



Consulting Civil Engineers

SuDS Maintenance and Management Plan

Copesfield, Eastergate Lane, Eastergate

For

James Ward

Rev -

Reference C1255

Date **10th September 2019**

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1. Introduction

CGS Civils Ltd have been appointed to undertake a drainage design using sustainable techniques for a proposed development at Copesfield, Eastergate Lane in Eastergate.

The site will consist two existing dwellings being converted into a single dwelling to the south of the site as well as a new dwelling being constructed to the north of the site. This will result in two dwellings in total for the site with separate drainage arrangements.

The individual dwellings will be maintained by their respective owners who will be required to adhere to the guidance presented within this document.

All drainage will remain private.

2. Sustainable Drainage Systems (SuDS)

The surface water management strategy has been developed using best practice Sustainable Drainage Systems (SuDS) techniques. Guidance on suitable techniques and methods has been obtained from the EA, and the SuDS manual (CIRIA C753).

The National Planning Policy Framework (NPPF) recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface runoff from development sites and recommends that priority is given to the use of Sustainable Drainage Systems (SuDS) in new development.

The overall philosophy of SuDS is to replicate, as closely as possible, the natural drainage process of a site prior to development to mitigate the adverse effect of storm water runoff on the environment. SuDS not only provide the ability to control surface water flows, but also improve water quality, amenity and bio-diversity within the development.

The Building Regulations Requirement H3 and GCC Planning Policy stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority:

- 1- Discharge into the ground
- 2- Discharge to a surface water body
- 3- Discharge to a surface water sewer

3. SuDS at Copesfield, Eastergate.

Investigations on site in the form of infiltration testing have confirmed the sub strata to be sandy clay.

Two soakage tests to BRE 365 have been undertaken on site which confirm a worst-case rate of 1.31×10^{-5} m/s and 1.24×10^{-5} m/s which are considered fair rates.

Based on the soakage results, it is proposed that all surface water is discharged into the ground via infiltration.

All roof areas will be discharged into geo-cellular soakaways. All hard-paved areas will be constructed of a permeable surface i.e. permeable block paving. This will reduce the need for excessive pipe work and provide a degree of water treatment.

All SuDS features have been designed to cater for and contain the 1 in 100-year storm + 40%.

4. Managing SuDS

The SuDS have been designed for easy maintenance and comprise:

- Regular day-to-day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS feature
- Occasional tasks – checking the SUDS feature and removing any silt that builds up in the SuDS feature
- Remedial work – repairing damage where necessary

5. SuDS Drainage Maintenance Specification

5.1. Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5.2. Soakaways

In order to maintain the functioning of the Soakaway, the following maintenance requirements should be adhered to:

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

6. General Drainage Maintenance Specification

6.1. Inlet Structures and Inspection Chambers

- Inlet structures such as rain water downpipes, road gullies and channel drains should be free from obstruction at all times to allow free flow through the SuDS.
- Inspection Chambers and rodding eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	Frequency
Inlet Structures Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage. Strim vegetation 1m min surround to structures and keep area free from silt and debris	Monthly
Inspections Chambers and below ground control chambers Remove cover and inspect, ensuring that the 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 chambers to avoid mower damage.	As necessary
Remedial Work Repair physical damage if necessary	As required

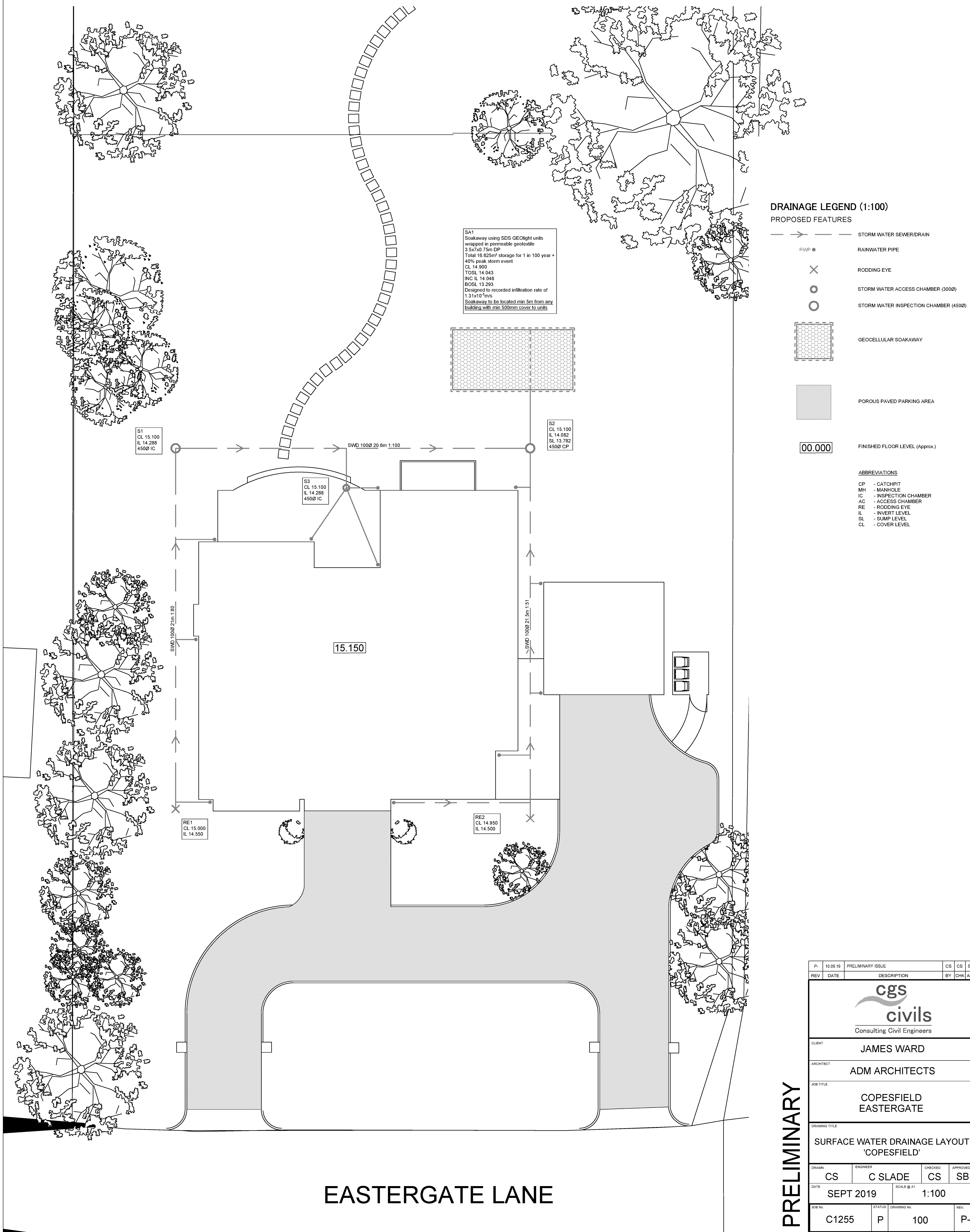
6.2. Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	Frequency
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
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks to avoid	Monthly or as required
Remedial Work	
Repair physical damage if necessary	As required
Monitoring	
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required

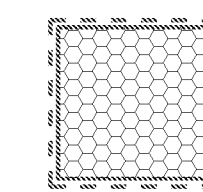
Appendix A

Drainage Strategy



PRELIMINARY

P-	10.06.19	PRELIMINARY ISSUE	CS	SB
REV	DATE	DESCRIPTION	BY	CHK/APP
				
CLIENT				
JAMES WARD				
ARCHITECT				
ADM ARCHITECTS				
JOB TITLE				
COPEFIELD EASTERGATE				
DRAWING TITLE				
SURFACE WATER DRAINAGE LAYOUT 'COPEFIELD'				
DRAWN	ENGINEER		CHECKED	APPROVED
CS	C SLADE		CS	SB
DATE	SCALE @ A1		1:100	
SEPT 2019				
JOB No.	STATUS	DRAWINGS No.		REV
C1255	P	100		P-



THE DRIVE

PRELIMINARY

P-	09.09.16	PRELIMINARY ISSUE	CS	CS	SE
REV	DATE	DESCRIPTION	BY	CHK	APP
					
CLIENT JAMES WARD					
ARCHITECT ADM ARCHITECTS					
JOB TITLE COPESFIELD EASTERGATE					
DRAWING TITLE SURFACE WATER DRAINAGE LAYOUT 'COPESFIELD LODGE'					
DRAWN CS		ENGINEER C SLADE		CHECKED CS	APPROVED SB
DATE SEPT 2019			SCALE @ A1 1:100		
JOB No: C1255		STATUS P		DRAWING No: 101	
				REV P-	

Appendix B

Surface Water Drainage Calculations

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)	0.600
Ratio-R	0.500	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.018	5.00	15.100	450	1442.260	119.106	0.812
S2	0.016	5.00	15.100	450	1462.900	119.106	1.018
RE1	0.000	5.00	15.000	10	1442.260	98.110	0.450
RE2	0.000	5.00	14.950	10	1462.900	97.569	0.450
SA1	0.000		14.900	10	1462.900	122.502	0.852
S4	0.008	5.00	16.100	450	1444.523	234.747	0.570
S5	0.004	5.00	16.200	450	1444.534	253.161	0.854
S6	0.012	5.00	16.150	450	1462.273	253.161	0.981
RE3	0.000	5.00	16.050	10	1451.481	234.747	0.450
RE4	0.000	5.00	16.100	10	1462.273	239.459	0.500
SA2	0.000		16.300	10	1462.273	256.447	1.164

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	RE1	S1	20.996	0.600	14.550	14.288	0.262	80.0	100	5.41	50.0
1.001	S1	S2	20.640	0.600	14.288	14.082	0.206	100.0	100	5.85	50.0
1.002	S2	SA1	3.396	0.600	14.082	14.048	0.034	100.0	100	5.92	50.0
2.000	RE2	S2	21.537	0.600	14.500	14.082	0.418	51.5	100	5.33	50.0
3.000	RE3	S4	6.958	0.600	15.600	15.530	0.070	100.0	100	5.15	50.0
3.001	S4	S5	18.414	0.600	15.530	15.346	0.184	100.0	100	5.55	50.0

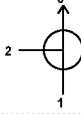
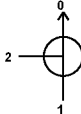
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.861	6.8	0.0	0.350	0.712	0.000	0.0	0	0.000
1.001	0.769	6.0	2.4	0.712	0.918	0.018	0.0	44	0.727
1.002	0.769	6.0	4.6	0.918	0.752	0.034	0.0	65	0.846
2.000	1.076	8.4	0.0	0.350	0.918	0.000	0.0	0	0.000
3.000	0.769	6.0	0.0	0.350	0.470	0.000	0.0	0	0.000
3.001	0.769	6.0	1.1	0.470	0.754	0.008	0.0	29	0.579

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.002	S5	S6	17.739	0.600	15.346	15.169	0.177	100.0	100	5.93	50.0
3.003	S6	SA2	3.286	0.600	15.169	15.136	0.033	100.0	100	6.01	50.0
4.000	RE4	S6	13.702	0.600	15.600	15.169	0.431	31.8	100	5.17	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.002	0.769	6.0	1.6	0.754	0.881	0.012	0.0	36	0.653
3.003	0.769	6.0	3.3	0.881	1.064	0.024	0.0	52	0.781
4.000	1.373	10.8	0.0	0.400	0.881	0.000	0.0	0	0.000

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1	1442.260	119.106	15.100	0.812	450		1	1.000	14.288	100
S2	1462.900	119.106	15.100	1.018	450		0 2 1	1.001 1.001 1.002	14.288 14.082 14.082	100 100 100
RE1	1442.260	98.110	15.000	0.450	10		0	1.000	14.550	100
RE2	1462.900	97.569	14.950	0.450	10		0	2.000	14.500	100
SA1	1462.900	122.502	14.900	0.852	10		1	1.002	14.048	100
S4	1444.523	234.747	16.100	0.570	450		1	3.000	15.530	100
S5	1444.534	253.161	16.200	0.854	450		0	3.001	15.530	100
S6	1462.273	253.161	16.150	0.981	450		1 2 0	4.000 3.002 3.003	15.346 15.346 15.169	100 100 100
RE3	1451.481	234.747	16.050	0.450	10		0	3.000	15.600	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE4	1462.273	239.459	16.100	0.500	10				
							0	4.000	15.600
SA2	1462.273	256.447	16.300	1.164	10		1	3.003	15.136

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.500	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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 %)
30	0	0	0
100	40	0	0

Node SA1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.04716	Invert Level (m)	13.293	Depth (m)	0.750
Side Inf Coefficient (m/hr)	0.04716	Time to half empty (mins)	686	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.500	Number Required	1
Porosity	0.95	Pit Length (m)	7.000		

Node SA2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.04464	Invert Level (m)	14.381	Depth (m)	0.750
Side Inf Coefficient (m/hr)	0.04464	Time to half empty (mins)	684	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.000	Number Required	1
Porosity	0.95	Pit Length (m)	5.000		

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	14.507	0.219	6.7	0.1319	0.0000	SURCHARGED
15 minute winter	S2	11	14.306	0.224	11.0	0.1057	0.0000	SURCHARGED
15 minute summer	RE1	1	14.550	0.000	0.0	0.0000	0.0000	OK
15 minute summer	RE2	1	14.500	0.000	0.0	0.0000	0.0000	OK
240 minute winter	SA1	236	13.702	-0.346	2.1	9.5150	0.0000	OK
15 minute winter	S4	10	15.579	0.049	3.0	0.0216	0.0000	OK
15 minute winter	S5	11	15.410	0.064	4.4	0.0162	0.0000	OK
15 minute winter	S6	11	15.326	0.157	8.8	0.0633	0.0000	SURCHARGED
15 minute summer	RE3	1	15.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	RE4	1	15.600	0.000	0.0	0.0000	0.0000	OK
180 minute winter	SA2	180	14.858	-0.278	1.8	6.7953	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S1	1.001	S2	5.6	0.717	0.929	0.1615
15 minute winter	S2	1.002	SA1	10.8	1.378	1.786	0.0263
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0821
15 minute summer	RE2	2.000	S2	0.0	0.000	0.000	0.0843
240 minute winter	SA1	Infiltration		0.2			
15 minute winter	S4	3.001	S5	2.9	0.658	0.485	0.0832
15 minute winter	S5	3.002	S6	4.3	0.594	0.707	0.1163
15 minute winter	S6	3.003	SA2	8.5	1.084	1.404	0.0251
15 minute summer	RE3	3.000	S4	0.0	0.000	0.000	0.0127
15 minute summer	RE4	4.000	S6	0.0	0.000	0.000	0.0536
180 minute winter	SA2	Infiltration		0.1			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	14.974	0.686	12.2	0.4127	0.0000	FLOOD RISK
15 minute winter	S2	11	14.531	0.449	17.8	0.2124	0.0000	SURCHARGED
15 minute winter	RE1	13	14.977	0.427	3.0	0.0000	0.0000	FLOOD RISK
15 minute winter	RE2	12	14.535	0.035	0.8	0.0000	0.0000	OK
360 minute winter	SA1	352	14.371	0.323	2.7	17.4679	0.0000	OK
360 minute winter	S4	352	15.767	0.237	0.6	0.1045	0.0000	SURCHARGED
360 minute winter	S5	352	15.767	0.421	0.9	0.1066	0.0000	SURCHARGED
360 minute winter	S6	352	15.767	0.598	1.8	0.2417	0.0000	SURCHARGED
360 minute winter	RE3	352	15.767	0.167	0.1	0.0000	0.0000	FLOOD RISK
360 minute winter	RE4	352	15.767	0.167	0.1	0.0000	0.0000	SURCHARGED
360 minute winter	SA2	352	15.767	0.631	1.8	10.6946	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	S1	1.001	S2	8.4	1.071	1.388	0.1615
15 minute winter	S2	1.002	SA1	16.7	2.129	2.759	0.0263
15 minute winter	RE1	1.000	S1	-3.0	-0.426	-0.446	0.1643
15 minute winter	RE2	2.000	S2	0.9	-0.163	0.105	0.1104
360 minute winter	SA1	Infiltration		0.3			
360 minute winter	S4	3.001	S5	0.6	0.424	0.099	0.1441
360 minute winter	S5	3.002	S6	0.9	0.396	0.149	0.1388
360 minute winter	S6	3.003	SA2	1.8	0.641	0.298	0.0257
360 minute winter	RE3	3.000	S4	-0.1	-0.013	-0.009	0.0544
360 minute winter	RE4	4.000	S6	-0.1	-0.013	-0.006	0.1072
360 minute winter	SA2	Infiltration		0.2			