



Consulting Civil Engineers

SuDS Maintenance and Management Plan

Tyrone House, Aldingbourne

For

Kieran Napthine

Rev – **A1**

Reference **C1340**

Date **17th November 2020**

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1. Introduction

CGS Civils Ltd has been appointed to undertake a drainage design using sustainable techniques for a proposed development at Tyrone House in Aldingbourne.

The site will consist of the demolition of an existing dwellings and construction of a new single dwelling with a new driveway.

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.

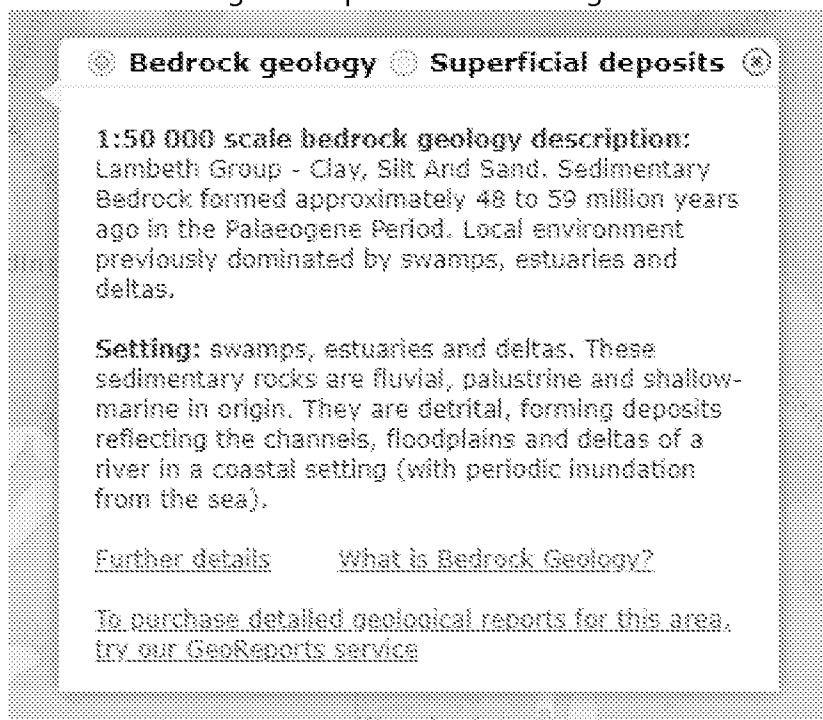
The overall philosophy of SuDS is to replicate, as closely as possible, the natural drainage process of a site prior to development to mitigate the adverse effect of storm water runoff on the environment. SuDS not only provide the ability to control surface water flows, but also improve water quality,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

The Building Regulations Requirement H3 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 Tyrone House, Aldingbourne

The British Geological survey confirms the bedrock geology to be made up of Lambeth group which is comprised of Clay, Silt and Sand. A geotechnical investigation has also been carried out on site, this investigation has confirmed that ground is made up of topsoil to a depth of 0.9m and followed by clay to a depth of 2.6m. This investigation report also confirms ground water at a depth of 0.48mbgl.



Based on the high groundwater and generally unfavourable sub soils, it is proposed that we discharge surface water into a nearby drainage ditch at a maximum rate of 1l/s. Storage will be provided in the form of a below ground attenuation tank sized to cater for the 1 in 100-year storm +40% additional volume for climate change.

The driveway will be constructed from porous driveway to allow the water to percolate naturally into the ground whilst also providing a level 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. Attenuation Tank

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

TABLE 21.3 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

5.2. 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

5.3. Drainage Ditch

Watercourses and drainage ditches require correct maintenance in order to allow surface water to flow freely, this will also reduce the risks of flooding. Correctly maintained watercourses can also create an excellent habitat for wildlife. There are specific maintenance procedures that should be followed in order to correctly maintain the ditch.

In order to maintain the functioning of a drainage ditch, the following requirements should be adhered to:

Watercourse and Drainage Ditches	
Regular Maintenance	Frequency
Keep Watercourse Free of Debris Remove any physical obstructions such as large rocks, rubble, fallen trees and branches and other waste materials (litter, grass cuttings etc) so that water can flow freely. All non-organic waste should be completely removed off site and disposed of in an appropriate manner. Any green waste resulting from the maintenance of ditches can be left a safe distance from the bank for a few days to allow any organisms to move back into the watercourse, after which the green waste should be removed so it doesn't wash back into the watercourse. Ensure that any disturbed debris does not end up flowing downstream and causing problems for other landowners. Do not store anything alongside the watercourse which may interfere with maintenance, affect the stability of the bank or get washed into the channel.	Monthly
Keep growth of vegetation under control When trimming vegetation, it is important to consider any impact on biodiversity. Mowing of banks around ditches should be minimised during the animal spawning season of March to mid-July. Some trees may have tree protection orders (TPOs) on them, so if in doubt check with local planning authority. It is recommended to cut only up to just above the water level on one side of the watercourse, leaving the fringe of the bank uncut, thereby maintaining	As Required

some habitat as well as enabling a free flow of water in the ditch. Cuttings from any clearance work should be removed from the channel to avoid it causing blockages downstream. Putting removed material too close to the top of the bank can lead to it falling back in during times of flooding.	
Remove excess Silt Silt should be removed along the length of the ditch to ensure it flows properly in the right direction. If there are any pipes into or out of the ditch you should remove silt to the same level or below the bottom of the pipe(s). Where possible, try to maintain the original slope and cross section of the ditch when de-silting. If the slope of the ditch is altered it can change the flow pattern, cause erosion or increase flood risk either upstream or downstream. As long as the silt is non-hazardous you can put it on the bank of the watercourse. Depositing silt on top of the banks of the watercourse allows for any organisms to move back into the ditch. However; • It is essential that this material does not then block any other ditches or nearby roads, or stop water draining into the ditch if it would normally do so. • The silts must be as close as possible to where it was dredged from either: on the bank of the waters from where it was taken or on land directly next to the watercourse. If you think a material may be hazardous. Contact the Environment Agency for advice.	As required.

6. General Drainage Maintenance Specification

6.1. Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater 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

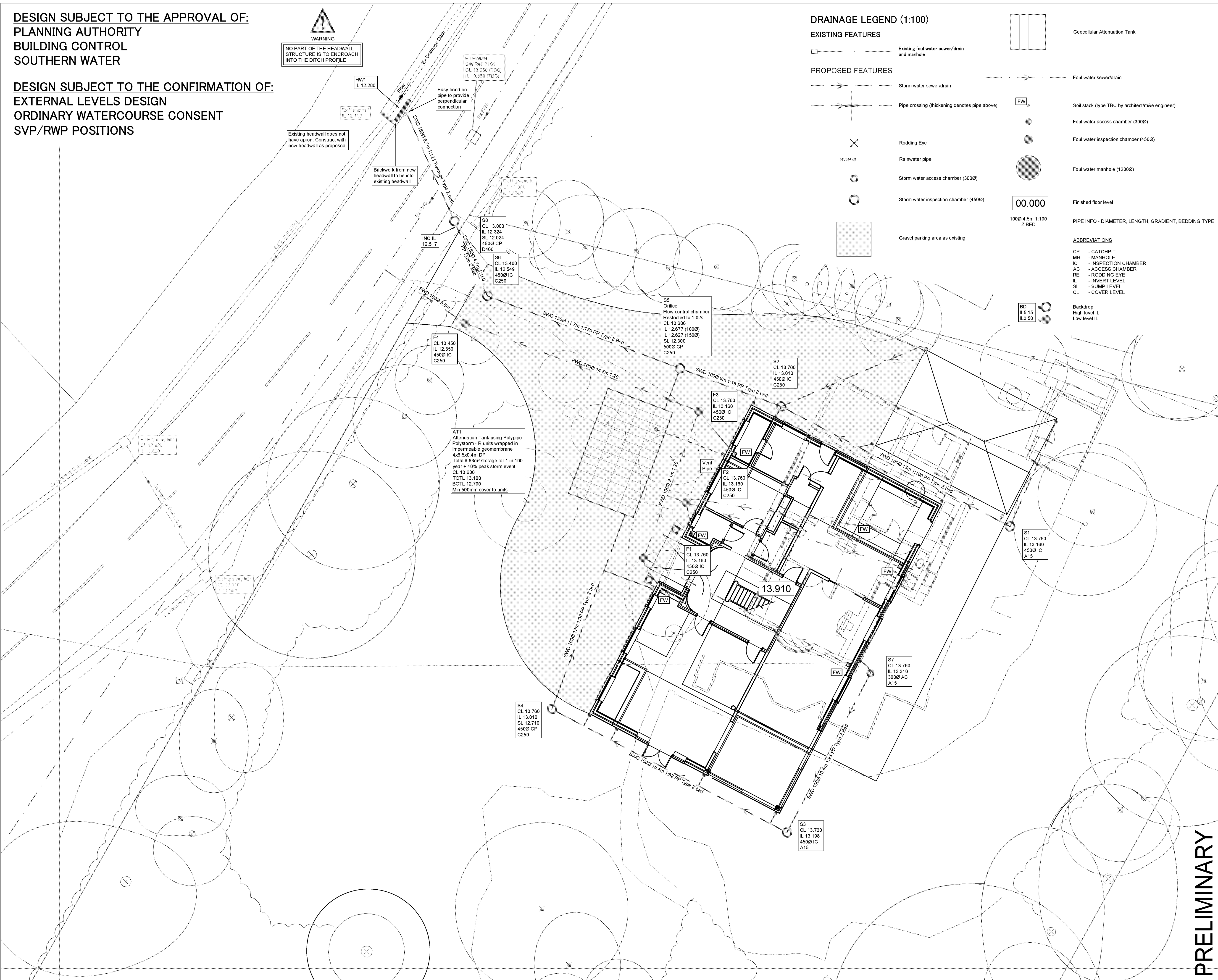
- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

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

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE CONSENT
SVP/RWP POSITIONS



- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD



PRELIMINARY
NOT FOR CONSTRUCTION

P8	17.11.20	REVISED DRIVEWAY	LH	CS	C5
P7	09.11.20	INCLUDED INC IL TO CHAMBER S8	LH	CS	C5
P6	09.11.20	UPDATED S8 TO SUIT COMMENTS	LH	CS	C5
P5	09.11.20	UPDATED TO SUIT ADC COMMENTS	LH	CS	C5
P4	28.10.20	UPDATED TO SUIT ADC COMMENTS	LH	CS	C5
P3	02.08.20	UPDATED TO SUIT NEW SITE PLAN	LH	CS	C5
P2	20.08.20	UPDATED TO SUIT ADC COMMENTS	LH	CS	C5
P1	21.07.20	UPDATED HEADWALL LOCATION	LH	CS	C5
P	23.03.20	PRELIMINARY ISSUE	LH	CS	C5
REV	DATE	DESCRIPTION	BY	CHK	APP

 Consulting Civil Engineers				
CLIENT KIERAN NAPHTHINE				
ARCHITECT SMITH SIMMONS AND PARTNERS				
JOB TITLE TYRONE HOUSE ALDINGBOURNE				
DRAWING TITLE DRAINAGE LAYOUT				
DRAWN LH	ENGINEER CS	CHECKED CS	APPROVED	
DATE MARCH 2020	SCALE @ A1		1:100	
JOB No. C1340	STATUS P	DRAWING No. 100	REV P8	

PRELIMINARY

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	0.400	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)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.001	5.00	13.760	Manhole	Adoptable	450	747.568	119.701	0.600
S2	0.008	5.00	13.760	Manhole	Adoptable	450	735.438	125.559	0.750
S3	0.009	5.00	13.760	Manhole	Adoptable	450	734.638	101.974	0.562
S4	0.006	5.00	13.760	Manhole	Adoptable	450	721.024	109.120	0.750
S5	0.007	5.00	13.600	Manhole	Adoptable	500	730.455	128.025	0.973
S6			13.400	Manhole	Adoptable	450	717.285	133.062	0.851
S7	0.000	5.00	13.760	Manhole	Adoptable	300	739.861	111.924	0.450
S8	0.000		13.000	Manhole	Adoptable	450	715.371	137.399	0.676
HW1	0.000		12.850	Manhole	Adoptable	100	712.370	143.821	0.570

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S1	S2	13.470	13.160	13.010	0.150	89.8	100
1.001	S2	S5	5.560	13.010	12.677	0.333	16.7	100
2.000	S7	S3	11.238	13.310	13.198	0.112	100.3	100
2.001	S3	S4	15.376	13.198	13.010	0.188	81.8	100
2.002	S4	S5	21.127	13.010	12.677	0.333	63.4	100
2.003	S5	S6	14.100	12.627	12.549	0.078	180.8	150
2.004	S6	S8	4.741	12.549	12.517	0.032	148.1	150
2.005	S8	HW1	7.089	12.324	12.280	0.044	161.1	150

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.0
Summer CV	0.750	30 year (l/s)	0.0
Winter CV	0.840	100 year (l/s)	0.0
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.30
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.031	Betterment (%)	0
SAAR (mm)	771	QBar	0.0
Soil Index	1	Q 1 year (l/s)	0.0
SPR	0.10	Q 30 year (l/s)	0.0
Region	1	Q 100 year (l/s)	0.0
Growth Factor 1 year	0.85		

Node S5 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.973	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	12.627	Diameter (m)	0.022		

Node S5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	12.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	254

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	26.0	0.0	0.400	26.0	0.0	0.401	0.0	0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	12	13.175	0.015	0.3	0.0028	0.0000	OK
15 minute winter	S2	10	13.041	0.031	3.1	0.0115	0.0000	OK
15 minute winter	S3	10	13.245	0.047	3.1	0.0227	0.0000	OK
15 minute winter	S4	11	13.069	0.059	5.1	0.0190	0.0000	OK
120 minute winter	S5	112	12.956	0.329	3.4	6.4368	0.0000	SURCHARGED
120 minute winter	S6	112	12.570	0.021	0.6	0.0033	0.0000	OK

15 minute summer	S7	1	13.310	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S8	112	12.345	0.021	0.6	0.0034	0.0000	OK
120 minute winter	HW1	112	12.301	0.021	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	S1	1.000	S2	0.3	0.259	0.047	0.0180	
15 minute winter	S2	1.001	S5	3.1	0.744	0.206	0.0274	
15 minute winter	S3	2.001	S4	3.0	0.714	0.453	0.0652	
15 minute winter	S4	2.002	S5	5.0	0.829	0.663	0.1339	
120 minute winter	S5	Orifice	S6	0.6				
120 minute winter	S6	2.004	S8	0.6	0.393	0.039	0.0069	
15 minute summer	S7	2.000	S3	0.0	0.000	0.000	0.0200	
120 minute winter	S8	2.005	HW1	0.6	0.384	0.041	0.0105	9.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	114	13.569	0.409	1.4	0.0785	0.0000	FLOOD RISK
120 minute winter	S2	114	13.569	0.559	3.2	0.2078	0.0000	FLOOD RISK
120 minute winter	S3	114	13.570	0.372	1.8	0.1784	0.0000	FLOOD RISK
120 minute winter	S4	114	13.570	0.560	3.0	0.1787	0.0000	FLOOD RISK
120 minute winter	S5	114	13.568	0.941	6.2	10.2248	0.0000	FLOOD RISK
120 minute winter	S6	114	12.576	0.027	1.0	0.0043	0.0000	OK
120 minute winter	S7	114	13.570	0.260	0.7	0.0185	0.0000	FLOOD RISK
120 minute winter	S8	114	12.352	0.028	1.0	0.0044	0.0000	OK
120 minute winter	HW1	114	12.307	0.027	1.0	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)
120 minute winter	S1	1.000	S2	-1.3	0.229	-0.198	0.1054	
120 minute winter	S2	1.001	S5	1.8	0.630	0.121	0.0435	
120 minute winter	S3	2.001	S4	1.8	0.626	0.269	0.1203	
120 minute winter	S4	2.002	S5	3.0	0.465	0.395	0.1653	
120 minute winter	S5	Orifice	S6	1.0				
120 minute winter	S6	2.004	S8	1.0	0.458	0.067	0.0101	
120 minute winter	S7	2.000	S3	-0.7	-0.117	-0.114	0.0879	
120 minute winter	S8	2.005	HW1	1.0	0.449	0.070	0.0154	13.5