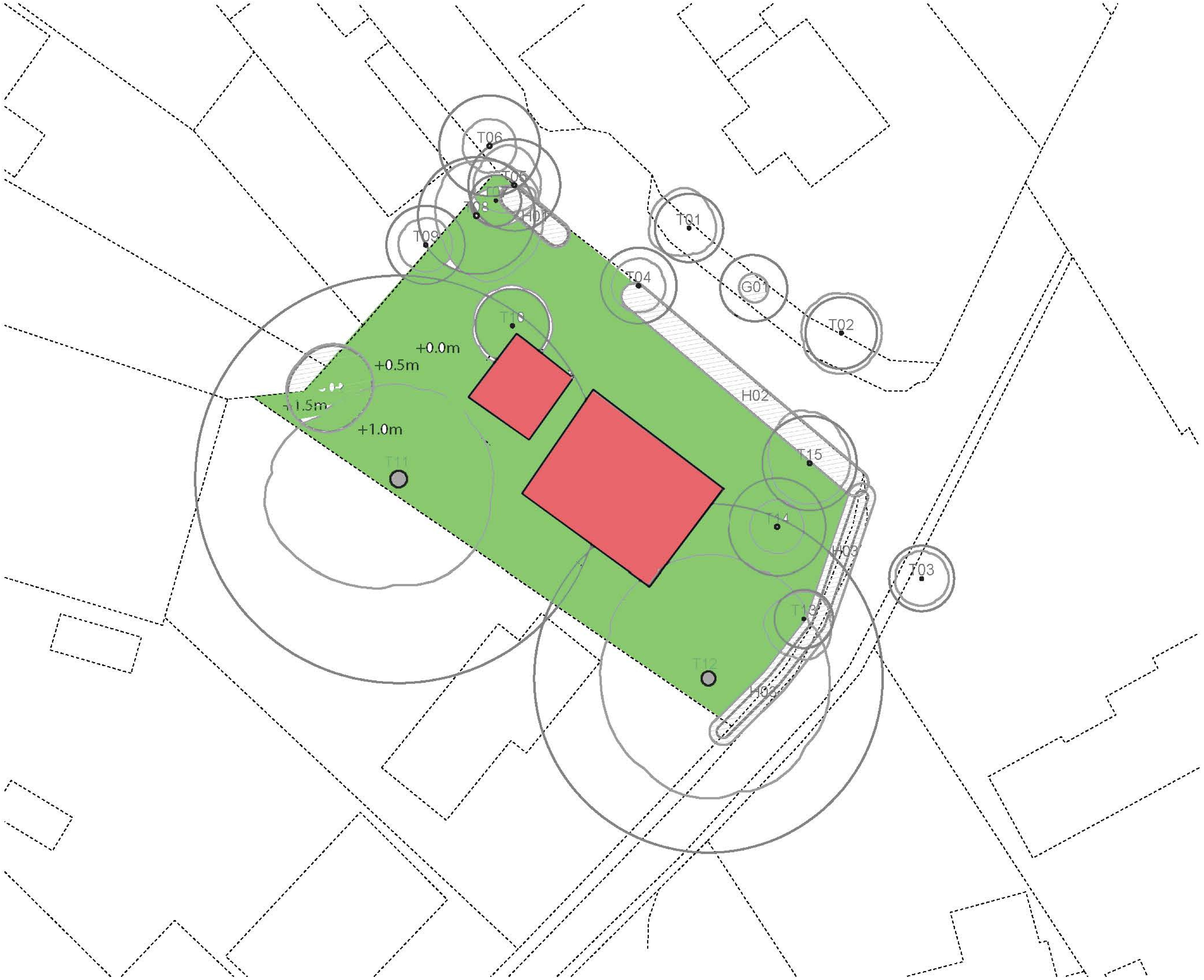
5.2 The maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined above. The maintenance for SuDS structures are as follow:

TABLE 13.1 Operation and maintenance requirements for soakaways

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

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

Appendix A



Impermeable Area

Permeable Area

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

Rev	Details	Date	By	Ch'd

Drawing Status:
PRELIMINARY

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGIES

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Client:
MR OMER MEHMET

Project:
R/O 1 MELBOURNE CLOSE

Drawing:
Existing and Proposed Areas
Permeable and Impermeable

Print Size:	Project No:	Drawing No:	Revision:
A1	0521	002	P1

Appendix B

L. LEWIS **GENERAL BUILDER**

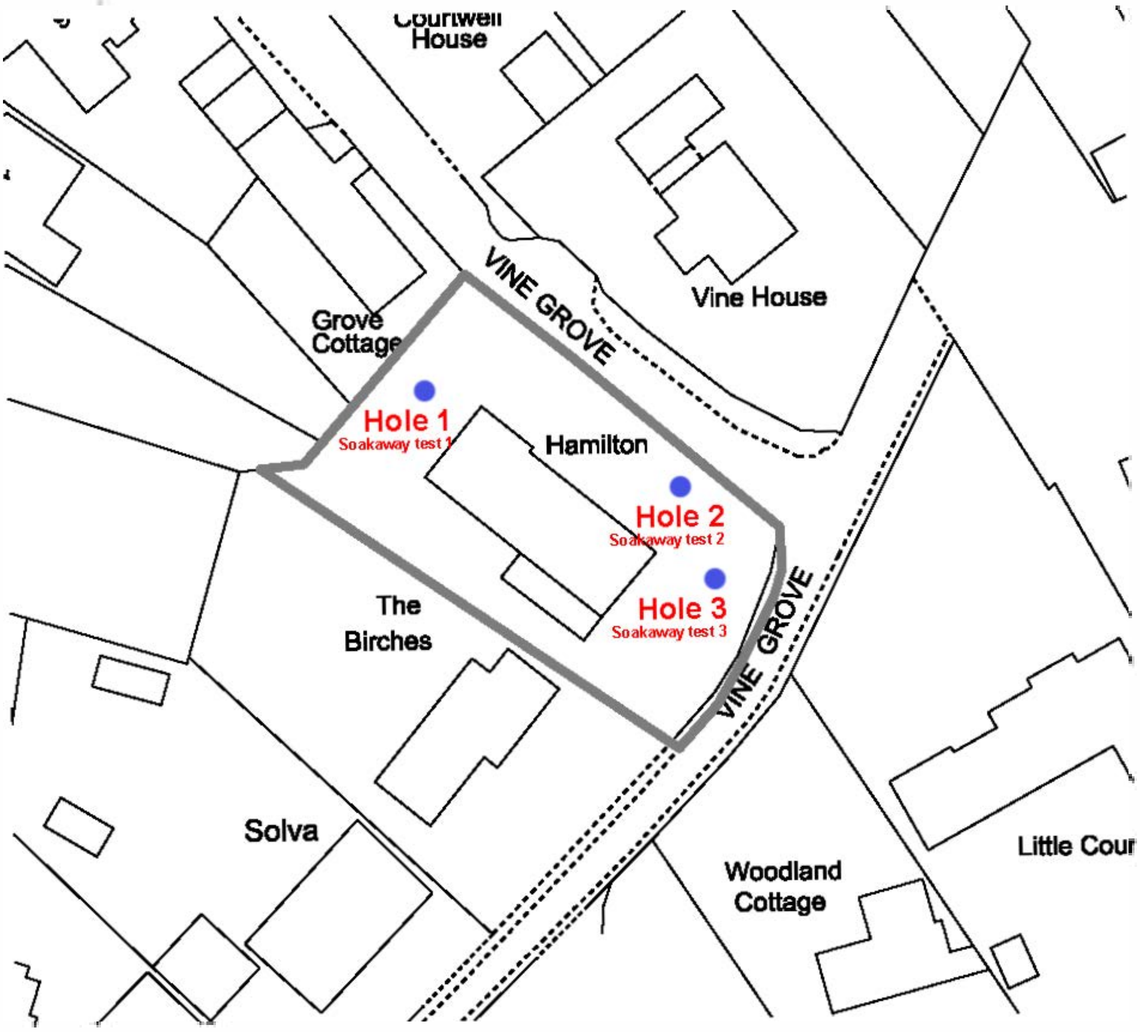
VAT REG. 425 9265 92

EXTENSIONS
ROOFING
BRICKWORK
MAINTENANCE
NO JOB TOO SMALL

2 HORNE CLOSE
SEVENOAKS
TN13 1BA
TELEPHONE: (01869) 242614 MOBILE: 07712 105050

Please find soakaway tests from the garden of Hamilton Vine Grove UB10

Many thanks



Project:	Hamilton Vine Grove
Calculation By:	Argemiro Rivera
Calculation Title:	Soil Infiltration Rate - Soakaway Test 1
Job Reference:	111 — Element: Civil
Sheet No.:	1 of 2 — Rev: A
Date:	29/03/2024

Pit Dimensions:

L:	1000	mm
W:	1500	mm
D:	1800	mm

Key

	Input
xxx	Calculation

Test 1

Mean Surface Area 2.725 m2
Depth of water at start of test 490 mm
Time at 25% or at 122.5 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	490		
5	310		
20	200		
30	105		
40	40		
50	0		

Interpolating Values

Time	Water Depth
20	200
30	105

t: 28.16 min. From interpolating values

Time at 75% or at 367.5 mm of water

Interpolating Values

Time	Water Depth
2	490
5	310

t: 4.042 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.368 m3
Time Taken to drain between 25% and 75% of water depth: 24.12 min or 0.402 hr

Test 1 - Soil Infiltration rate: 9.32E-05 m/s
0.335531 m/hr

Test 2

Mean Surface Area 2.75 m2
Depth of water 500 mm
Time at 25% or at 125 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	500	80	5
5	390	85	0
10	270		
20	210		
30	160		
40	120		
50	85		
60	55		
70	30		

Interpolating Values

Time	Water Depth
30	160
40	120

t: 38.75 min. From interpolating values

Time at 75% or at 375 mm of water

Interpolating Values

Time	Water Depth
5	390
10	270

t: 5.625 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.375 m3
Time Taken to drain between 25% and 75% of water depth: 33.13 min or 0.552 hr

Test 2 - Soil Infiltration rate: 6.86E-05 m/s
0.246998 m/hr

Project:	Hamilton Vine Grove
Calculation By:	Argemiro Rivera
Drawn:	Soil Infiltration Rate - Soakaway Test 1
Job Refrence:	111
Sheet No.:	2 of 2
Element:	Civil
Date:	29/03/2024
Rev:	A

Test 3

Mean Surface Area 2.8 m2
Depth of water 520 mm
Time at 25% or at 130 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	520	90	35
5	420	100	20
10	320	115	0
20	250		
30	200		
40	160		
50	130		
60	100		
70	75		
80	55		

Interpolating Values

Time	Water Depth
40	160
50	130

t: 50 min. From interpolating values

Time at 75% or at 390 mm of water

Interpolating Values

Time	Water Depth
5	420
10	320

t: 6.5 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.39 m3
Time Taken to drain between 25% and 75% of water depth: 43.5 min or 0.725 hr

Test 3 - Soil Infiltration rate: 5.34E-05 m/s
0.192118 m/hr

Soil Infiltration Rate: 5.34E-05 m/s
0.1921 m/hr

Project:	Hamilton Vine Grove
Calculation By:	Argemiro Rivera
Calculation Title:	Soil Infiltration Rate - Soakaway Test 2
Job Reference:	111
Element:	Civil
Sheet No.:	1 of 2
Rev:	A
Date:	29/03/2024

Pit Dimensions:

L: 1000 mm
W: 1000 mm
D: 1000 mm

Key

	Input
xxx	Calculation

Test 1

Mean Surface Area 1.980 m2
Depth of water at start of test 490 mm
Time at 25% or at 122.5 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	490		
5	310		
15	220		
20	125		
30	65		
40	25		
50	0		

Interpolating Values

Time	Water Depth
20	125
30	65

t: 20.4167 min. From interpolating values

Time at 75% or at 367.5 mm of water

Interpolating Values

Time	Water Depth
2	490
5	310

t: 4.04167 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.245 m3
Time Taken to drain between 25% and 75% of water depth: 16.375 min or 0.273 hr

Test 1 - Soil Infiltration rate: 1.26E-04 m/s
0.453389 m/hr

Test 2

Mean Surface Area 2.000 m2
Depth of water 500 mm
Time at 25% or at 125 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	500	80	5
5	390	85	0
15	270		
20	210		
30	160		
40	120		
50	85		
60	55		
70	30		

Interpolating Values

Time	Water Depth
30	160
40	120

t: 38.75 min. From interpolating values

Time at 75% or at 375 mm of water

Interpolating Values

Time	Water Depth
5	390
10	270

t: 5.625 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.25 m3
Time Taken to drain between 25% and 75% of water depth: 33.125 min or 0.552 hr

Test 2 - Soil Infiltration rate: 6.29E-05 m/s
0.226415 m/hr

Project:	Hamilton Vine Grove
Calculation By:	Argemiro Rivera
Drawn:	Soil Infiltration Rate - Soakaway Test 2
Job Refrence:	111
Sheet No.:	2 of 2 — Element: Civil
Date:	29/03/2024 — Rev: A

RIDA

Test 3

Mean Surface Area **2.040** m2
Depth of water **520** mm
Time at 25% or at **130** mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	**520**	90	**35**
5	**420**	100	**20**
15	**325**	120	**0**
20	**250**		
30	**200**		
40	**160**		
50	**130**		
60	**100**		
70	**75**		
80	**55**		

Interpolating Values

Time	Water Depth
40	160
50	130

t: **50** min. From interpolating values

Time at 75% or at **390** mm of water

Interpolating Values

Time	Water Depth
5	420
10	325

t: **6.57895** min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: **0.26** m3
Time Taken to drain between 25% and 75% of water depth: **43.4211** min or **0.724** hr

Test 3 - Soil Infiltration rate: **4.89E-05** m/s
0.176114 m/hr

Soil Infiltration Rate: **4.89E-05** m/s
0.1761 m/hr

Project: Hamilton Vine Grove
Calculation By: Argemiro Rivera
Calculation Title: Soil Infiltration Rate - Soakaway Test 3
Job Reference: 111 Element: Civil
Sheet No.: 1 of 2 Rev: A
Date: 29/03/2024

Pit Dimensions:

L: 1000 mm
W: 1000 mm
D: 1000 mm

Key

	Input
xxx	Calculation

Test 1

Mean Surface Area: 2.000 m2
Depth of water at start of test: 500 mm
Time at 25% or at: 125 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	500	70	60
10	390	80	40
15	290	100	0
20	215		
30	165		
40	125		
50	100		
60	80		

Interpolating Values

Time	Water Depth
30	165
40	125

t: 40 min. From interpolating values

Time at 75% or at: 375 mm of water

Interpolating Values

Time	Water Depth
10	390
15	290

t: 10.75 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.25 m3
Time Taken to drain between 25% and 75% of water depth: 29.25 min or 0.488 hr

Test 1 - Soil Infiltration rate: 7.12E-05 m/s
0.256410 m/hr

Test 2

Mean Surface Area: 2.200 m2
Depth of water: 600 mm
Time at 25% or at: 150 mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	600	80	145
10	500	90	110
15	460	100	95
20	400	120	45
30	345	135	0
40	295		
50	250		
60	210		
70	185		

Interpolating Values

Time	Water Depth
70	185
80	145

t: 78.75 min. From interpolating values

Time at 75% or at: 450 mm of water

Interpolating Values

Time	Water Depth
15	460
20	400

t: 15.8333 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.3 m3
Time Taken to drain between 25% and 75% of water depth: 62.9167 min or 1.049 hr

Test 2 - Soil Infiltration rate: 3.61E-05 m/s
0.130042 m/hr

Project:	Hamilton Vine Grove
Calculation By:	Argemiro Rivera
Drawn:	Soil Infiltration Rate - Soakaway Test 3
Job Refrence:	111
Sheet No.:	2 of 2 — Element: Civil
Date:	29/03/2024 — Rev: A

Test 3

Mean Surface Area **2.300** m2
Depth of water **650** mm
Time at 25% or at **162.5** mm of water

Time Since Start	Depth of water	Time Since Start	Depth of water
min	mm	min	mm
2	**650**	90	**170**
10	**510**	120	**100**
15	**480**	150	**70**
20	**420**	180	**20**
30	**370**	195	**0**
40	**330**		
50	**300**		
60	**270**		
70	**240**		
80	**205**		

Interpolating Values

Time	Water Depth
90	170
120	100

t: **93.2143** min. From interpolating values

Time at 75% or at **487.5** mm of water

Interpolating Values

Time	Water Depth
10	510
15	480

t: **13.75** min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: **0.325** m3
Time Taken to drain between 25% and 75% of water depth: **79.4643** min or **1.324** hr

Test 3 - Soil Infiltration rate: **2.96E-05** m/s
0.106693 m/hr

Soil Infiltration Rate: **2.96E-05** m/s
0.1067 m/hr

Appendix C

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.050	100.0	0.023	6.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.11	99.700	0.023	0.0	0.0	0.0	0.77	6.0	3.1
1.001	50.00	6.22	99.650	0.023	0.0	0.0	0.0	0.77	6.0	3.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		100.000	99.600	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	House	15 Winter	2	+0%	30/15 Summer				99.763
1.001	Discharge Point	15 Winter	2	+0%	30/15 Summer				99.713

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	House	-0.037	0.000	0.72		3.8	OK	
1.001	Discharge Point	-0.037	0.000	0.72		3.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	House	15 Winter	30	+0%	30/15 Summer				99.862
1.001	Discharge Point	15 Winter	30	+0%	30/15 Summer				99.778

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	House	0.062	0.000	1.29		6.8	SURCHARGED	
1.001	Discharge Point	0.028	0.000	1.29		6.8	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	House	15 Winter	100	+0%	30/15 Summer				99.960
1.001	Discharge Point	15 Winter	100	+0%	30/15 Summer				99.827

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	House	0.160	0.000	1.62		8.6	FLOOD RISK	
1.001	Discharge Point	0.077	0.000	1.62		8.5	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.800	0.180	60.0	0.010	6.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	17.200	0.172	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	10.800	0.352	30.7	0.010	6.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	12.000	0.120	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.18	99.400	0.010	0.0	0.0	0.0	1.00	7.8	1.4
1.001	50.00	6.55	99.220	0.010	0.0	0.0	0.0	0.77	6.0	1.4
2.000	50.00	6.13	99.400	0.010	0.0	0.0	0.0	1.40	11.0	1.4
1.002	50.00	6.81	99.048	0.020	0.0	0.0	0.0	0.77	6.0	2.7
1.003	50.00	6.92	98.928	0.020	0.0	0.0	0.0	0.77	6.0	2.7

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		100.000	98.878	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for Storm

Pump Manhole: Soakaway, DS/PN: 1.003, Volume (m^3): 0.3

Invert Level (m) 98.928

Depth (m)	Flow (l/s)
2.000	0.0000

Storage Structures for Storm

Cellular Storage Manhole: Soakaway, DS/PN: 1.003

Invert Level (m)	98.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.10670		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	16.0	16.0	0.800	16.0	28.8	0.900	0.0	28.8

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE1	15 Winter	1	+0%	100/15 Summer				99.428	-0.072
1.001	S01	15 Winter	1	+0%	100/15 Summer				99.252	-0.068
2.000	RE3	15 Winter	1	+0%	100/15 Winter				99.423	-0.077
1.002	S02	15 Winter	1	+0%	30/15 Winter				99.095	-0.053
1.003	Soakaway	960 Winter	1	+0%					98.218	-0.810

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	0.000	0.18		1.3	OK	
1.001	S01	0.000	0.22		1.3	OK	
2.000	RE3	0.000	0.13		1.3	OK	
1.002	S02	0.000	0.45		2.6	OK	
1.003	Soakaway	0.000	0.00		0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE1	15 Winter	30	+0%	100/15 Summer				99.446	-0.054
1.001	S01	15 Winter	30	+0%	100/15 Summer				99.273	-0.047
2.000	RE3	15 Winter	30	+0%	100/15 Winter				99.438	-0.062
1.002	S02	15 Winter	30	+0%	30/15 Winter				99.167	0.019
1.003	Soakaway	960 Winter	30	+0%					98.458	-0.570

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	0.000	0.43		3.2	OK	
1.001	S01	0.000	0.54		3.1	OK	
2.000	RE3	0.000	0.31		3.2	OK	
1.002	S02	0.000	1.09		6.2	SURCHARGED	
1.003	Soakaway	0.000	0.00		0.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE1	15 Winter	100	+40%	100/15 Summer				99.654	0.154
1.001	S01	15 Winter	100	+40%	100/15 Summer				99.563	0.243
2.000	RE3	15 Winter	100	+40%	100/15 Winter				99.515	0.015
1.002	S02	15 Winter	100	+40%	30/15 Winter				99.424	0.276
1.003	Soakaway	480 Winter	100	+40%					98.842	-0.186

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE1	0.000	0.71		5.2	SURCHARGED	
1.001	S01	0.000	0.89		5.1	SURCHARGED	
2.000	RE3	0.000	0.54		5.5	SURCHARGED	
1.002	S02	0.000	1.82		10.3	SURCHARGED	
1.003	Soakaway	0.000	0.00		0.0	OK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.050	100.0	0.023	6.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.08	99.600	0.023	0.0	0.0	0.0	1.00	17.8	3.1
1.001	50.00	6.17	99.550	0.023	0.0	0.0	0.0	1.00	17.8	3.1

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		100.000	99.500	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for Storm

Pump Manhole: Permeable Surface, DS/PN: 1.001, Volume (m^3): 0.2

Invert Level (m) 99.550

Depth (m)	Flow (l/s)
2.000	0.0000

Storage Structures for Storm

Porous Car Park Manhole: Permeable Surface, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.10670	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	55.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.500	Cap Volume Depth (m)	0.400

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
1.000	Catchment	0.500
1.001	Permeable Surface	0.500

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	Catchment	15 Winter	1	+0%					99.647	-0.103
1.001	Permeable Surface	30 Winter	1	+0%					99.518	-0.182

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Catchment	0.000	0.21		3.0	OK	
1.001	Permeable Surface	0.000	0.00		0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	Catchment	15 Winter	30	+0%					99.677	-0.073
1.001	Permeable Surface	30 Winter	30	+0%					99.544	-0.156

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Catchment	0.000	0.52		7.3	OK	
1.001	Permeable Surface	0.000	0.00		0.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.400	Cv (Winter)	0.840

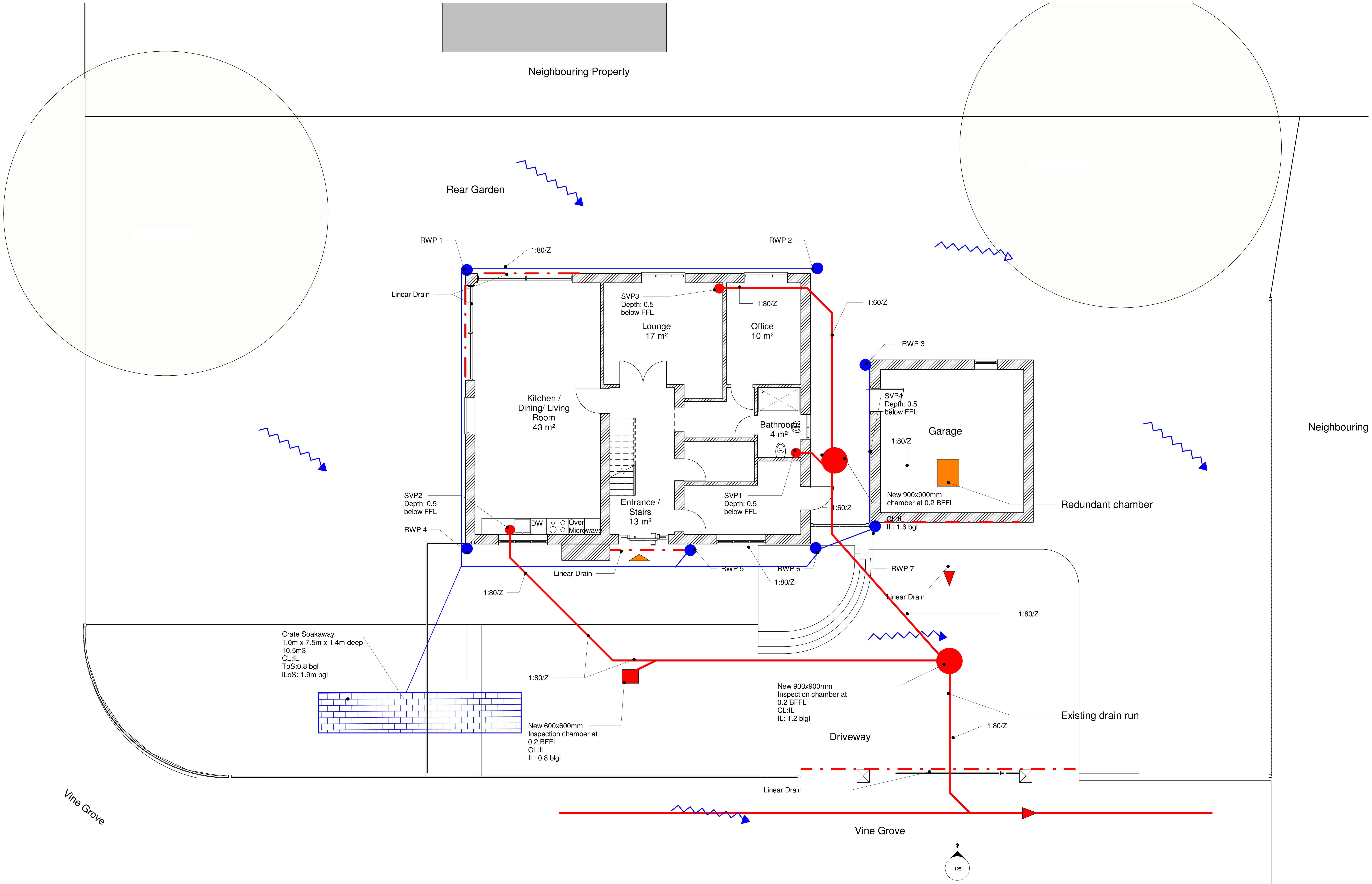
Margin for Flood Risk Warning (mm)	50.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	Catchment	15 Winter	100	+40%					99.715	-0.035
1.001	Permeable Surface	30 Winter	100	+40%					99.591	-0.109

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Catchment	0.000	0.94		13.2	OK	
1.001	Permeable Surface	0.000	0.00		0.0	OK	

Appendix D



DRAINAGE LAYOUT
SCALE 1:100 @ A1

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 meters 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. Concrete structures design sulphate class and ACEC concrete class unknown.

7. Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at levels marked on this drawing. Pipe bedding should be class Z in pipes within 1.5m of the building or shallower than 700mm below ground level. For all other areas the pipe bedding should be class S.

8. Joints and fittings for gravity sewers shall comply with the relevant provisions of BS EN 1401-1, BS EN 1852 and BS EN 12666-1. Pipes shall have a limit of 6% deformation. Pipes shall be SN8 ring stiffness and stamped accordingly. Pipe sections shall not be longer than 3m.

9. Plastic chambers and rings, including demarcation chambers,shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.

10. Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.

11. All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.

12. Testing of pipelines should be as follow:

Gravity Pipework: Air pipe testing. Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5minute period. It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.

13. Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.

14. Granular Bedding for pipes shall be constructed by spreading and compacting granular bedding material over the full width of the pipe trench. After the pipes have been laid, additional granular material shall, if required, be placed and compacted equally on each side of the pipes and, where practicable, this shall be done in sequence with the removal of the trench supports.

Rev	Details	Date	By	Ch'd

Drawing Status:
PRELIMINARY

RIDA
FLOOD RISK ASSESSMENT & DRAINAGE STRATEGIES

4 Bean Acre Road, Hook Norton,
e: info@rida-reports.co.uk
t: 01608 510 121
www.rida-reports.co.uk

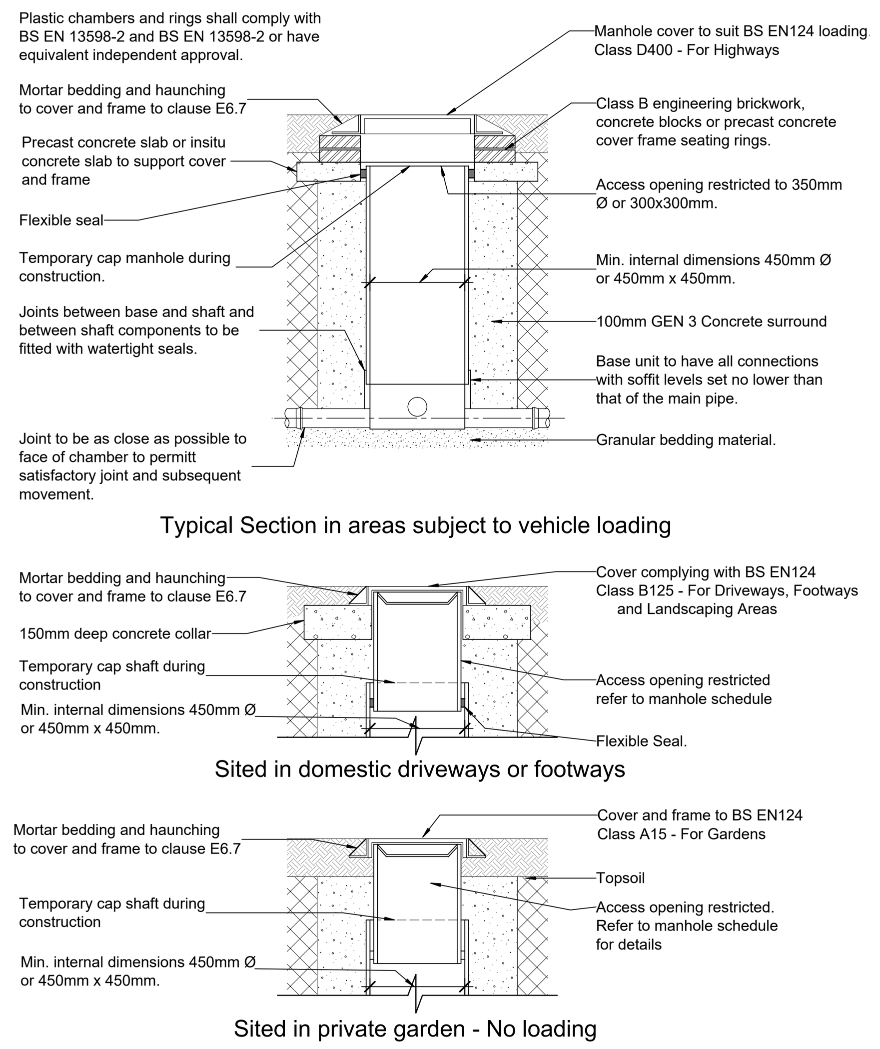
Slope / Bedding Class (red line)	**Proposed Foul Water Sewer**
Slope / Bedding Class (blue line)	**Proposed Surface Water Sewer**
RWP	**Rainwater Pipe High**
IL	**Invert Level**
GL	**Ground Level**
ToS	**Top of the structure level**
ILoS	**Invert Level of the structure**
bgl	**Below Ground Level**
(symbol)	**Exceedance Flow**

Client:
MR OMER MEHMET

Project:
R/O 1 MELBOURNE CLOSE

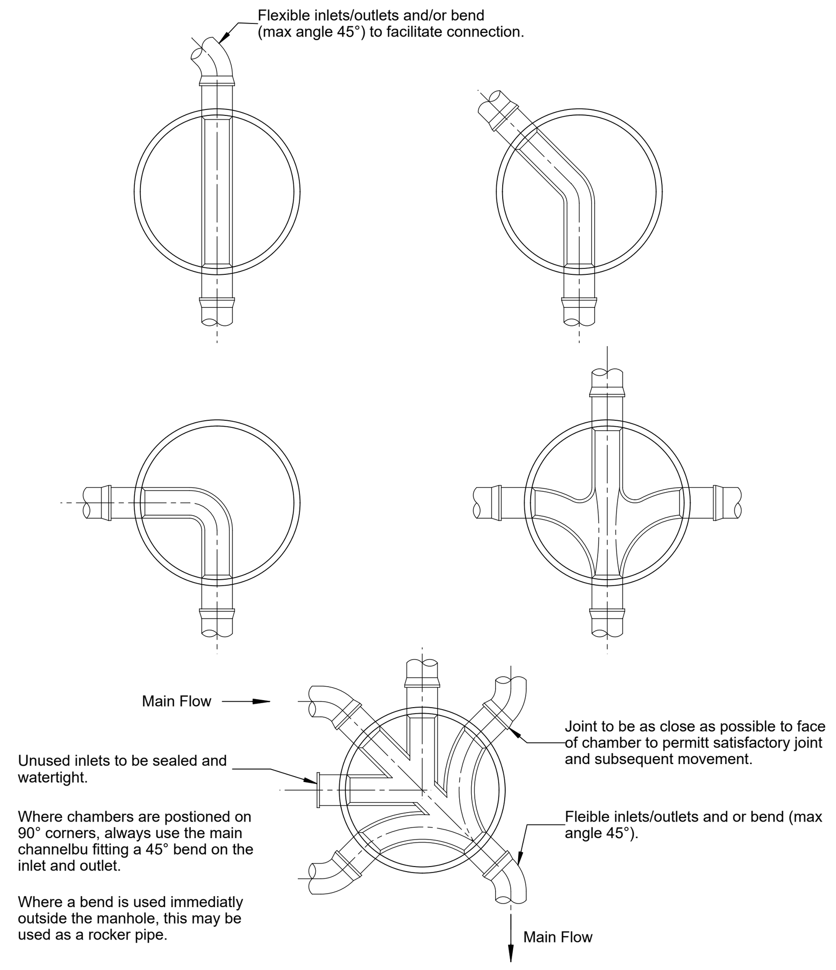
Drawing:
PROPOSED DRAINAGE STRATEGY LAYOUT

Print Size:	Project No:	Drawing No:	Revision:
A1	0111	003	P1

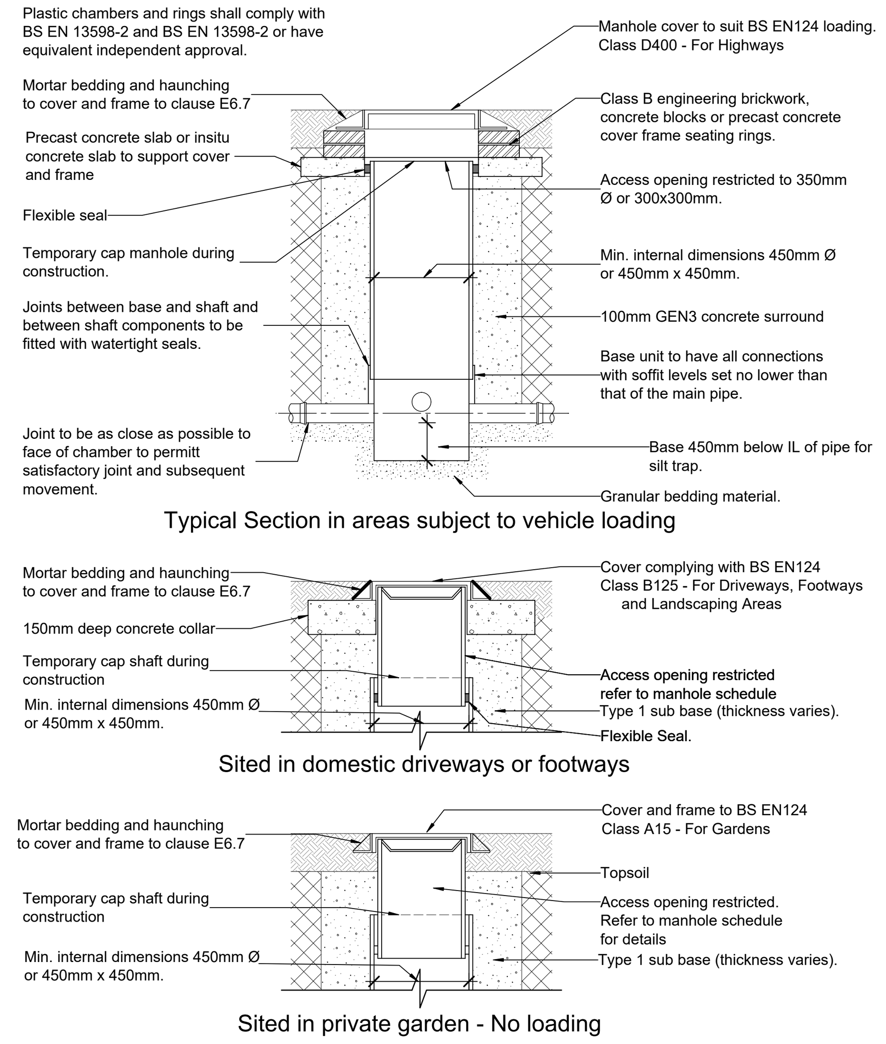


Notes:
1. Refer to drawing 8193 for base layouts.

Chamber Type 3 - Flexible Material

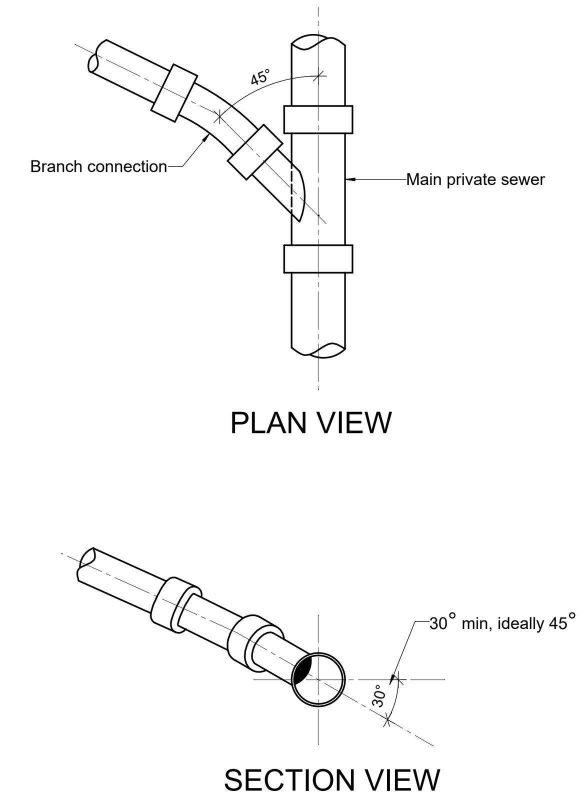


Chamber Type 3 Base Layouts



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

Silt Trap Plastic



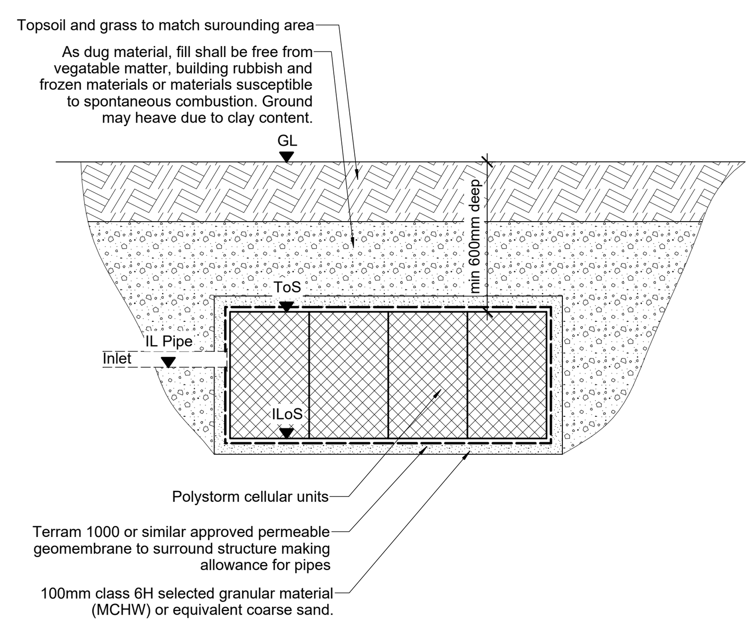
NOTES:

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



NOTES:

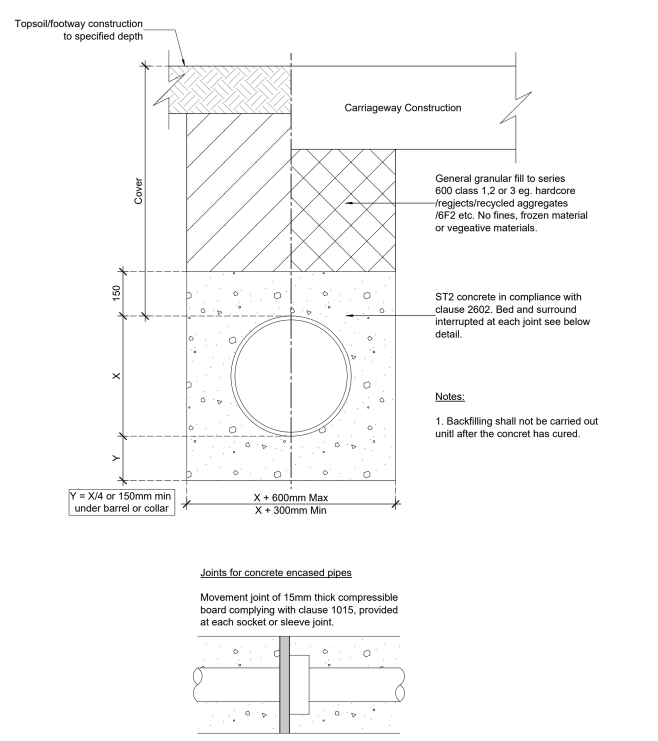
1. Permeable modular storage cell with 95% minimum void ratio. Maximum load 20 tonnes/m².

2. Installation of units as per supplier recommendations.

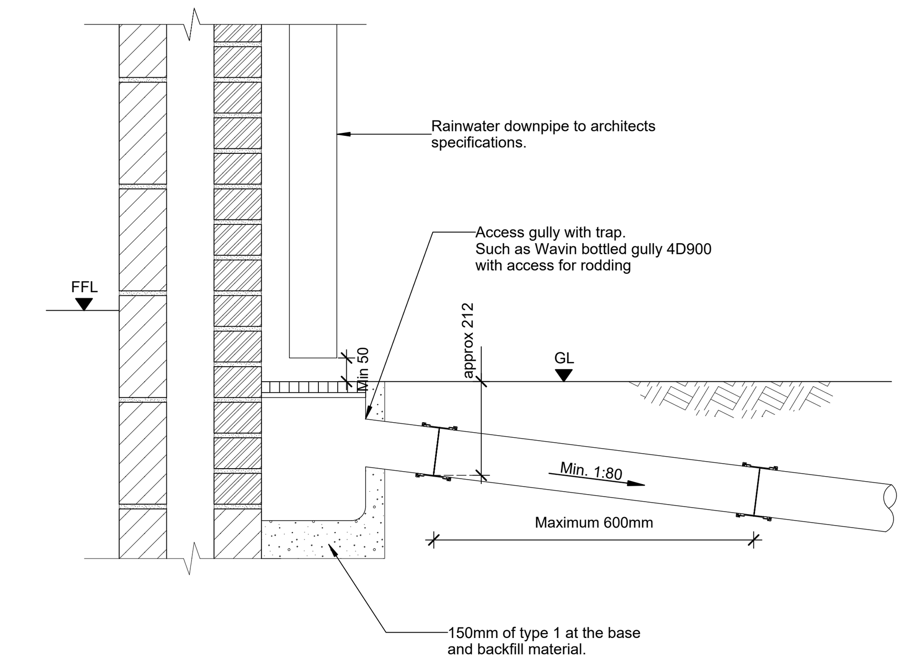
3. Ground may heave due to clay content in the as dug material. Contractor to level ground where required.

4. The area of the infiltration unit and the minimum total storage volume should be as per approved by the local planning authority documents.

Cellular Infiltration System - Landscape Area



Pipe Bedding Detail Type Z

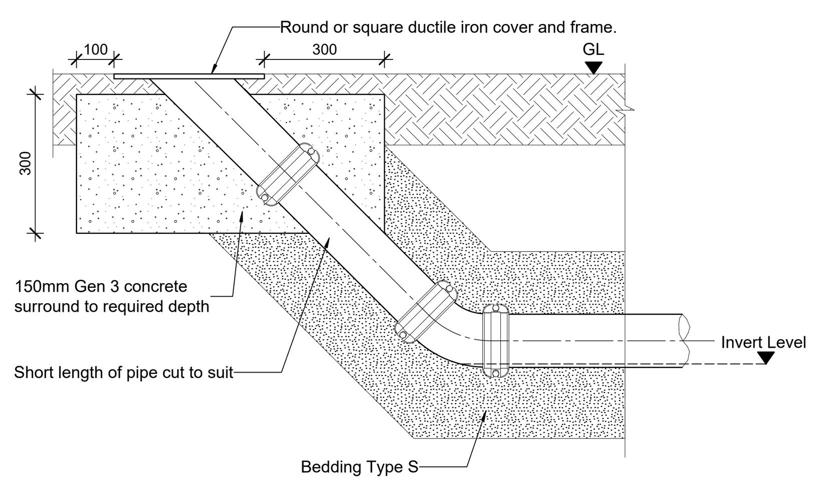


NOTES:

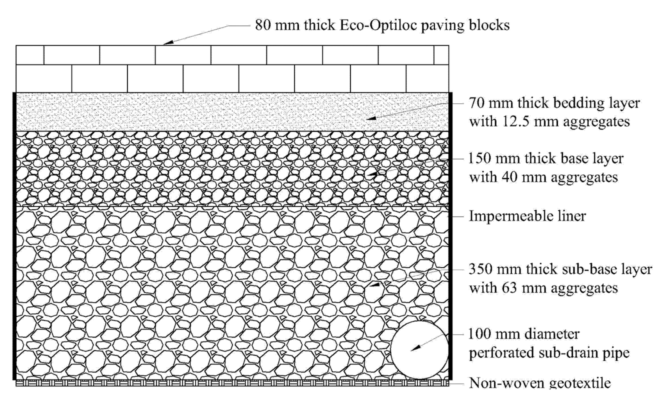
1. This details shows the standard generic arrangement.

2. The pipe and connector details will be different for each manufacturer of the components. They are to be in installed in accordance with the manufacturers recommendations.

External Rainwater (High Level)



External Rodding Eye Detail



Permeable Surface

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

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R/O 1 MELBOURNE CLOSE

Drawing:
STANDARD DETAILS

Print Size:	Project No:	Drawing No:	Revision:
A1	0111	004	P1