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Drainage Statement

New Phoenix Gymnastics Club
Maidenhead

Document	BF/667769/DOC	**Prepared:**	Darragh O'Connell Civil Engineer [redacted]
Revision:	P5		
Date:	22 December 2016		
		Checked:	Ben Freedman Director [redacted]

Project Revision Sheet

Revision No	Date	Status	Changes	Author	Approved
P1	02/09/2016	Planning	First Issue	D O'Connell	B Freedman
P2	23/09/2016	Planning	Sect. 6.3 - Drainage proposals amended	D O'Connell	B Freedman
P3	19/10/2016	Planning	Section 8.0 – Ordinary Watercourse Application added. Sections 6.3 and 10.1 as marked	D O'Connell	C Bishop
P4	20/12/2016	Planning	Updated following comments and meeting of 14th Dec 2016. Section 6.3 and 10.1 amended, Section 6.3.1 added	D O'Connell	C Bishop
P5	22/12/2016	Planning	Minor changes	C Bishop	B Freedman

Contents **Page**

Appendices

1 Introduction

MLM Consulting Engineers Ltd have been appointed by Feltham Construction Ltd to undertake a detailed foul and storm water drainage design and provide supporting documentation for the proposed New Phoenix Gymnasium, Fifield Road, Maidenhead, Berkshire SL6 2PG.

This document sets out the proposed drainage strategy to manage the foul and storm water generated by the new development and has been prepared in response to planning condition number 6 of the Royal Borough of Windsor and Maidenhead (RBWM) Planning Application reference 15/02107. This report will also demonstrate how SuDS techniques are proposed to be used on site.

This report has now been updated as a result of responses received after submission to planning and subsequent meeting of 14 Dec with WSP (working on behalf of RBWM) and Phoenix Gymnastics Club.

A number of documents have previously been submitted as part of the planning process for this development. These documents (listed below) have been reviewed and relevant information has been extracted and included as part of the creation of this document:

- 9 July 2015: "SuDS Drainage Report", Stephen Bowley Planning Consultancy (Ref: 15/02107)
- 30 July 2015: Memo from Simon Lavin, Flood Risk Manager, RBWM
- 19 August 2015: "Run-off calculations to support a Sustainable Drainage Scheme", Hafren Water (project ref: 2051)
- September 2015: "SUDS Strategy" drawing, Pleydell Smithyman
- 9 September 2015: RBMW internal email
- 15 October 2015: Molyneux Planning email with attachments
- 26 October 2015: WSP-PB letter to RBMW Planning Services
- January 2016: Flood Risk Assessment – Hafren Water – Ref: 2051/FRA
- July 2016: Planning Condition 6 letter, Hafren Water: Project ref 2181
- July 2016: Sustainable Drainage Design Statement – Environmental Protection Group (EPG) – Ref: EPG-8484-RG-DOC1 V1.0, Date: July 2016.
- 7 October 2016 – WSP-PB Letter to Feltham Construction Ref: 70012202/RS/SR, Date: October 7th
- 14 October 2016: MLM Letter to Simon Lavin, RBWM – Ref: RE: 667769 - Phoenix Gym: Discharge to a Watercourse Consent
- 18 October 2016: MLM Confirmation Letter to Emma Chilton @ RBWM – Ref: 667769 - Phoenix Gym - Discharge to an Ordinary Watercourse

This document should be read as additional information to the previously submitted documentation.

2 The Site & Outline Proposed Development

The site is approximately 1.80ha (18,000m^2) in area. The site lies approximately 4.3km south-east of Maidenhead, Berkshire and is currently being used for arable farming. The site is bounded by Fifield Road to the west, Longlea House (a nursing home) to the south and adjacent agricultural fields to the north and east.

The proposed development will consist of a new gymnasium building with cycle and bin storage externally at ground level and associated hard landscaped areas, parking facilities and access road.

3 Flood Risk

As set out in previous documentation, the site is located in Flood Zone 1 and as the proposed site is greater than 1 hectare a site specific flood risk assessment is required.

The previous documentation has explored the other potential flood risk sources (ref: Hafren Water FRA – January 2016), summary below:

Fluvial flooding	- Flood Zone 1 (EA Flood Map) "very low flood risk"
Surface water flooding	- EA flood map indicates "risk of flooding from surface water" to the western part of the site, along Fifield Road.

This existing surface water flooding is understood to be attributed primarily to the existing open channel ditch located to the east of Fifield Road.

It should be noted that the existing ditch appears from a visual inspection to be quite overgrown – which may well contribute to the surface water flooding. It is understood that the ditch is a local authority asset.

Groundwater flooding	- overall risk of groundwater flooding is deemed to be "very low"
Flooding from water mains	- no historic incidents have been reported of flooding from utility infrastructure.

Overall the site is deemed to be at low risk of sea or river flooding, however the surface water flooding that has occurred previously around the eastern edge of Fifield Road / western portion of the site remains. As set out previously, and further corroborated by this report, the proposed development of the gym building and external works has been designed not to detrimentally affect the current situation – this is explored further over the following sections of this report.

4 Climate Change

The current planning policy framework "*Climate change allowance for planners*" recommends a factor of 30% to be applied to drainage design calculations. This climate change factor reflects the future predicted increase in rainfall intensity due to climate change.

Therefore, the proposed drainage design has been tested to allow for an additional +30% on the rainfall intensity (Ref: Climate Change Allowances for Planners, Environment Agency, September 2013).

5 Pre-development Drainage

5.1 Existing Foul

The site is currently an undeveloped Greenfield site and there is no foul drainage serving the site.

5.2 Existing Storm

There is no existing below ground storm water drainage serving the site. The site is currently undeveloped Greenfield space on arable land and all storm water flows generated are assumed to follow the natural surface gradients.

Surface water generated on the existing site is assumed to discharge to adjacent drainage ditches to the existing field, predominantly the existing open channel ditch located adjacent to the site and Fifield Road. This ditch drains northwards where it eventually discharges to the River Thames. [Refer to: Hafren Water Flood Risk Assessment Ref: 2051/FRA, Date: Jan 2016].

6 Post-development Drainage

6.1 Foul Discharge

Foul flows within the proposed gymnasium will be collected by 100mm diameter pipes laid to gradients to ensure self-cleansing. These pipes shall connect to a new 100mm dia. pipe and will facilitate flow under gravity to a proposed discharge into the Thames Water 150mm foul water sewer which runs north beneath Fifield Road, to the west of the proposed development. The proposed foul flows are relatively low, originating only from the few facilities within the proposed gymnasium. Permission to connect to the Thames Water sewer shall be required via a Section 106 connection application.

6.2 Proposed Storm Water Drainage

The drainage design for the development shall adopt wherever possible the principles embodied in Sustainable Urban Drainage Systems (SuDS) and follow the principles set out in the Building Regulations Part H and CIRIA C753: 'The SuDS Manual'. The design will incorporate SuDS measures in accordance with the Environment Agency guidance and prevailing site conditions.

The pre-development area is 1.8Ha (18,000m^2) and for the purposes of this report is considered greenfield. The Hafren Water Flood risk assessment (Ref: 2051/FRA, Date: Jan 2016) states that the greenfield runoff rate for the site to be 6.6 l/s. This has been calculated using the IH124 method. MLM have calculated the storm water runoff rate, QBar, (in this case Greenfield runoff rate) to be 7.9 l/s. This has been calculated using the ICP SuDS method which is a more accurate method for a site less than 50Ha in total area.

The proposed discharge for the development shall conform to the drainage hierarchy set out in the building regulations:

6.2.1 Infiltration

The proposed site is underlain by London Clay Formation. This is defined by the Environment Agency as 'Unproductive Strata' with a low permeability. This has been confirmed in the Site Investigation carried out by BRD (Ref: BRD2669-OR2-A).

Therefore, infiltration drainage is not considered to be suitable for the proposed development.

6.2.2 Watercourse

The nearest existing watercourse is the open channel/ditch located to the west of the site alongside Fifield Road.

This has been approved for receipt of surface water from the new gymnasium development and is at a suitable level for discharge. As such, it is proposed that storm water generated by the development will discharge to this drainage ditch at a controlled rate with on-site attenuation.

6.2.3 Discharge to Sewer

The Thames Water asset location search for the site shows that there is no storm water or combined water sewer near to the proposed development, only the foul water sewer within Fifield road. As such, this option is not feasible.

6.3 Discharge Location & Rate

Following the hierarchy of discharge, it is therefore proposed that storm water flows generated from the proposed gymnasium building and associated external works shall discharge to the open watercourse/ditch adjacent to Fifield road.

The proposed discharge of the storm water will be controlled via a flow control prior to discharging to the watercourse/ditch. A discharge rate of 5 l/s is proposed, which is less than the calculated greenfield runoff rate, and is recognized as the practical minimum discharge rate to manage risk of blockages of flow control devices. The flow control has been designed as a vortex flow control in order to maximize aperture size and minimize risk of blockage.

It should be noted that the proposed entrance to the site will cross the existing ditch. Culverting the existing ditch under the proposed entrance will be required and the detail for this will be submitted for approval under the Land Drainage Act (See section 8.0).

On site attenuation is proposed in the form of permeable/porous surfacing and coarse graded aggregate sub-base to parking bays along with swales to the west and north of the proposed development. A 500mm diameter oversized pipe adjacent to the access road will provide additional storm water storage prior to discharge into the ditch. A flow control manhole is proposed at the end of the drainage network before the water discharges into the existing drainage ditch. This houses the HydroBrake, which will restrict storm water discharging to 5 l/s.

The discharge rate of 5 l/s was agreed with Martin Wheeler of WSP, on behalf of the Royal Borough of Windsor and Maidenhead (RBWM), at a meeting on 14th December 2016 between the various stakeholders. The minutes of this meeting have been appended to this report. Further detailed information about the proposed porous parking bays and general drainage layout is attached in the appendices.

The parking bays, swales and oversized pipe will act in sequence in order to provide sufficient storm water storage to ensure that there is minimal surface water flooding, and none that will leave the site uncontrolled. These have been modelled in WinDes/MicroDrainage for a range of storm durations and storm return periods up to and including the 1 in 100 year event with an additional 30% allowance for climate change.

The receiving ditch adjacent to Fifield Road occasionally runs full due to receipt of runoff from areas outside the development boundary for the proposed new gymnasium. This results in the possibility that the discharge pipe from the new development is surcharged by level, reducing or preventing outflow from the new site network for a period of time. This surcharged condition of the ditch has been modelled as a surcharged outfall, with a water depth of 1.45m from the base of the ditch identified as the maximum possible water level, corresponding to the maximum height of the road above ditch invert. The length of time that the ditch remains full is currently unknown, but has been modelled as 10080 minutes for the purposes of the on-site network design.

In the event of a surcharged outfall the network surcharges and shows a small volume of flooding for the critical storm. The analysis shows that 4.2m^3 of flooding occurs at over the porous car park. Since the permeable paving is installed at slightly lower elevations than the remainder of the car park (to receive runoff from the impermeable car park surfacing), the flooded volume will pond on top of the permeable parking bays and not run off site. The maximum water depth for this scenario is 2mm. Detailed calculations for the scenario when the drainage ditch is full, are appended to this report as the 'Surcharged Outfall' case.

Finally, consent to discharge to the drainage ditch has been discussed with the Royal Borough of Windsor and Maidenhead. Please see the confirmation from Simon Lavin, the flood risk manager within the highways and planning department of the borough, confirming that consent to discharge to the drainage ditch does not require consent from the environment agency nor does it require consent under the land drainage act, subject to no projection of the new outfall or headwall into the existing ditch. An additional email to Emma Chilton (RBWM) has been appended, further confirming Simon's email.

6.3.1 Rainfall Data

The proposed drainage layout has been designed and modelled using Flood Estimation Handbook (FEH) Rainfall Data provided by HR Wallingford. FEH Rainfall is the industry standard used to estimate local flood risk and develop resilient infrastructure and has been collected on a catchment by catchment basis over a 30 year period from 1961-1999. It is generally used for designing systems with a storm duration of 60 minutes or greater. For completeness, Flood Studies Report (FSR) rainfall data has also been run on the completed models, and has been found to be less onerous. Both results sets are included in appendices.

7 Pollution control

The proposed site is deemed generally to have a low pollution risk, with the primary risk arising from any leaks or spills from vehicles within the car park.

The proposed combination of porous surfaces and swale features, along with catch-pit manholes will provide the necessary filtration for the development to mitigate any such pollution before reaching the watercourse.

8 Ordinary Watercourse Application

As part of the proposals, a section of the drainage ditch to the west of the site (adjacent to Fifield Road) is required to be culverted in order to provide access to the site. As this alters an existing watercourse, an Ordinary Watercourse Consent is required for the works. An ordinary watercourse application will be made directly to the Royal Borough of Windsor and Maidenhead, who have confirmed that they are the correct recipient for this application. The culvert proposals are covered separately to these drainage proposals and as such do not form a part of this planning condition response, but are mentioned here for completeness.

9 Drainage – General

The design of the drainage generally within the development will be in accordance with the current revisions of the relevant British Standards, Codes of Practice and Building Regulations. These include, but are not limited to the following:

- BS EN 752 - Drain and sewer systems outside buildings.
- BS EN 12056 - Drain and sewer systems inside buildings.
- Building Regulations – Part H: Drainage and waste disposal.
- UKWIR Ltd - Civil engineering specification for the water industry.
- CIRIA C753 - The SUDS manual.
- WRc - Sewers for adoption 7th Edition.

10 Operation & Maintenance

To ensure that below ground drainage networks continue to perform efficiently, it is essential that the networks are appropriately and regularly maintained. Inspection of the storm water chambers, flow restrictions, permeable pavements and swales should be carried out on a regular basis and in particular after every large storm event. Where products are installed, maintenance should be carried out to manufacturers' specifications. Further information on the operation and maintenance of specific components of the drainage network is outlined below.

10.1 Flow Control: HydroBrake

HydroBrake manholes should be checked after a major storm to ensure that they are free from blockage and reviewed annually. The HydroBrake manhole should undergo maintenance in line with the manufacturers' recommendations. The HydroBrake will limit discharge to 5 l/s which is widely recognised as the minimum discharge rate to prevent blockages at the flow control in accordance with Sewers for Adoption 7th Edition.

10.2 Permeable Pavements

The most prevalent maintenance concern of permeable pavements is the potential clogging of the pores. Over time detritus and silt can build up on the surface. Inspections should be carried out regularly to ensure that this build-up does not cause clogging.

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 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

Pervious pavement Operation & Maintenance requirements [CIRIA C753: The SuDS Manual]

10.3 Swales

Regular maintenance of swales is required in order to ensure that they operate to a high design performance standard. The maintenance of swales is relatively straightforward. The swale should be kept free from rubbish and other debris and grass should be regularly cut / mown. This will ensure that pollutants are removed from storm water prior to discharging to the ditch. Any sediment buildup should also be removed in order to maintain a clear passage for water flow.

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Swale Operation & Maintenance requirements [CIRIA C753: The SuDS Manual]

Fig. 28.15- Example of swale outlet with grating [C753 – 'The SuDS Manual']

11 Summary

It is proposed to limit the storm water discharge rate from the proposed development to 5l/s, representing the minimum practicable discharge rate with an acceptable flow control to avoid major risk of blockages. This rate is also less than the calculated greenfield runoff from the site and has been agreed with RBWM. The on-site network is designed, and has approval, to discharge storm water to the existing open channel / watercourse to the west of the site with on-site attenuation within swales, an oversized pipe and porous pavements to accommodate storm events up to and including the 1 in 100 year storm event with an allowance for climate change. This has been tested for the condition where the drainage ditch is full (a surcharged outfall from the network) and found to generate acceptable flood volumes which can be retained on site.

A new foul connection is proposed to the Thames Water foul sewer located in Fifield Road for the proposed foul flows from the development.

It is hoped that this document provides sufficient information to support the SuDS requirements for the development and response to the associated planning condition.

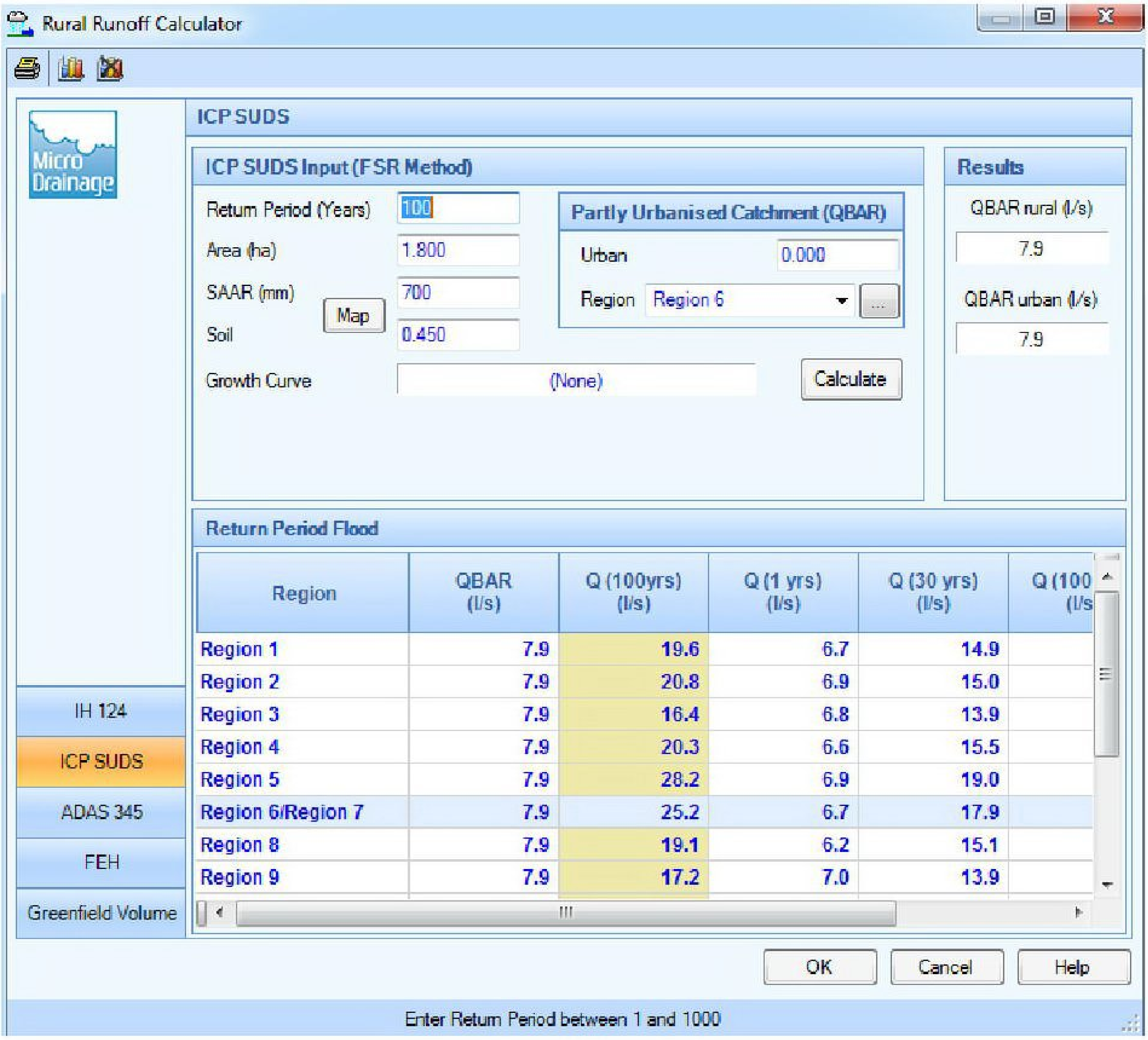
Appendices

Appendix A:	Greenfield Runoff Calculation
Appendix B:	WinDes Calculations
Appendix C:	Proposed Drainage Drawing
Appendix D:	Proposed Construction Details
Appendix E:	Proposed Swale Sections
Appendix F:	Correspondence with Royal Borough of Windsor and Maidenhead
Appendix G:	Proposed Outfall Details
Appendix H:	Meeting Minutes – 14 December 2016

Appendix A

Greenfield Runoff Calculation

Greenfield Runoff Calculation



Appendix B

WinDes Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000
Site Location	GB 491100 176950 SU 91100 76950	Volumetric Runoff Coeff.	0.750
C (1km)	-0.027	Add Flow / Climate Change (%)	0
D1 (1km)	0.267	Minimum Backdrop Height (m)	0.000
D2 (1km)	0.250	Maximum Backdrop Height (m)	0.000
D3 (1km)	0.248	Min Design Depth for Optimisation (m)	1.200
E (1km)	0.300	Min Vel for Auto Design only (m/s)	1.00
F (1km)	2.736	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50		
Maximum Time of Concentration (mins)	30		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.046	4-8	0.019	8-12	0.000	12-16	0.039	16-20	0.077	20-24	0.239	24-28	0.106

Total Area Contributing (ha) = 0.525

Total Pipe Volume (m³) = 519.102

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.500	0.044	920.5	0.062	6.00	0.0		0.030	3 \=/	1200	1:3 Swale	🔒
1.001	28.000	0.112	250.0	0.000	0.00	0.0	0.600		o	100	Pipe/Conduit	🔒
2.000	81.000	0.032	2531.3	0.315	6.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.001	23.600	0.094	251.1	0.032	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.002	16.500	0.066	250.0	0.031	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.003	21.070	0.084	250.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	🔒
1.002	115.000	0.055	2100.0	0.020	0.00	0.0		0.030	4 \=/	1400	1:4 Swale	🔒
1.003	26.000	0.037	702.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
1.004	44.600	0.047	948.9	0.065	0.00	0.0	0.600		o	500	Pipe/Conduit	🔓
1.005	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	8.60	26.930	0.062	0.0	0.0	0.0	0.26	64.4	8.4
1.001	50.00	9.56	26.880	0.062	0.0	0.0	0.0	0.48	3.8«	8.4
2.000	50.00	11.38	26.950	0.315	0.0	0.0	0.0	0.25	10.0«	42.7
2.001	50.00	11.86	26.910	0.347	0.0	0.0	0.0	0.82	32.6«	47.0
2.002	50.00	12.19	26.816	0.378	0.0	0.0	0.0	0.82	32.7«	51.2
2.003	50.00	12.75	26.750	0.378	0.0	0.0	0.0	0.63	11.1«	51.2
1.002	50.00	23.97	26.450	0.460	0.0	0.0	0.0	0.17	51.2«	62.3
1.003	50.00	24.86	26.395	0.460	0.0	0.0	0.0	0.49	19.3«	62.3
1.004	50.00	25.93	26.358	0.525	0.0	0.0	0.0	0.70	136.9	71.1
1.005	50.00	26.01	26.311	0.525	0.0	0.0	0.0	1.00	17.8«	71.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
Swale 1	27.300	0.370	Junction		1.000	26.930	1200				
SW1 -O/L	27.300	0.420	Junction		1.001	26.880	100	1.000	26.886	1200	56
P.P.	27.350	0.400	Sealed Manhole	1200	2.000	26.950	225				
S1.0	27.450	0.540	Open Manhole	1350	2.001	26.910	225	2.000	26.918	225	8
S1.1	27.450	0.634	Open Manhole	1200	2.002	26.816	225	2.001	26.816	225	
S1.2	27.350	0.600	Open Manhole		2.003	26.750	150	2.002	26.750	225	
Swale 2	27.300	0.850	Junction		1.002	26.450	1400	1.001	26.768	100	268
								2.003	26.666	150	216
S1.3	27.250	0.855	Junction	0	1.003	26.395	225	1.002	26.395	1400	
S1.4	27.000	0.642	Sealed Manhole	1500	1.004	26.358	500	1.003	26.358	225	
S1.5	27.000	0.689	Sealed Manhole	1500	1.005	26.311	150	1.004	26.311	500	
	27.000	0.739	Open Manhole	0		OUTFALL		1.005	26.261	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	3 \=/	1200	Swale 1	27.300	26.930	0.220	Junction	
1.001	o	100	SW1 -O/L	27.300	26.880	0.320	Junction	
2.000	o	225	P.P.	27.350	26.950	0.175	Sealed Manhole	1200
2.001	o	225	S1.0	27.450	26.910	0.315	Open Manhole	1350
2.002	o	225	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.003	o	150	S1.2	27.350	26.750	0.450	Open Manhole	1200
1.002	4 \=/	1400	Swale 2	27.300	26.450	0.700	Junction	
1.003	o	225	S1.3	27.250	26.395	0.630	Junction	
1.004	o	500	S1.4	27.000	26.358	0.142	Sealed Manhole	1500
1.005	o	150	S1.5	27.000	26.311	0.539	Sealed Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	40.500	920.5	SW1 -O/L	27.300	26.886	0.264	Junction	
1.001	28.000	250.0	Swale 2	27.300	26.768	0.432	Junction	
2.000	81.000	2531.3	S1.0	27.450	26.918	0.307	Open Manhole	1350
2.001	23.600	251.1	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.002	16.500	250.0	S1.2	27.350	26.750	0.375	Open Manhole	1200
2.003	21.070	250.8	Swale 2	27.300	26.666	0.484	Junction	
1.002	115.000	2100.0	S1.3	27.250	26.395	0.705	Junction	
1.003	26.000	702.7	S1.4	27.000	26.358	0.417	Sealed Manhole	1500
1.004	44.600	948.9	S1.5	27.000	26.311	0.189	Sealed Manhole	1500
1.005	5.000	100.0		27.000	26.261	0.589	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.062	0.062	0.062
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.315	0.315	0.315
2.001	-	-	100	0.032	0.032	0.032
2.002	-	-	100	0.031	0.031	0.031
2.003	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.020	0.020	0.020
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.065	0.065	0.065
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.525	0.525	0.525

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		27.000	26.261	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	0.000	60	0.000	105	0.000	150	0.000	195	0.000	240	0.000	285	0.000	330	0.000
30	0.000	75	0.000	120	0.000	165	0.000	210	0.000	255	0.000	300	0.000	345	0.000
45	0.000	90	0.000	135	0.000	180	0.000	225	0.000	270	0.000	315	0.000	360	0.000

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	1920
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	16

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	FEH	E (1km)	0.300
Return Period (years)	100	F (1km)	2.736
Site Location	GB 491100 176950 SU 91100 76950	Summer Storms	No
C (1km)	-0.027	Winter Storms	Yes
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840
D3 (1km)	0.248	Storm Duration (mins)	960

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S1.5, DS/PN: 1.005, Volume (m^3): 9.7

Unit Reference	MD-SCL-0098-5000-1100-5000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	98
Design Flow (l/s)	5.0	Invert Level (m)	26.311
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise blockage risk	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	5.0	Kick-Flo®	0.614	3.8
Flush-Flo™	0.257	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.600	4.0	1.600	5.9	2.600	7.5	5.000	10.1	7.500	12.3
0.200	4.9	0.800	4.3	1.800	6.3	3.000	8.0	5.500	10.6	8.000	12.7
0.300	5.0	1.000	4.8	2.000	6.6	3.500	8.6	6.000	11.1	8.500	13.0
0.400	4.8	1.200	5.2	2.200	6.9	4.000	9.1	6.500	11.5	9.000	13.4
0.500	4.5	1.400	5.6	2.400	7.2	4.500	9.6	7.000	11.9	9.500	13.8

Storage Structures for Storm

Porous Car Park Manhole: P.P., DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	26.900	Depression Storage (mm)	5
Max Percolation (l/s)	422.2	Width (m)	80.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	19.0	Membrane Depth (mm)	0

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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	FEH	D3 (1km)	0.248
Site Location	GB 491100 176950 SU 91100 76950	E (1km)	0.300
C (1km)	-0.027	F (1km)	2.736
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	15 Winter	1	+30%					27.013	-0.287	0.000	0.04		13.3
1.001	SW1 -O/L	15 Winter	1	+30%	1/15 Summer				27.004	0.024	0.000	1.12		4.2
2.000	P.P.	480 Winter	1	+30%	100/15 Summer				27.030	-0.145	0.000	0.25		3.9
2.001	S1.0	15 Winter	1	+30%	30/15 Summer	100/15 Summer			26.980	-0.155	0.000	0.21		6.2
2.002	S1.1	15 Winter	1	+30%	30/15 Summer				26.928	-0.113	0.000	0.40		11.7
2.003	S1.2	15 Winter	1	+30%	1/15 Winter	100/15 Summer			26.902	0.002	0.000	1.05		11.0
1.002	Swale 2	120 Winter	1	+30%					26.563	-0.737	0.000	0.00		9.4
1.003	S1.3	120 Winter	1	+30%	30/15 Summer				26.561	-0.059	0.000	0.29		4.8
1.004	S1.4	120 Winter	1	+30%	30/120 Winter				26.551	-0.307	0.000	0.06		6.9
1.005	S1.5	120 Winter	1	+30%	1/15 Summer				26.549	0.088	0.000	0.35		5.0

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	3
2.002	S1.1	OK	
2.003	S1.2	SURCHARGED	4
1.002	Swale 2	OK	
1.003	S1.3	OK*	
1.004	S1.4	OK	20
1.005	S1.5	SURCHARGED*	20

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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	FEH	D3 (1km)	0.248
Site Location	GB 491100 176950 SU 91100 76950	E (1km)	0.300
C (1km)	-0.027	F (1km)	2.736
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	15 Winter	30	+30%					27.152	-0.148	0.000	0.12		41.9
1.001	SW1 -O/L	15 Winter	30	+30%	1/15 Summer				27.152	0.172	0.000	1.61		6.1
2.000	P.P.	60 Winter	30	+30%	100/15 Summer				27.169	-0.006	0.000	0.99		15.5
2.001	S1.0	15 Winter	30	+30%	30/15 Summer	100/15 Summer			27.381	0.246	0.000	0.51		15.4
2.002	S1.1	15 Winter	30	+30%	30/15 Summer				27.374	0.333	0.000	0.92		26.7
2.003	S1.2	15 Winter	30	+30%	1/15 Winter	100/15 Summer			27.321	0.421	0.000	2.45		25.8
1.002	Swale 2	360 Winter	30	+30%					26.932	-0.368	0.000	0.01		20.9
1.003	S1.3	360 Winter	30	+30%	30/15 Summer				26.932	0.312	0.000	0.64		10.8
1.004	S1.4	960 Winter	30	+30%	30/120 Winter				27.000	0.142	0.000	0.05		5.7
1.005	S1.5	960 Winter	30	+30%	1/15 Summer				27.000	0.539	0.000	0.35		5.0

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	FLOOD RISK	3
2.002	S1.1	FLOOD RISK	
2.003	S1.2	FLOOD RISK	4
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	20
1.005	S1.5	FLOOD RISK*	20

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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	FEH	D3 (1km)	0.248
Site Location	GB 491100 176950 SU 91100 76950	E (1km)	0.300
C (1km)	-0.027	F (1km)	2.736
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	15 Winter	100	+30%					27.244	-0.056	0.000	0.19		63.2
1.001	SW1 -O/L	15 Winter	100	+30%	1/15 Summer				27.243	0.263	0.000	1.84		7.0
2.000	P.P.	60 Winter	100	+30%	100/15 Summer				27.304	0.129	0.000	1.22		19.1
2.001	S1.0	15 Winter	100	+30%	30/15 Summer	100/15 Summer			27.452	0.317	2.075	0.63		18.9
2.002	S1.1	15 Winter	100	+30%	30/15 Summer				27.447	0.406	0.000	1.21		35.1
2.003	S1.2	15 Winter	100	+30%	1/15 Winter	100/15 Summer			27.352	0.452	2.055	2.54		26.7
1.002	Swale 2	480 Winter	100	+30%					27.050	-0.250	0.000	0.01		22.6
1.003	S1.3	480 Winter	100	+30%	30/15 Summer				27.050	0.430	0.000	0.46		7.8
1.004	S1.4	120 Winter	100	+30%	30/120 Winter				27.000	0.142	0.000	0.08		9.3
1.005	S1.5	120 Winter	100	+30%	1/15 Summer				27.000	0.539	0.000	0.35		5.0

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	FLOOD RISK*	
1.001	SW1 -O/L	FLOOD RISK*	
2.000	P.P.	FLOOD RISK*	
2.001	S1.0	FLOOD	3
2.002	S1.1	FLOOD RISK	
2.003	S1.2	FLOOD	4
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	20
1.005	S1.5	FLOOD RISK*	20

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000
Site Location	GB 491100 176950 SU 91100 76950	Volumetric Runoff Coeff.	0.750
C (1km)	-0.027	Add Flow / Climate Change (%)	0
D1 (1km)	0.267	Minimum Backdrop Height (m)	0.000
D2 (1km)	0.250	Maximum Backdrop Height (m)	0.000
D3 (1km)	0.248	Min Design Depth for Optimisation (m)	1.200
E (1km)	0.300	Min Vel for Auto Design only (m/s)	1.00
F (1km)	2.736	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50		
Maximum Time of Concentration (mins)	30		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.046	4-8	0.019	8-12	0.000	12-16	0.039	16-20	0.077	20-24	0.239	24-28	0.106

Total Area Contributing (ha) = 0.525

Total Pipe Volume (m^3) = 519.102

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.500	0.044	920.5	0.062	6.00	0.0		0.030	3 \=/	1200	1:3 Swale	
1.001	28.000	0.112	250.0	0.000	0.00	0.0	0.600		o	100	Pipe/Conduit	
2.000	81.000	0.032	2531.3	0.315	6.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	23.600	0.094	251.1	0.032	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.002	16.500	0.066	250.0	0.031	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.003	21.070	0.084	250.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
1.002	115.000	0.055	2100.0	0.020	0.00	0.0		0.030	4 \=/	1400	1:4 Swale	
1.003	26.000	0.037	702.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	44.600	0.047	948.9	0.065	0.00	0.0	0.600		o	500	Pipe/Conduit	
1.005	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	8.60	26.930	0.062	0.0	0.0	0.0	0.26	64.4	8.4
1.001	50.00	9.56	26.880	0.062	0.0	0.0	0.0	0.48	3.8«	8.4
2.000	50.00	11.38	26.950	0.315	0.0	0.0	0.0	0.25	10.0«	42.7
2.001	50.00	11.86	26.910	0.347	0.0	0.0	0.0	0.82	32.6«	47.0
2.002	50.00	12.19	26.816	0.378	0.0	0.0	0.0	0.82	32.7«	51.2
2.003	50.00	12.75	26.750	0.378	0.0	0.0	0.0	0.63	11.1«	51.2
1.002	50.00	23.97	26.450	0.460	0.0	0.0	0.0	0.17	51.2«	62.3
1.003	50.00	24.86	26.395	0.460	0.0	0.0	0.0	0.49	19.3«	62.3
1.004	50.00	25.93	26.358	0.525	0.0	0.0	0.0	0.70	136.9	71.1
1.005	50.00	26.01	26.311	0.525	0.0	0.0	0.0	1.00	17.8«	71.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
Swale 1	27.300	0.370	Junction		1.000	26.930	1200				
SW1 -O/L	27.300	0.420	Junction		1.001	26.880	100	1.000	26.886	1200	56
P.P.	27.350	0.400	Sealed Manhole	1200	2.000	26.950	225				
S1.0	27.450	0.540	Open Manhole	1350	2.001	26.910	225	2.000	26.918	225	8
S1.1	27.450	0.634	Open Manhole	1200	2.002	26.816	225	2.001	26.816	225	
S1.2	27.350	0.600	Open Manhole		2.003	26.750	150	2.002	26.750	225	
Swale 2	27.300	0.850	Junction		1.002	26.450	1400	1.001	26.768	100	268
								2.003	26.666	150	216
S1.3	27.250	0.855	Junction	0	1.003	26.395	225	1.002	26.395	1400	
S1.4	27.000	0.642	Sealed Manhole	1500	1.004	26.358	500	1.003	26.358	225	
S1.5	27.000	0.689	Sealed Manhole	1500	1.005	26.311	150	1.004	26.311	500	
	27.000	0.739	Open Manhole	0		OUTFALL		1.005	26.261	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	3 \=/	1200	Swale 1	27.300	26.930	0.220	Junction	
1.001	o	100	SW1 -O/L	27.300	26.880	0.320	Junction	
2.000	o	225	P.P.	27.350	26.950	0.175	Sealed Manhole	1200
2.001	o	225	S1.0	27.450	26.910	0.315	Open Manhole	1350
2.002	o	225	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.003	o	150	S1.2	27.350	26.750	0.450	Open Manhole	1200
1.002	4 \=/	1400	Swale 2	27.300	26.450	0.700	Junction	
1.003	o	225	S1.3	27.250	26.395	0.630	Junction	
1.004	o	500	S1.4	27.000	26.358	0.142	Sealed Manhole	1500
1.005	o	150	S1.5	27.000	26.311	0.539	Sealed Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	40.500	920.5	SW1 -O/L	27.300	26.886	0.264	Junction	
1.001	28.000	250.0	Swale 2	27.300	26.768	0.432	Junction	
2.000	81.000	2531.3	S1.0	27.450	26.918	0.307	Open Manhole	1350
2.001	23.600	251.1	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.002	16.500	250.0	S1.2	27.350	26.750	0.375	Open Manhole	1200
2.003	21.070	250.8	Swale 2	27.300	26.666	0.484	Junction	
1.002	115.000	2100.0	S1.3	27.250	26.395	0.705	Junction	
1.003	26.000	702.7	S1.4	27.000	26.358	0.417	Sealed Manhole	1500
1.004	44.600	948.9	S1.5	27.000	26.311	0.189	Sealed Manhole	1500
1.005	5.000	100.0		27.000	26.261	0.589	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.062	0.062	0.062
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.315	0.315	0.315
2.001	-	-	100	0.032	0.032	0.032
2.002	-	-	100	0.031	0.031	0.031
2.003	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.020	0.020	0.020
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.065	0.065	0.065
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.525	0.525	0.525

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		27.000	26.261	0.000	0	0

Datum (m) 25.500 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	1.450	870	1.450	1725	1.450	2580	1.450	3435	1.450	4290	1.450	5145	1.450	6000	1.450	6855	1.450	7710	1.450
30	1.450	885	1.450	1740	1.450	2595	1.450	3450	1.450	4305	1.450	5160	1.450	6015	1.450	6870	1.450	7725	1.450
45	1.450	900	1.450	1755	1.450	2610	1.450	3465	1.450	4320	1.450	5175	1.450	6030	1.450	6885	1.450	7740	1.450
60	1.450	915	1.450	1770	1.450	2625	1.450	3480	1.450	4335	1.450	5190	1.450	6045	1.450	6900	1.450	7755	1.450
75	1.450	930	1.450	1785	1.450	2640	1.450	3495	1.450	4350	1.450	5205	1.450	6060	1.450	6915	1.450	7770	1.450
90	1.450	945	1.450	1800	1.450	2655	1.450	3510	1.450	4365	1.450	5220	1.450	6075	1.450	6930	1.450	7785	1.450
105	1.450	960	1.450	1815	1.450	2670	1.450	3525	1.450	4380	1.450	5235	1.450	6090	1.450	6945	1.450	7800	1.450
120	1.450	975	1.450	1830	1.450	2685	1.450	3540	1.450	4395	1.450	5250	1.450	6105	1.450	6960	1.450	7815	1.450
135	1.450	990	1.450	1845	1.450	2700	1.450	3555	1.450	4410	1.450	5265	1.450	6120	1.450	6975	1.450	7830	1.450
150	1.450	1005	1.450	1860	1.450	2715	1.450	3570	1.450	4425	1.450	5280	1.450	6135	1.450	6990	1.450	7845	1.450
165	1.450	1020	1.450	1875	1.450	2730	1.450	3585	1.450	4440	1.450	5295	1.450	6150	1.450	7005	1.450	7860	1.450
180	1.450	1035	1.450	1890	1.450	2745	1.450	3600	1.450	4455	1.450	5310	1.450	6165	1.450	7020	1.450	7875	1.450
195	1.450	1050	1.450	1905	1.450	2760	1.450	3615	1.450	4470	1.450	5325	1.450	6180	1.450	7035	1.450	7890	1.450
210	1.450	1065	1.450	1920	1.450	2775	1.450	3630	1.450	4485	1.450	5340	1.450	6195	1.450	7050	1.450	7905	1.450
225	1.450	1080	1.450	1935	1.450	2790	1.450	3645	1.450	4500	1.450	5355	1.450	6210	1.450	7065	1.450	7920	1.450
240	1.450	1095	1.450	1950	1.450	2805	1.450	3660	1.450	4515	1.450	5370	1.450	6225	1.450	7080	1.450	7935	1.450
255	1.450	1110	1.450	1965	1.450	2820	1.450	3675	1.450	4530	1.450	5385	1.450	6240	1.450	7095	1.450	7950	1.450
270	1.450	1125	1.450	1980	1.450	2835	1.450	3690	1.450	4545	1.450	5400	1.450	6255	1.450	7110	1.450	7965	1.450
285	1.450	1140	1.450	1995	1.450	2850	1.450	3705	1.450	4560	1.450	5415	1.450	6270	1.450	7125	1.450	7980	1.450
300	1.450	1155	1.450	2010	1.450	2865	1.450	3720	1.450	4575	1.450	5430	1.450	6285	1.450	7140	1.450	7995	1.450
315	1.450	1170	1.450	2025	1.450	2880	1.450	3735	1.450	4590	1.450	5445	1.450	6300	1.450	7155	1.450	8010	1.450
330	1.450	1185	1.450	2040	1.450	2895	1.450	3750	1.450	4605	1.450	5460	1.450	6315	1.450	7170	1.450	8025	1.450
345	1.450	1200	1.450	2055	1.450	2910	1.450	3765	1.450	4620	1.450	5475	1.450	6330	1.450	7185	1.450	8040	1.450
360	1.450	1215	1.450	2070	1.450	2925	1.450	3780	1.450	4635	1.450	5490	1.450	6345	1.450	7200	1.450	8055	1.450
375	1.450	1230	1.450	2085	1.450	2940	1.450	3795	1.450	4650	1.450	5505	1.450	6360	1.450	7215	1.450	8070	1.450
390	1.450	1245	1.450	2100	1.450	2955	1.450	3810	1.450	4665	1.450	5520	1.450	6375	1.450	7230	1.450	8085	1.450
405	1.450	1260	1.450	2115	1.450	2970	1.450	3825	1.450	4680	1.450	5535	1.450	6390	1.450	7245	1.450	8100	1.450
420	1.450	1275	1.450	2130	1.450	2985	1.450	3840	1.450	4695	1.450	5550	1.450	6405	1.450	7260	1.450	8115	1.450
435	1.450	1290	1.450	2145	1.450	3000	1.450	3855	1.450	4710	1.450	5565	1.450	6420	1.450	7275	1.450	8130	1.450
450	1.450	1305	1.450	2160	1.450	3015	1.450	3870	1.450	4725	1.450	5580	1.450	6435	1.450	7290	1.450	8145	1.450
465	1.450	1320	1.450	2175	1.450	3030	1.450	3885	1.450	4740	1.450	5595	1.450	6450	1.450	7305	1.450	8160	1.450
480	1.450	1335	1.450	2190	1.450	3045	1.450	3900	1.450	4755	1.450	5610	1.450	6465	1.450	7320	1.450	8175	1.450
495	1.450	1350	1.450	2205	1.450	3060	1.450	3915	1.450	4770	1.450	5625	1.450	6480	1.450	7335	1.450	8190	1.450
510	1.450	1365	1.450	2220	1.450	3075	1.450	3930	1.450	4785	1.450	5640	1.450	6495	1.450	7350	1.450	8205	1.450
525	1.450	1380	1.450	2235	1.450	3090	1.450	3945	1.450	4800	1.450	5655	1.450	6510	1.450	7365	1.450	8220	1.450
540	1.450	1395	1.450	2250	1.450	3105	1.450	3960	1.450	4815	1.450	5670	1.450	6525	1.450	7380	1.450	8235	1.450
555	1.450	1410	1.450	2265	1.450	3120	1.450	3975	1.450	4830	1.450	5685	1.450	6540	1.450	7395	1.450	8250	1.450
570	1.450	1425	1.450	2280	1.450	3135	1.450	3990	1.450	4845	1.450	5700	1.450	6555	1.450	7410	1.450	8265	1.450
585	1.450	1440	1.450	2295	1.450	3150	1.450	4005	1.450	4860	1.450	5715	1.450	6570	1.450	7425	1.450	8280	1.450
600	1.450	1455	1.450	2310	1.450	3165	1.450	4020	1.450	4875	1.450	5730	1.450	6585	1.450	7440	1.450	8295	1.450
615	1.450	1470	1.450	2325	1.450	3180	1.450	4035	1.450	4890	1.450	5745	1.450	6600	1.450	7455	1.450	8310	1.450
630	1.450	1485	1.450	2340	1.450	3195	1.450	4050	1.450	4905	1.450	5760	1.450	6615	1.450	7470	1.450	8325	1.450
645	1.450	1500	1.450	2355	1.450	3210	1.450	4065	1.450	4920	1.450	5775	1.450	6630	1.450	7485	1.450	8340	1.450
660	1.450	1515	1.450	2370	1.450	3225	1.450	4080	1.450	4935	1.450	5790	1.450	6645	1.450	7500	1.450	8355	1.450
675	1.450	1530	1.450	2385	1.450	3240	1.450	4095	1.450	4950	1.450	5805	1.450	6660	1.450	7515	1.450	8370	1.450
690	1.450	1545	1.450	2400	1.450	3255	1.450	4110	1.450	4965	1.450	5820	1.450	6675	1.450	7530	1.450	8385	1.450
705	1.450	1560	1.450	2415	1.450	3270	1.450	4125	1.450	4980	1.450	5835	1.450	6690	1.450	7545	1.450	8400	1.450
720	1.450	1575	1.450	2430	1.450	3285	1.450	4140	1.450	4995	1.450	5850	1.450	6705	1.450	7560	1.450	8415	1.450
735	1.450	1590	1.450	2445	1.450	3300	1.450	4155	1.450	5010	1.450	5865	1.450	6720	1.450	7575	1.450	8430	1.450
750	1.450	1605	1.450	2460	1.450	3315	1.450	4170	1.450	5025	1.450	5880	1.450	6735	1.450	7590	1.450	8445	1.450
765	1.450	1620	1.450	2475	1.450	3330	1.450	4185	1.450	5040	1.450	5895	1.450	6750	1.450	7605	1.450	8460	1.450
780	1.450	1635	1.450	2490	1.450	3345	1.450	4200	1.450	5055	1.450	5910	1.450	6765	1.450	7620	1.450	8475	1.450
795	1.450	1650	1.450	2505	1.450	3360	1.450	4215	1.450	5070	1.450	5925	1.450	6780	1.450	7635	1.450	8490	1.450
810	1.450	1665	1.450	2520	1.450	3375	1.450	4230	1.450	5085	1.450	5940	1.450	6795	1.450	7650	1.450	8505	1.450
825	1.450	1680	1.450	2535	1.450	3390	1.450	4245	1.450	5100	1.450	5955	1.450	6810	1.450	7665	1.450	8520	1.450
840	1.450	1695	1.450	2550	1.450	3405	1.450	4260	1.450	5115	1.450	5970	1.450	6825	1.450	7680	1.450	8535	1.450
855	1.450	1710	1.450	2565	1.450	3420	1.450	4275	1.450	5130	1.450	5985	1.450	6840	1.450	7695	1.450	8550	1.450

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
8565	1.450	9735	1.450	10905	1.450	12075	1.450	13245	1.450	14415	1.450	15585	1.450	16755	1.450	17925	1.450	19095	1.450
8580	1.450	9750	1.450	10920	1.450	12090	1.450	13260	1.450	14430	1.450	15600	1.450	16770	1.450	17940	1.450	19110	1.450
8595	1.450	9765	1.450	10935	1.450	12105	1.450	13275	1.450	14445	1.450	15615	1.450	16785	1.450	17955	1.450	19125	1.450
8610	1.450	9780	1.450	10950	1.450	12120	1.450	13290	1.450	14460	1.450	15630	1.450	16800	1.450	17970	1.450	19140	1.450
8625	1.450	9795	1.450	10965	1.450	12135	1.450	13305	1.450	14475	1.450	15645	1.450	16815	1.450	17985	1.450	19155	1.450
8640	1.450	9810	1.450	10980	1.450	12150	1.450	13320	1.450	14490	1.450	15660	1.450	16830	1.450	18000	1.450	19170	1.450
8655	1.450	9825	1.450	10995	1.450	12165	1.450	13335	1.450	14505	1.450	15675	1.450	16845	1.450	18015	1.450	19185	1.450
8670	1.450	9840	1.450	11010	1.450	12180	1.450	13350	1.450	14520	1.450	15690	1.450	16860	1.450	18030	1.450	19200	1.450
8685	1.450	9855	1.450	11025	1.450	12195	1.450	13365	1.450	14535	1.450	15705	1.450	16875	1.450	18045	1.450	19215	1.450
8700	1.450	9870	1.450	11040	1.450	12210	1.450	13380	1.450	14550	1.450	15720	1.450	16890	1.450	18060	1.450	19230	1.450
8715	1.450	9885	1.450	11055	1.450	12225	1.450	13395	1.450	14565	1.450	15735	1.450	16905	1.450	18075	1.450	19245	1.450
8730	1.450	9900	1.450	11070	1.450	12240	1.450	13410	1.450	14580	1.450	15750	1.450	16920	1.450	18090	1.450	19260	1.450
8745	1.450	9915	1.450	11085	1.450	12255	1.450	13425	1.450	14595	1.450	15765	1.450	16935	1.450	18105	1.450	19275	1.450
8760	1.450	9930	1.450	11100	1.450	12270	1.450	13440	1.450	14610	1.450	15780	1.450	16950	1.450	18120	1.450	19290	1.450
8775	1.450	9945	1.450	11115	1.450	12285	1.450	13455	1.450	14625	1.450	15795	1.450	16965	1.450	18135	1.450	19305	1.450
8790	1.450	9960	1.450	11130	1.450	12300	1.450	13470	1.450	14640	1.450	15810	1.450	16980	1.450	18150	1.450	19320	1.450
8805	1.450	9975	1.450	11145	1.450	12315	1.450	13485	1.450	14655	1.450	15825	1.450	16995	1.450	18165	1.450	19335	1.450
8820	1.450	9990	1.450	11160	1.450	12330	1.450	13500	1.450	14670	1.450	15840	1.450	17010	1.450	18180	1.450	19350	1.450
8835	1.450	10005	1.450	11175	1.450	12345	1.450	13515	1.450	14685	1.450	15855	1.450	17025	1.450	18195	1.450	19365	1.450
8850	1.450	10020	1.450	11190	1.450	12360	1.450	13530	1.450	14700	1.450	15870	1.450	17040	1.450	18210	1.450	19380	1.450
8865	1.450	10035	1.450	11205	1.450	12375	1.450	13545	1.450	14715	1.450	15885	1.450	17055	1.450	18225	1.450	19395	1.450
8880	1.450	10050	1.450	11220	1.450	12390	1.450	13560	1.450	14730	1.450	15900	1.450	17070	1.450	18240	1.450	19410	1.450
8895	1.450	10065	1.450	11235	1.450	12405	1.450	13575	1.450	14745	1.450	15915	1.450	17085	1.450	18255	1.450	19425	1.450
8910	1.450	10080	1.450	11250	1.450	12420	1.450	13590	1.450	14760	1.450	15930	1.450	17100	1.450	18270	1.450	19440	1.450
8925	1.450	10095	1.450	11265	1.450	12435	1.450	13605	1.450	14775	1.450	15945	1.450	17115	1.450	18285	1.450	19455	1.450
8940	1.450	10110	1.450	11280	1.450	12450	1.450	13620	1.450	14790	1.450	15960	1.450	17130	1.450	18300	1.450	19470	1.450
8955	1.450	10125	1.450	11295	1.450	12465	1.450	13635	1.450	14805	1.450	15975	1.450	17145	1.450	18315	1.450	19485	1.450
8970	1.450	10140	1.450	11310	1.450	12480	1.450	13650	1.450	14820	1.450	15990	1.450	17160	1.450	18330	1.450	19500	1.450
8985	1.450	10155	1.450	11325	1.450	12495	1.450	13665	1.450	14835	1.450	16005	1.450	17175	1.450	18345	1.450	19515	1.450
9000	1.450	10170	1.450	11340	1.450	12510	1.450	13680	1.450	14850	1.450	16020	1.450	17190	1.450	18360	1.450	19530	1.450
9015	1.450	10185	1.450	11355	1.450	12525	1.450	13695	1.450	14865	1.450	16035	1.450	17205	1.450	18375	1.450	19545	1.450
9030	1.450	10200	1.450	11370	1.450	12540	1.450	13710	1.450	14880	1.450	16050	1.450	17220	1.450	18390	1.450	19560	1.450
9045	1.450	10215	1.450	11385	1.450	12555	1.450	13725	1.450	14895	1.450	16065	1.450	17235	1.450	18405	1.450	19575	1.450
9060	1.450	10230	1.450	11400	1.450	12570	1.450	13740	1.450	14910	1.450	16080	1.450	17250	1.450	18420	1.450	19590	1.450
9075	1.450	10245	1.450	11415	1.450	12585	1.450	13755	1.450	14925	1.450	16095	1.450	17265	1.450	18435	1.450	19605	1.450
9090	1.450	10260	1.450	11430	1.450	12600	1.450	13770	1.450	14940	1.450	16110	1.450	17280	1.450	18450	1.450	19620	1.450
9105	1.450	10275	1.450	11445	1.450	12615	1.450	13785	1.450	14955	1.450	16125	1.450	17295	1.450	18465	1.450	19635	1.450
9120	1.450	10290	1.450	11460	1.450	12630	1.450	13800	1.450	14970	1.450	16140	1.450	17310	1.450	18480	1.450	19650	1.450
9135	1.450	10305	1.450	11475	1.450	12645	1.450	13815	1.450	14985	1.450	16155	1.450	17325	1.450	18495	1.450	19665	1.450
9150	1.450	10320	1.450	11490	1.450	12660	1.450	13830	1.450	15000	1.450	16170	1.450	17340	1.450	18510	1.450	19680	1.450
9165	1.450	10335	1.450	11505	1.450	12675	1.450	13845	1.450	15015	1.450	16185	1.450	17355	1.450	18525	1.450	19695	1.450
9180	1.450	10350	1.450	11520	1.450	12690	1.450	13860	1.450	15030	1.450	16200	1.450	17370	1.450	18540	1.450	19710	1.450
9195	1.450	10365	1.450	11535	1.450	12705	1.450	13875	1.450	15045	1.450	16215	1.450	17385	1.450	18555	1.450	19725	1.450
9210	1.450	10380	1.450	11550	1.450	12720	1.450	13890	1.450	15060	1.450	16230	1.450	17400	1.450	18570	1.450	19740	1.450
9225	1.450	10395	1.450	11565	1.450	12735	1.450	13905	1.450	15075	1.450	16245	1.450	17415	1.450	18585	1.450	19755	1.450
9240	1.450	10410	1.450	11580	1.450	12750	1.450	13920	1.450	15090	1.450	16260	1.450	17430	1.450	18600	1.450	19770	1.450
9255	1.450	10425	1.450	11595	1.450	12765	1.450	13935	1.450	15105	1.450	16275	1.450	17445	1.450	18615	1.450	19785	1.450
9270	1.450	10440	1.450	11610	1.450	12780	1.450	13950	1.450	15120	1.450	16290	1.450	17460	1.450	18630	1.450	19800	1.450
9285	1.450	10455	1.450	11625	1.450	12795	1.450	13965	1.450	15135	1.450	16305	1.450	17475	1.450	18645	1.450	19815	1.450
9300	1.450	10470	1.450	11640	1.450	12810	1.450	13980	1.450	15150	1.450	16320	1.450	17490	1.450	18660	1.450	19830	1.450
9315	1.450	10485	1.450	11655	1.450	12825	1.450	13995	1.450	15165	1.450	16335	1.450	17505	1.450	18675	1.450	19845	1.450
9330	1.450	10500	1.450	11670	1.450	12840	1.450	14010	1.450	15180	1.450	16350	1.450	17520	1.450	18690	1.450	19860	1.450
9345	1.450	10515	1.450	11685	1.450	12855	1.450	14025	1.450	15195	1.450	16365	1.450	17535	1.450	18705	1.450	19875	1.450
9360	1.450	10530	1.450	11700	1.450	12870	1.450	14040	1.450	15210	1.450	16380	1.450	17550	1.450	18720	1.450	19890	1.450
9375	1.450	10545	1.450	11715	1.450	12885	1.450	14055	1.450	15225	1.450	16395	1.450	17565	1.450	18735	1.450	19905	1.450
9390	1.450	10560	1.450	11730	1.450	12900	1.450	14070	1.450	15240	1.450	16410	1.450	17580	1.450	18750	1.450	19920	1.450
9405	1.450	10575	1.450	11745	1.450	12915	1.450	14085	1.450	15255	1.450	16425	1.450	17595	1.450	18765	1.450	19935	1.450
9420	1.450	10590	1.450	11760	1.450	12930	1.450	14100	1.450	15270	1.450	16440	1.450	17610	1.450	18780	1.450	19950	1.450
9435	1.450	10605	1.450	11775	1.450	12945	1.450	14115	1.450	15285	1.450	16455	1.450	17625	1.450	18795	1.450	19965	1.450
9450	1.450	10620	1.450	11790	1.450	12960	1.450	14130	1.450	15300	1.450	16470	1.450	17640	1.450	18810	1.450	19980	1.450
9465	1.450	10635	1.450	11805	1.450	12975	1.450	14145	1.450	15315	1.450	16485	1.450	17655	1.450	18825	1.450	19995	1.450
9480	1.450	10650	1.450	11820	1.450	12990	1.450	14160	1.450	15330	1.450	16500	1.450	17670	1.450	18840	1.450	20010	1.450
9495	1.450	10665	1.450	11835	1.450	13005	1.450	14175	1.450	15345	1.450	16515	1.450	17685	1.450	18855	1.450	20025	1.450
9510	1.450	10680	1.450	11850	1.450	13020	1.450	14190	1.450	15360	1.450	16530	1.450	17700	1.450	18870	1.450	20040	1.450
9525	1.450	10695	1.450	11865	1.450	13035	1.450	14205	1.450	15375	1.450	16545	1.450	17715	1.450	18885	1.450	20055	1.450
9540	1.450	10710	1.450	11880	1.450	13050	1.450	14220	1.450	15390	1.450	16560	1.450	17730	1.450	18900	1.450	20070	1.450
9555	1.450	10725	1.450	11895	1.450	13065	1.450	14235	1.450	15405	1.450	16575	1.450	17745	1.450	18915	1.450	20085	1.450
9570	1.450	10740	1.450	11910	1.450	13080	1.450	14250	1.450	15420	1.450	16590	1.450	17760	1.450	18930	1.450	20100	1.450
9585	1.450	10755	1.450	11925	1.450	13095	1.450	14265	1.450	15435	1.450	16605	1.450	17775	1.450	18945	1.450	20115	1.450
9600	1.450	10770	1.450	11940	1.450	13110	1.450	14280	1.450	15450	1.450	16620	1.450	17790	1.450	18960	1.450	20130	1.450
9615	1.450	10785	1.450	11955	1.450	13125	1.450	14295	1.450	15465	1.450	16635	1.450	17805	1.450	18975	1.450	20145	1.450
9630	1.450	10800	1.450	11970	1.450	13140	1.450	14310	1.450	15480	1.450	16650	1.450	17820	1.450	18990	1.450	20160	1.450
9645	1.450	10815	1.450	11985	1.450	13155	1.450	14325	1.450	15495	1.450	16665	1.450	17835	1.450	19005	1.450		
9660	1.450	10830	1.450	12000	1.450	13170	1.450	14340	1.450	15510	1.450	16680	1.450	17850	1.450	19020	1.450		
9675	1.450	10845	1.450	12015	1.450	13185	1.450	14355	1.450	15525	1.450	16695	1.450	17865	1.450	19035	1.450		
9690	1.450	10860	1.450	12030	1.450	13200	1.450	14370	1.450	15540	1.450	16710	1.450	17880	1.450	19050	1.450		
9705	1.450	10875	1.450	12045	1.450	13215	1.450	14385	1.450	15555	1.450	16725	1.450	17895	1.450	19065	1.450		
9720	1.450	10890	1.450	12060	1.450	13230	1.450	14400	1.450	15570	1.450	16740	1.450	17910	1.450	19080	1.450		

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	1920
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	16

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	FEH	E (1km)	0.300
Return Period (years)	100	F (1km)	2.736
Site Location	GB 491100 176950 SU 91100 76950	Summer Storms	No
C (1km)	-0.027	Winter Storms	Yes
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840
D3 (1km)	0.248	Storm Duration (mins)	960

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S1.5, DS/PN: 1.005, Volume (m^3): 9.7

Unit Reference	MD-SCL-0098-5000-1100-5000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	98
Design Flow (l/s)	5.0	Invert Level (m)	26.311
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise blockage risk	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	5.0	Kick-Flo®	0.614	3.8
Flush-Flo™	0.257	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.600	4.0	1.600	5.9	2.600	7.5	5.000	10.1	7.500	12.3
0.200	4.9	0.800	4.3	1.800	6.3	3.000	8.0	5.500	10.6	8.000	12.7
0.300	5.0	1.000	4.8	2.000	6.6	3.500	8.6	6.000	11.1	8.500	13.0
0.400	4.8	1.200	5.2	2.200	6.9	4.000	9.1	6.500	11.5	9.000	13.4
0.500	4.5	1.400	5.6	2.400	7.2	4.500	9.6	7.000	11.9	9.500	13.8

Storage Structures for Storm

Porous Car Park Manhole: P.P., DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	26.900	Depression Storage (mm)	5
Max Percolation (l/s)	422.2	Width (m)	80.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	19.0	Membrane Depth (mm)	0

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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 FEH D3 (1km) 0.248
Site Location GB 491100 176950 SU 91100 76950 E (1km) 0.300
C (1km) -0.027 F (1km) 2.736
D1 (1km) 0.267 Cv (Summer) 0.750
D2 (1km) 0.250 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	7200 Summer	1	+30%					27.028	-0.272	0.000	0.00		0.3
1.001	SW1 -O/L	7200 Summer	1	+30%	1/15 Summer				27.028	0.048	0.000	-0.56		-2.1
2.000	P.P.	480 Winter	1	+30%	100/15 Summer				27.030	-0.145	0.000	0.25		3.9
2.001	S1.0	7200 Summer	1	+30%	30/15 Summer	100/15 Summer			27.022	-0.113	0.000	0.05		1.5
2.002	S1.1	7200 Summer	1	+30%	30/15 Summer				27.027	-0.014	0.000	0.06		1.7
2.003	S1.2	7200 Summer	1	+30%	1/15 Winter	100/15 Summer			27.034	0.134	0.000	0.16		1.6
1.002	Swale 2	7200 Summer	1	+30%					27.043	-0.257	0.000	0.00		-3.1
1.003	S1.3	7200 Summer	1	+30%	1/60 Winter				27.043	0.423	0.000	-3.44		-58.0
1.004	S1.4	7200 Summer	1	+30%	1/960 Summer				27.000	0.142	0.000	-0.16		-19.2
1.005	S1.5	7200 Summer	1	+30%	1/15 Summer				27.000	0.539	0.000	-0.27		-3.8

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	3
2.002	S1.1	OK	
2.003	S1.2	SURCHARGED	4
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	51
1.005	S1.5	FLOOD RISK*	52

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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	FEH	D3 (1km)	0.248
Site Location	GB 491100 176950 SU 91100 76950	E (1km)	0.300
C (1km)	-0.027	F (1km)	2.736
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	15 Winter	30	+30%					27.152	-0.148	0.000	0.12		41.9
1.001	SW1 -O/L	15 Winter	30	+30%	1/15 Summer				27.152	0.172	0.000	1.61		6.1
2.000	P.P.	60 Winter	30	+30%	100/15 Summer				27.169	-0.006	0.000	0.99		15.5
2.001	S1.0	15 Winter	30	+30%	30/15 Summer	100/15 Summer			27.381	0.246	0.000	0.51		15.4
2.002	S1.1	15 Winter	30	+30%	30/15 Summer				27.374	0.333	0.000	0.92		26.7
2.003	S1.2	15 Winter	30	+30%	1/15 Winter	100/15 Summer			27.321	0.421	0.000	2.45		25.8
1.002	Swale 2	1440 Winter	30	+30%					27.044	-0.256	0.000	0.00		9.5
1.003	S1.3	1440 Winter	30	+30%	1/60 Winter				27.044	0.424	0.000	0.19		3.1
1.004	S1.4	240 Winter	30	+30%	1/960 Summer				27.000	0.142	0.000	0.02		2.4
1.005	S1.5	240 Winter	30	+30%	1/15 Summer				27.000	0.539	0.000	0.16		2.2

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	FLOOD RISK	3
2.002	S1.1	FLOOD RISK	
2.003	S1.2	FLOOD RISK	4
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	51
1.005	S1.5	FLOOD RISK*	52

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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	FEH	D3 (1km)	0.248
Site Location	GB 491100 176950 SU 91100 76950	E (1km)	0.300
C (1km)	-0.027	F (1km)	2.736
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	15 Winter	100	+30%					27.244	-0.056	0.000	0.19		63.2
1.001	SW1 -O/L	15 Winter	100	+30%	1/15 Summer				27.243	0.263	0.000	1.84		7.0
2.000	P.P.	60 Winter	100	+30%	100/15 Summer				27.304	0.129	0.000	1.19		18.7
2.001	S1.0	15 Winter	100	+30%	30/15 Summer	100/15 Summer			27.452	0.317	2.075	0.63		18.9
2.002	S1.1	15 Winter	100	+30%	30/15 Summer				27.447	0.406	0.000	1.21		35.1
2.003	S1.2	15 Winter	100	+30%	1/15 Winter	100/15 Summer			27.352	0.452	2.055	2.54		26.7
1.002	Swale 2	960 Winter	100	+30%					27.115	-0.185	0.000	0.01		15.0
1.003	S1.3	960 Winter	100	+30%	1/60 Winter				27.115	0.495	0.000	0.21		3.6
1.004	S1.4	240 Winter	100	+30%	1/960 Summer				27.000	0.142	0.000	0.04		4.4
1.005	S1.5	240 Winter	100	+30%	1/15 Summer				27.000	0.539	0.000	0.27		3.8

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	FLOOD RISK*	
1.001	SW1 -O/L	FLOOD RISK*	
2.000	P.P.	FLOOD RISK*	
2.001	S1.0	FLOOD	3
2.002	S1.1	FLOOD RISK	
2.003	S1.2	FLOOD	4
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	51
1.005	S1.5	FLOOD RISK*	52

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)	100	Foul Sewage (l/s/ha)	0.000	Min Design Depth for Optimisation (m)	1.200
M5-60 (mm)	19.400	Volumetric Runoff Coeff.	0.750	Min Vel for Auto Design only (m/s)	1.00
Ratio R	0.400	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50	Minimum Backdrop Height (m)	0.000		
Maximum Time of Concentration (mins)	30	Maximum Backdrop Height (m)	0.000		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.046	4-8	0.019	8-12	0.000	12-16	0.039	16-20	0.077	20-24	0.239	24-28	0.106

Total Area Contributing (ha) = 0.525

Total Pipe Volume (m^3) = 519.102

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.500	0.044	920.5	0.062	6.00	0.0		0.030	3 \=/	1200	1:3 Swale	
1.001	28.000	0.112	250.0	0.000	0.00	0.0	0.600		o	100	Pipe/Conduit	
2.000	81.000	0.032	2531.3	0.315	6.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	23.600	0.094	251.1	0.032	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.002	16.500	0.066	250.0	0.031	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.003	21.070	0.084	250.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
1.002	115.000	0.055	2100.0	0.020	0.00	0.0		0.030	4 \=/	1400	1:4 Swale	
1.003	26.000	0.037	702.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	44.600	0.047	948.9	0.065	0.00	0.0	0.600		o	500	Pipe/Conduit	
1.005	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	8.60	26.930	0.062	0.0	0.0	0.0	0.26	64.4	8.4
1.001	50.00	9.56	26.880	0.062	0.0	0.0	0.0	0.48	3.8«	8.4
2.000	50.00	11.38	26.950	0.315	0.0	0.0	0.0	0.25	10.0«	42.7
2.001	50.00	11.86	26.910	0.347	0.0	0.0	0.0	0.82	32.6«	47.0
2.002	50.00	12.19	26.816	0.378	0.0	0.0	0.0	0.82	32.7«	51.2
2.003	50.00	12.75	26.750	0.378	0.0	0.0	0.0	0.63	11.1«	51.2
1.002	50.00	23.97	26.450	0.460	0.0	0.0	0.0	0.17	51.2«	62.3
1.003	50.00	24.86	26.395	0.460	0.0	0.0	0.0	0.49	19.3«	62.3
1.004	50.00	25.93	26.358	0.525	0.0	0.0	0.0	0.70	136.9	71.1
1.005	50.00	26.01	26.311	0.525	0.0	0.0	0.0	1.00	17.8«	71.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
Swale 1	27.300	0.370	Junction		1.000	26.930	1200				
SW1 -O/L	27.300	0.420	Junction		1.001	26.880	100	1.000	26.886	1200	56
P.P.	27.350	0.400	Sealed Manhole	1200	2.000	26.950	225				
S1.0	27.450	0.540	Open Manhole	1350	2.001	26.910	225	2.000	26.918	225	8
S1.1	27.450	0.634	Open Manhole	1200	2.002	26.816	225	2.001	26.816	225	
S1.2	27.350	0.600	Open Manhole		2.003	26.750	150	2.002	26.750	225	
Swale 2	27.300	0.850	Junction		1.002	26.450	1400	1.001	26.768	100	268
								2.003	26.666	150	216
S1.3	27.250	0.855	Junction	0	1.003	26.395	225	1.002	26.395	1400	
S1.4	27.000	0.642	Sealed Manhole	1500	1.004	26.358	500	1.003	26.358	225	
S1.5	27.000	0.689	Sealed Manhole	1500	1.005	26.311	150	1.004	26.311	500	
	27.000	0.739	Open Manhole	0		OUTFALL		1.005	26.261	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	3 \=/	1200	Swale 1	27.300	26.930	0.220	Junction	
1.001	o	100	SW1 -O/L	27.300	26.880	0.320	Junction	
2.000	o	225	P.P.	27.350	26.950	0.175	Sealed Manhole	1200
2.001	o	225	S1.0	27.450	26.910	0.315	Open Manhole	1350
2.002	o	225	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.003	o	150	S1.2	27.350	26.750	0.450	Open Manhole	1200
1.002	4 \=/	1400	Swale 2	27.300	26.450	0.700	Junction	
1.003	o	225	S1.3	27.250	26.395	0.630	Junction	
1.004	o	500	S1.4	27.000	26.358	0.142	Sealed Manhole	1500
1.005	o	150	S1.5	27.000	26.311	0.539	Sealed Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	40.500	920.5	SW1 -O/L	27.300	26.886	0.264	Junction	
1.001	28.000	250.0	Swale 2	27.300	26.768	0.432	Junction	
2.000	81.000	2531.3	S1.0	27.450	26.918	0.307	Open Manhole	1350
2.001	23.600	251.1	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.002	16.500	250.0	S1.2	27.350	26.750	0.375	Open Manhole	1200
2.003	21.070	250.8	Swale 2	27.300	26.666	0.484	Junction	
1.002	115.000	2100.0	S1.3	27.250	26.395	0.705	Junction	
1.003	26.000	702.7	S1.4	27.000	26.358	0.417	Sealed Manhole	1500
1.004	44.600	948.9	S1.5	27.000	26.311	0.189	Sealed Manhole	1500
1.005	5.000	100.0		27.000	26.261	0.589	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.062	0.062	0.062
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.315	0.315	0.315
2.001	-	-	100	0.032	0.032	0.032
2.002	-	-	100	0.031	0.031	0.031
2.003	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.020	0.020	0.020
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.065	0.065	0.065
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.525	0.525	0.525

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		27.000	26.261	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	0.000	60	0.000	105	0.000	150	0.000	195	0.000	240	0.000	285	0.000	330	0.000
30	0.000	75	0.000	120	0.000	165	0.000	210	0.000	255	0.000	300	0.000	345	0.000
45	0.000	90	0.000	135	0.000	180	0.000	225	0.000	270	0.000	315	0.000	360	0.000

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	1920
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	16

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	FEH	E (1km)	0.300
Return Period (years)	100	F (1km)	2.736
Site Location	GB 491100 176950 SU 91100 76950	Summer Storms	No
C (1km)	-0.027	Winter Storms	Yes
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840
D3 (1km)	0.248	Storm Duration (mins)	960

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S1.5, DS/PN: 1.005, Volume (m³): 9.7

Unit Reference	MD-SCL-0098-5000-1100-5000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	98
Design Flow (l/s)	5.0	Invert Level (m)	26.311
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise blockage risk	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	5.0	Kick-Flo®	0.614	3.8
Flush-Flo™	0.257	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.600	4.0	1.600	5.9	2.600	7.5	5.000	10.1	7.500	12.3
0.200	4.9	0.800	4.3	1.800	6.3	3.000	8.0	5.500	10.6	8.000	12.7
0.300	5.0	1.000	4.8	2.000	6.6	3.500	8.6	6.000	11.1	8.500	13.0
0.400	4.8	1.200	5.2	2.200	6.9	4.000	9.1	6.500	11.5	9.000	13.4
0.500	4.5	1.400	5.6	2.400	7.2	4.500	9.6	7.000	11.9	9.500	13.8

Storage Structures for Storm

Porous Car Park Manhole: P.P., DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	26.900	Depression Storage (mm)	5
Max Percolation (l/s)	422.2	Width (m)	80.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	19.0	Membrane Depth (mm)	0

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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) 19.400 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	30 Winter	1	+30%					26.993	-0.307	0.000	0.02		7.9
1.001	SW1 -O/L	30 Winter	1	+30%	1/15 Winter				26.984	0.004	0.000	1.04		3.9
2.000	P.P.	480 Winter	1	+30%					27.019	-0.156	0.000	0.18		2.8
2.001	S1.0	15 Winter	1	+30%					26.967	-0.168	0.000	0.14		4.3
2.002	S1.1	15 Winter	1	+30%	30/15 Winter				26.900	-0.141	0.000	0.29		8.5
2.003	S1.2	15 Winter	1	+30%	30/15 Summer				26.852	-0.048	0.000	0.80		8.4
1.002	Swale 2	30 Winter	1	+30%					26.536	-0.764	0.000	0.00		13.2
1.003	S1.3	120 Winter	1	+30%	30/30 Summer				26.528	-0.092	0.000	0.27		4.6
1.004	S1.4	120 Winter	1	+30%	100/120 Winter				26.519	-0.339	0.000	0.06		6.6
1.005	S1.5	120 Winter	1	+30%	1/15 Summer				26.515	0.054	0.000	0.35		4.9

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	
2.002	S1.1	OK	
2.003	S1.2	OK	
1.002	Swale 2	OK	
1.003	S1.3	OK*	
1.004	S1.4	OK	9
1.005	S1.5	SURCHARGED*	9

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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) 19.400 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	30 Winter	30	+30%					27.074	-0.226	0.000	0.06		19.3
1.001	SW1 -O/L	30 Winter	30	+30%	1/15 Winter				27.074	0.094	0.000	1.37		5.2
2.000	P.P.	240 Winter	30	+30%					27.099	-0.076	0.000	0.75		11.8
2.001	S1.0	15 Winter	30	+30%					27.064	-0.071	0.000	0.32		9.6
2.002	S1.1	15 Winter	30	+30%	30/15 Winter				27.049	0.008	0.000	0.59		17.0
2.003	S1.2	15 Winter	30	+30%	30/15 Summer				27.016	0.116	0.000	1.57		16.5
1.002	Swale 2	480 Winter	30	+30%					26.829	-0.471	0.000	0.01		15.5
1.003	S1.3	480 Winter	30	+30%	30/30 Summer				26.829	0.209	0.000	0.36		6.1
1.004	S1.4	480 Winter	30	+30%	100/120 Winter				26.849	-0.009	0.000	0.05		6.0
1.005	S1.5	480 Winter	30	+30%	1/15 Summer				26.850	0.389	0.000	0.35		5.0

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	
2.002	S1.1	SURCHARGED	
2.003	S1.2	SURCHARGED	
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	OK	9
1.005	S1.5	SURCHARGED*	9

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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) 19.400 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	60 Winter	100	+30%					27.116	-0.184	0.000	0.05		17.1
1.001	SW1 -O/L	60 Winter	100	+30%	1/15 Winter				27.115	0.135	0.000	1.50		5.7
2.000	P.P.	120 Winter	100	+30%					27.161	-0.014	0.000	0.95		14.9
2.001	S1.0	15 Winter	100	+30%					27.133	-0.002	0.000	0.32		9.6
2.002	S1.1	15 Winter	100	+30%	30/15 Winter				27.116	0.075	0.000	0.65		18.9
2.003	S1.2	15 Winter	100	+30%	30/15 Summer				27.079	0.179	0.000	1.79		18.8
1.002	Swale 2	360 Winter	100	+30%					26.949	-0.351	0.000	0.01		21.4
1.003	S1.3	360 Winter	100	+30%	30/30 Summer				26.949	0.329	0.000	0.67		11.3
1.004	S1.4	1440 Summer	100	+30%	100/120 Winter				27.000	0.142	0.000	0.05		5.6
1.005	S1.5	1440 Summer	100	+30%	1/15 Summer				27.000	0.539	0.000	0.35		5.0

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	
2.002	S1.1	SURCHARGED	
2.003	S1.2	SURCHARGED	
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	9
1.005	S1.5	FLOOD RISK*	9

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)	100	Foul Sewage (l/s/ha)	0.000	Min Design Depth for Optimisation (m)	1.200
M5-60 (mm)	19.400	Volumetric Runoff Coeff.	0.750	Min Vel for Auto Design only (m/s)	1.00
Ratio R	0.400	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50	Minimum Backdrop Height (m)	0.000		
Maximum Time of Concentration (mins)	30	Maximum Backdrop Height (m)	0.000		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.046	4-8	0.019	8-12	0.000	12-16	0.039	16-20	0.077	20-24	0.239	24-28	0.106

Total Area Contributing (ha) = 0.525

Total Pipe Volume (m³) = 519.102

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.500	0.044	920.5	0.062	6.00	0.0		0.030	3 \=/	1200	1:3 Swale	
1.001	28.000	0.112	250.0	0.000	0.00	0.0	0.600		o	100	Pipe/Conduit	
2.000	81.000	0.032	2531.3	0.315	6.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	23.600	0.094	251.1	0.032	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.002	16.500	0.066	250.0	0.031	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.003	21.070	0.084	250.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
1.002	115.000	0.055	2100.0	0.020	0.00	0.0		0.030	4 \=/	1400	1:4 Swale	
1.003	26.000	0.037	702.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	44.600	0.047	948.9	0.065	0.00	0.0	0.600		o	500	Pipe/Conduit	
1.005	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	8.60	26.930	0.062	0.0	0.0	0.0	0.26	64.4	8.4
1.001	50.00	9.56	26.880	0.062	0.0	0.0	0.0	0.48	3.8«	8.4
2.000	50.00	11.38	26.950	0.315	0.0	0.0	0.0	0.25	10.0«	42.7
2.001	50.00	11.86	26.910	0.347	0.0	0.0	0.0	0.82	32.6«	47.0
2.002	50.00	12.19	26.816	0.378	0.0	0.0	0.0	0.82	32.7«	51.2
2.003	50.00	12.75	26.750	0.378	0.0	0.0	0.0	0.63	11.1«	51.2
1.002	50.00	23.97	26.450	0.460	0.0	0.0	0.0	0.17	51.2«	62.3
1.003	50.00	24.86	26.395	0.460	0.0	0.0	0.0	0.49	19.3«	62.3
1.004	50.00	25.93	26.358	0.525	0.0	0.0	0.0	0.70	136.9	71.1
1.005	50.00	26.01	26.311	0.525	0.0	0.0	0.0	1.00	17.8«	71.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
Swale 1	27.300	0.370	Junction		1.000	26.930	1200				
SW1 -O/L	27.300	0.420	Junction		1.001	26.880	100	1.000	26.886	1200	56
P.P.	27.350	0.400	Sealed Manhole	1200	2.000	26.950	225				
S1.0	27.450	0.540	Open Manhole	1350	2.001	26.910	225	2.000	26.918	225	8
S1.1	27.450	0.634	Open Manhole	1200	2.002	26.816	225	2.001	26.816	225	
S1.2	27.350	0.600	Open Manhole		2.003	26.750	150	2.002	26.750	225	
Swale 2	27.300	0.850	Junction		1.002	26.450	1400	1.001	26.768	100	268
								2.003	26.666	150	216
S1.3	27.250	0.855	Junction	0	1.003	26.395	225	1.002	26.395	1400	
S1.4	27.000	0.642	Sealed Manhole	1500	1.004	26.358	500	1.003	26.358	225	
S1.5	27.000	0.689	Sealed Manhole	1500	1.005	26.311	150	1.004	26.311	500	
	27.000	0.739	Open Manhole	0		OUTFALL		1.005	26.261	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	3 \=/	1200	Swale 1	27.300	26.930	0.220	Junction	
1.001	o	100	SW1 -O/L	27.300	26.880	0.320	Junction	
2.000	o	225	P.P.	27.350	26.950	0.175	Sealed Manhole	1200
2.001	o	225	S1.0	27.450	26.910	0.315	Open Manhole	1350
2.002	o	225	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.003	o	150	S1.2	27.350	26.750	0.450	Open Manhole	1200
1.002	4 \=/	1400	Swale 2	27.300	26.450	0.700	Junction	
1.003	o	225	S1.3	27.250	26.395	0.630	Junction	
1.004	o	500	S1.4	27.000	26.358	0.142	Sealed Manhole	1500
1.005	o	150	S1.5	27.000	26.311	0.539	Sealed Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	40.500	920.5	SW1 -O/L	27.300	26.886	0.264	Junction	
1.001	28.000	250.0	Swale 2	27.300	26.768	0.432	Junction	
2.000	81.000	2531.3	S1.0	27.450	26.918	0.307	Open Manhole	1350
2.001	23.600	251.1	S1.1	27.450	26.816	0.409	Open Manhole	1200
2.002	16.500	250.0	S1.2	27.350	26.750	0.375	Open Manhole	1200
2.003	21.070	250.8	Swale 2	27.300	26.666	0.484	Junction	
1.002	115.000	2100.0	S1.3	27.250	26.395	0.705	Junction	
1.003	26.000	702.7	S1.4	27.000	26.358	0.417	Sealed Manhole	1500
1.004	44.600	948.9	S1.5	27.000	26.311	0.189	Sealed Manhole	1500
1.005	5.000	100.0		27.000	26.261	0.589	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.062	0.062	0.062
1.001	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.315	0.315	0.315
2.001	-	-	100	0.032	0.032	0.032
2.002	-	-	100	0.031	0.031	0.031
2.003	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.020	0.020	0.020
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.065	0.065	0.065
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.525	0.525	0.525

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005		27.000	26.261	0.000	0	0

Datum (m) 25.500 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	1.450	870	1.450	1725	1.450	2580	1.450	3435	1.450	4290	1.450	5145	1.450	6000	1.450	6855	1.450	7710	1.450
30	1.450	885	1.450	1740	1.450	2595	1.450	3450	1.450	4305	1.450	5160	1.450	6015	1.450	6870	1.450	7725	1.450
45	1.450	900	1.450	1755	1.450	2610	1.450	3465	1.450	4320	1.450	5175	1.450	6030	1.450	6885	1.450	7740	1.450
60	1.450	915	1.450	1770	1.450	2625	1.450	3480	1.450	4335	1.450	5190	1.450	6045	1.450	6900	1.450	7755	1.450
75	1.450	930	1.450	1785	1.450	2640	1.450	3495	1.450	4350	1.450	5205	1.450	6060	1.450	6915	1.450	7770	1.450
90	1.450	945	1.450	1800	1.450	2655	1.450	3510	1.450	4365	1.450	5220	1.450	6075	1.450	6930	1.450	7785	1.450
105	1.450	960	1.450	1815	1.450	2670	1.450	3525	1.450	4380	1.450	5235	1.450	6090	1.450	6945	1.450	7800	1.450
120	1.450	975	1.450	1830	1.450	2685	1.450	3540	1.450	4395	1.450	5250	1.450	6105	1.450	6960	1.450	7815	1.450
135	1.450	990	1.450	1845	1.450	2700	1.450	3555	1.450	4410	1.450	5265	1.450	6120	1.450	6975	1.450	7830	1.450
150	1.450	1005	1.450	1860	1.450	2715	1.450	3570	1.450	4425	1.450	5280	1.450	6135	1.450	6990	1.450	7845	1.450
165	1.450	1020	1.450	1875	1.450	2730	1.450	3585	1.450	4440	1.450	5295	1.450	6150	1.450	7005	1.450	7860	1.450
180	1.450	1035	1.450	1890	1.450	2745	1.450	3600	1.450	4455	1.450	5310	1.450	6165	1.450	7020	1.450	7875	1.450
195	1.450	1050	1.450	1905	1.450	2760	1.450	3615	1.450	4470	1.450	5325	1.450	6180	1.450	7035	1.450	7890	1.450
210	1.450	1065	1.450	1920	1.450	2775	1.450	3630	1.450	4485	1.450	5340	1.450	6195	1.450	7050	1.450	7905	1.450
225	1.450	1080	1.450	1935	1.450	2790	1.450	3645	1.450	4500	1.450	5355	1.450	6210	1.450	7065	1.450	7920	1.450
240	1.450	1095	1.450	1950	1.450	2805	1.450	3660	1.450	4515	1.450	5370	1.450	6225	1.450	7080	1.450	7935	1.450
255	1.450	1110	1.450	1965	1.450	2820	1.450	3675	1.450	4530	1.450	5385	1.450	6240	1.450	7095	1.450	7950	1.450
270	1.450	1125	1.450	1980	1.450	2835	1.450	3690	1.450	4545	1.450	5400	1.450	6255	1.450	7110	1.450	7965	1.450
285	1.450	1140	1.450	1995	1.450	2850	1.450	3705	1.450	4560	1.450	5415	1.450	6270	1.450	7125	1.450	7980	1.450
300	1.450	1155	1.450	2010	1.450	2865	1.450	3720	1.450	4575	1.450	5430	1.450	6285	1.450	7140	1.450	7995	1.450
315	1.450	1170	1.450	2025	1.450	2880	1.450	3735	1.450	4590	1.450	5445	1.450	6300	1.450	7155	1.450	8010	1.450
330	1.450	1185	1.450	2040	1.450	2895	1.450	3750	1.450	4605	1.450	5460	1.450	6315	1.450	7170	1.450	8025	1.450
345	1.450	1200	1.450	2055	1.450	2910	1.450	3765	1.450	4620	1.450	5475	1.450	6330	1.450	7185	1.450	8040	1.450
360	1.450	1215	1.450	2070	1.450	2925	1.450	3780	1.450	4635	1.450	5490	1.450	6345	1.450	7200	1.450	8055	1.450
375	1.450	1230	1.450	2085	1.450	2940	1.450	3795	1.450	4650	1.450	5505	1.450	6360	1.450	7215	1.450	8070	1.450
390	1.450	1245	1.450	2100	1.450	2955	1.450	3810	1.450	4665	1.450	5520	1.450	6375	1.450	7230	1.450	8085	1.450
405	1.450	1260	1.450	2115	1.450	2970	1.450	3825	1.450	4680	1.450	5535	1.450	6390	1.450	7245	1.450	8100	1.450
420	1.450	1275	1.450	2130	1.450	2985	1.450	3840	1.450	4695	1.450	5550	1.450	6405	1.450	7260	1.450	8115	1.450
435	1.450	1290	1.450	2145	1.450	3000	1.450	3855	1.450	4710	1.450	5565	1.450	6420	1.450	7275	1.450	8130	1.450
450	1.450	1305	1.450	2160	1.450	3015	1.450	3870	1.450	4725	1.450	5580	1.450	6435	1.450	7290	1.450	8145	1.450
465	1.450	1320	1.450	2175	1.450	3030	1.450	3885	1.450	4740	1.450	5595	1.450	6450	1.450	7305	1.450	8160	1.450
480	1.450	1335	1.450	2190	1.450	3045	1.450	3900	1.450	4755	1.450	5610	1.450	6465	1.450	7320	1.450	8175	1.450
495	1.450	1350	1.450	2205	1.450	3060	1.450	3915	1.450	4770	1.450	5625	1.450	6480	1.450	7335	1.450	8190	1.450
510	1.450	1365	1.450	2220	1.450	3075	1.450	3930	1.450	4785	1.450	5640	1.450	6495	1.450	7350	1.450	8205	1.450
525	1.450	1380	1.450	2235	1.450	3090	1.450	3945	1.450	4800	1.450	5655	1.450	6510	1.450	7365	1.450	8220	1.450
540	1.450	1395	1.450	2250	1.450	3105	1.450	3960	1.450	4815	1.450	5670	1.450	6525	1.450	7380	1.450	8235	1.450
555	1.450	1410	1.450	2265	1.450	3120	1.450	3975	1.450	4830	1.450	5685	1.450	6540	1.450	7395	1.450	8250	1.450
570	1.450	1425	1.450	2280	1.450	3135	1.450	3990	1.450	4845	1.450	5700	1.450	6555	1.450	7410	1.450	8265	1.450
585	1.450	1440	1.450	2295	1.450	3150	1.450	4005	1.450	4860	1.450	5715	1.450	6570	1.450	7425	1.450	8280	1.450
600	1.450	1455	1.450	2310	1.450	3165	1.450	4020	1.450	4875	1.450	5730	1.450	6585	1.450	7440	1.450	8295	1.450
615	1.450	1470	1.450	2325	1.450	3180	1.450	4035	1.450	4890	1.450	5745	1.450	6600	1.450	7455	1.450	8310	1.450
630	1.450	1485	1.450	2340	1.450	3195	1.450	4050	1.450	4905	1.450	5760	1.450	6615	1.450	7470	1.450	8325	1.450
645	1.450	1500	1.450	2355	1.450	3210	1.450	4065	1.450	4920	1.450	5775	1.450	6630	1.450	7485	1.450	8340	1.450
660	1.450	1515	1.450	2370	1.450	3225	1.450	4080	1.450	4935	1.450	5790	1.450	6645	1.450	7500	1.450	8355	1.450
675	1.450	1530	1.450	2385	1.450	3240	1.450	4095	1.450	4950	1.450	5805	1.450	6660	1.450	7515	1.450	8370	1.450
690	1.450	1545	1.450	2400	1.450	3255	1.450	4110	1.450	4965	1.450	5820	1.450	6675	1.450	7530	1.450	8385	1.450
705	1.450	1560	1.450	2415	1.450	3270	1.450	4125	1.450	4980	1.450	5835	1.450	6690	1.450	7545	1.450	8400	1.450
720	1.450	1575	1.450	2430	1.450	3285	1.450	4140	1.450	4995	1.450	5850	1.450	6705	1.450	7560	1.450	8415	1.450
735	1.450	1590	1.450	2445	1.450	3300	1.450	4155	1.450	5010	1.450	5865	1.450	6720	1.450	7575	1.450	8430	1.450
750	1.450	1605	1.450	2460	1.450	3315	1.450	4170	1.450	5025	1.450	5880	1.450	6735	1.450	7590	1.450	8445	1.450
765	1.450	1620	1.450	2475	1.450	3330	1.450	4185	1.450	5040	1.450	5895	1.450	6750	1.450	7605	1.450	8460	1.450
780	1.450	1635	1.450	2490	1.450	3345	1.450	4200	1.450	5055	1.450	5910	1.450	6765	1.450	7620	1.450	8475	1.450
795	1.450	1650	1.450	2505	1.450	3360	1.450	4215	1.450	5070	1.450	5925	1.450	6780	1.450	7635	1.450	8490	1.450
810	1.450	1665	1.450	2520	1.450	3375	1.450	4230	1.450	5085	1.450	5940	1.450	6795	1.450	7650	1.450	8505	1.450
825	1.450	1680	1.450	2535	1.450	3390	1.450	4245	1.450	5100	1.450	5955	1.450	6810	1.450	7665	1.450	8520	1.450
840	1.450	1695	1.450	2550	1.450	3405	1.450	4260	1.450	5115	1.450	5970	1.450	6825	1.450	7680	1.450	8535	1.450
855	1.450	1710	1.450	2565	1.450	3420	1.450	4275	1.450	5130	1.450	5985	1.450	6840	1.450	7695	1.450	8550	1.450

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
8565	1.450	9735	1.450	10905	1.450	12075	1.450	13245	1.450	14415	1.450	15585	1.450	16755	1.450	17925	1.450	19095	1.450
8580	1.450	9750	1.450	10920	1.450	12090	1.450	13260	1.450	14430	1.450	15600	1.450	16770	1.450	17940	1.450	19110	1.450
8595	1.450	9765	1.450	10935	1.450	12105	1.450	13275	1.450	14445	1.450	15615	1.450	16785	1.450	17955	1.450	19125	1.450
8610	1.450	9780	1.450	10950	1.450	12120	1.450	13290	1.450	14460	1.450	15630	1.450	16800	1.450	17970	1.450	19140	1.450
8625	1.450	9795	1.450	10965	1.450	12135	1.450	13305	1.450	14475	1.450	15645	1.450	16815	1.450	17985	1.450	19155	1.450
8640	1.450	9810	1.450	10980	1.450	12150	1.450	13320	1.450	14490	1.450	15660	1.450	16830	1.450	18000	1.450	19170	1.450
8655	1.450	9825	1.450	10995	1.450	12165	1.450	13335	1.450	14505	1.450	15675	1.450	16845	1.450	18015	1.450	19185	1.450
8670	1.450	9840	1.450	11010	1.450	12180	1.450	13350	1.450	14520	1.450	15690	1.450	16860	1.450	18030	1.450	19200	1.450
8685	1.450	9855	1.450	11025	1.450	12195	1.450	13365	1.450	14535	1.450	15705	1.450	16875	1.450	18045	1.450	19215	1.450
8700	1.450	9870	1.450	11040	1.450	12210	1.450	13380	1.450	14550	1.450	15720	1.450	16890	1.450	18060	1.450	19230	1.450
8715	1.450	9885	1.450	11055	1.450	12225	1.450	13395	1.450	14565	1.450	15735	1.450	16905	1.450	18075	1.450	19245	1.450
8730	1.450	9900	1.450	11070	1.450	12240	1.450	13410	1.450	14580	1.450	15750	1.450	16920	1.450	18090	1.450	19260	1.450
8745	1.450	9915	1.450	11085	1.450	12255	1.450	13425	1.450	14595	1.450	15765	1.450	16935	1.450	18105	1.450	19275	1.450
8760	1.450	9930	1.450	11100	1.450	12270	1.450	13440	1.450	14610	1.450	15780	1.450	16950	1.450	18120	1.450	19290	1.450
8775	1.450	9945	1.450	11115	1.450	12285	1.450	13455	1.450	14625	1.450	15795	1.450	16965	1.450	18135	1.450	19305	1.450
8790	1.450	9960	1.450	11130	1.450	12300	1.450	13470	1.450	14640	1.450	15810	1.450	16980	1.450	18150	1.450	19320	1.450
8805	1.450	9975	1.450	11145	1.450	12315	1.450	13485	1.450	14655	1.450	15825	1.450	16995	1.450	18165	1.450	19335	1.450
8820	1.450	9990	1.450	11160	1.450	12330	1.450	13500	1.450	14670	1.450	15840	1.450	17010	1.450	18180	1.450	19350	1.450
8835	1.450	10005	1.450	11175	1.450	12345	1.450	13515	1.450	14685	1.450	15855	1.450	17025	1.450	18195	1.450	19365	1.450
8850	1.450	10020	1.450	11190	1.450	12360	1.450	13530	1.450	14700	1.450	15870	1.450	17040	1.450	18210	1.450	19380	1.450
8865	1.450	10035	1.450	11205	1.450	12375	1.450	13545	1.450	14715	1.450	15885	1.450	17055	1.450	18225	1.450	19395	1.450
8880	1.450	10050	1.450	11220	1.450	12390	1.450	13560	1.450	14730	1.450	15900	1.450	17070	1.450	18240	1.450	19410	1.450
8895	1.450	10065	1.450	11235	1.450	12405	1.450	13575	1.450	14745	1.450	15915	1.450	17085	1.450	18255	1.450	19425	1.450
8910	1.450	10080	1.450	11250	1.450	12420	1.450	13590	1.450	14760	1.450	15930	1.450	17100	1.450	18270	1.450	19440	1.450
8925	1.450	10095	1.450	11265	1.450	12435	1.450	13605	1.450	14775	1.450	15945	1.450	17115	1.450	18285	1.450	19455	1.450
8940	1.450	10110	1.450	11280	1.450	12450	1.450	13620	1.450	14790	1.450	15960	1.450	17130	1.450	18300	1.450	19470	1.450
8955	1.450	10125	1.450	11295	1.450	12465	1.450	13635	1.450	14805	1.450	15975	1.450	17145	1.450	18315	1.450	19485	1.450
8970	1.450	10140	1.450	11310	1.450	12480	1.450	13650	1.450	14820	1.450	15990	1.450	17160	1.450	18330	1.450	19500	1.450
8985	1.450	10155	1.450	11325	1.450	12495	1.450	13665	1.450	14835	1.450	16005	1.450	17175	1.450	18345	1.450	19515	1.450
9000	1.450	10170	1.450	11340	1.450	12510	1.450	13680	1.450	14850	1.450	16020	1.450	17190	1.450	18360	1.450	19530	1.450
9015	1.450	10185	1.450	11355	1.450	12525	1.450	13695	1.450	14865	1.450	16035	1.450	17205	1.450	18375	1.450	19545	1.450
9030	1.450	10200	1.450	11370	1.450	12540	1.450	13710	1.450	14880	1.450	16050	1.450	17220	1.450	18390	1.450	19560	1.450
9045	1.450	10215	1.450	11385	1.450	12555	1.450	13725	1.450	14895	1.450	16065	1.450	17235	1.450	18405	1.450	19575	1.450
9060	1.450	10230	1.450	11400	1.450	12570	1.450	13740	1.450	14910	1.450	16080	1.450	17250	1.450	18420	1.450	19590	1.450
9075	1.450	10245	1.450	11415	1.450	12585	1.450	13755	1.450	14925	1.450	16095	1.450	17265	1.450	18435	1.450	19605	1.450
9090	1.450	10260	1.450	11430	1.450	12600	1.450	13770	1.450	14940	1.450	16110	1.450	17280	1.450	18450	1.450	19620	1.450
9105	1.450	10275	1.450	11445	1.450	12615	1.450	13785	1.450	14955	1.450	16125	1.450	17295	1.450	18465	1.450	19635	1.450
9120	1.450	10290	1.450	11460	1.450	12630	1.450	13800	1.450	14970	1.450	16140	1.450	17310	1.450	18480	1.450	19650	1.450
9135	1.450	10305	1.450	11475	1.450	12645	1.450	13815	1.450	14985	1.450	16155	1.450	17325	1.450	18495	1.450	19665	1.450
9150	1.450	10320	1.450	11490	1.450	12660	1.450	13830	1.450	15000	1.450	16170	1.450	17340	1.450	18510	1.450	19680	1.450
9165	1.450	10335	1.450	11505	1.450	12675	1.450	13845	1.450	15015	1.450	16185	1.450	17355	1.450	18525	1.450	19695	1.450
9180	1.450	10350	1.450	11520	1.450	12690	1.450	13860	1.450	15030	1.450	16200	1.450	17370	1.450	18540	1.450	19710	1.450
9195	1.450	10365	1.450	11535	1.450	12705	1.450	13875	1.450	15045	1.450	16215	1.450	17385	1.450	18555	1.450	19725	1.450
9210	1.450	10380	1.450	11550	1.450	12720	1.450	13890	1.450	15060	1.450	16230	1.450	17400	1.450	18570	1.450	19740	1.450
9225	1.450	10395	1.450	11565	1.450	12735	1.450	13905	1.450	15075	1.450	16245	1.450	17415	1.450	18585	1.450	19755	1.450
9240	1.450	10410	1.450	11580	1.450	12750	1.450	13920	1.450	15090	1.450	16260	1.450	17430	1.450	18600	1.450	19770	1.450
9255	1.450	10425	1.450	11595	1.450	12765	1.450	13935	1.450	15105	1.450	16275	1.450	17445	1.450	18615	1.450	19785	1.450
9270	1.450	10440	1.450	11610	1.450	12780	1.450	13950	1.450	15120	1.450	16290	1.450	17460	1.450	18630	1.450	19800	1.450
9285	1.450	10455	1.450	11625	1.450	12795	1.450	13965	1.450	15135	1.450	16305	1.450	17475	1.450	18645	1.450	19815	1.450
9300	1.450	10470	1.450	11640	1.450	12810	1.450	13980	1.450	15150	1.450	16320	1.450	17490	1.450	18660	1.450	19830	1.450
9315	1.450	10485	1.450	11655	1.450	12825	1.450	13995	1.450	15165	1.450	16335	1.450	17505	1.450	18675	1.450	19845	1.450
9330	1.450	10500	1.450	11670	1.450	12840	1.450	14010	1.450	15180	1.450	16350	1.450	17520	1.450	18690	1.450	19860	1.450
9345	1.450	10515	1.450	11685	1.450	12855	1.450	14025	1.450	15195	1.450	16365	1.450	17535	1.450	18705	1.450	19875	1.450
9360	1.450	10530	1.450	11700	1.450	12870	1.450	14040	1.450	15210	1.450	16380	1.450	17550	1.450	18720	1.450	19890	1.450
9375	1.450	10545	1.450	11715	1.450	12885	1.450	14055	1.450	15225	1.450	16395	1.450	17565	1.450	18735	1.450	19905	1.450
9390	1.450	10560	1.450	11730	1.450	12900	1.450	14070	1.450	15240	1.450	16410	1.450	17580	1.450	18750	1.450	19920	1.450
9405	1.450	10575	1.450	11745	1.450	12915	1.450	14085	1.450	15255	1.450	16425	1.450	17595	1.450	18765	1.450	19935	1.450
9420	1.450	10590	1.450	11760	1.450	12930	1.450	14100	1.450	15270	1.450	16440	1.450	17610	1.450	18780	1.450	19950	1.450
9435	1.450	10605	1.450	11775	1.450	12945	1.450	14115	1.450	15285	1.450	16455	1.450	17625	1.450	18795	1.450	19965	1.450
9450	1.450	10620	1.450	11790	1.450	12960	1.450	14130	1.450	15300	1.450	16470	1.450	17640	1.450	18810	1.450	19980	1.450
9465	1.450	10635	1.450	11805	1.450	12975	1.450	14145	1.450	15315	1.450	16485	1.450	17655	1.450	18825	1.450	19995	1.450
9480	1.450	10650	1.450	11820	1.450	12990	1.450	14160	1.450	15330	1.450	16500	1.450	17670	1.450	18840	1.450	20010	1.450
9495	1.450	10665	1.450	11835	1.450	13005	1.450	14175	1.450	15345	1.450	16515	1.450	17685	1.450	18855	1.450	20025	1.450
9510	1.450	10680	1.450	11850	1.450	13020	1.450	14190	1.450	15360	1.450	16530	1.450	17700	1.450	18870	1.450	20040	1.450
9525	1.450	10695	1.450	11865	1.450	13035	1.450	14205	1.450	15375	1.450	16545	1.450	17715	1.450	18885	1.450	20055	1.450
9540	1.450	10710	1.450	11880	1.450	13050	1.450	14220	1.450	15390	1.450	16560	1.450	17730	1.450	18900	1.450	20070	1.450
9555	1.450	10725	1.450	11895	1.450	13065	1.450	14235	1.450	15405	1.450	16575	1.450	17745	1.450	18915	1.450	20085	1.450
9570	1.450	10740	1.450	11910	1.450	13080	1.450	14250	1.450	15420	1.450	16590	1.450	17760	1.450	18930	1.450	20100	1.450
9585	1.450	10755	1.450	11925	1.450	13095	1.450	14265	1.450	15435	1.450	16605	1.450	17775	1.450	18945	1.450	20115	1.450
9600	1.450	10770	1.450	11940	1.450	13110	1.450	14280	1.450	15450	1.450	16620	1.450	17790	1.450	18960	1.450	20130	1.450
9615	1.450	10785	1.450	11955	1.450	13125	1.450	14295	1.450	15465	1.450	16635	1.450	17805	1.450	18975	1.450	20145	1.450
9630	1.450	10800	1.450	11970	1.450	13140	1.450	14310	1.450	15480	1.450	16650	1.450	17820	1.450	18990	1.450	20160	1.450
9645	1.450	10815	1.450	11985	1.450	13155	1.450	14325	1.450	15495	1.450	16665	1.450	17835	1.450	19005	1.450		
9660	1.450	10830	1.450	12000	1.450	13170	1.450	14340	1.450	15510	1.450	16680	1.450	17850	1.450	19020	1.450		
9675	1.450	10845	1.450	12015	1.450	13185	1.450	14355	1.450	15525	1.450	16695	1.450	17865	1.450	19035	1.450		
9690	1.450	10860	1.450	12030	1.450	13200	1.450	14370	1.450	15540	1.450	16710	1.450	17880	1.450	19050	1.450		
9705	1.450	10875	1.450	12045	1.450	13215	1.450	14385	1.450	15555	1.450	16725	1.450	17895	1.450	19065	1.450		
9720	1.450	10890	1.450	12060	1.450	13230	1.450	14400	1.450	15570	1.450	16740	1.450	17910	1.450	19080	1.450		

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	1920
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	16

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	FEH	E (1km)	0.300
Return Period (years)	100	F (1km)	2.736
Site Location	GB 491100 176950 SU 91100 76950	Summer Storms	No
C (1km)	-0.027	Winter Storms	Yes
D1 (1km)	0.267	Cv (Summer)	0.750
D2 (1km)	0.250	Cv (Winter)	0.840
D3 (1km)	0.248	Storm Duration (mins)	960

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S1.5, DS/PN: 1.005, Volume (m³): 9.7

Unit Reference	MD-SCL-0098-5000-1100-5000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	98
Design Flow (l/s)	5.0	Invert Level (m)	26.311
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise blockage risk	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	5.0	Kick-Flo®	0.614	3.8
Flush-Flo™	0.257	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.600	4.0	1.600	5.9	2.600	7.5	5.000	10.1	7.500	12.3
0.200	4.9	0.800	4.3	1.800	6.3	3.000	8.0	5.500	10.6	8.000	12.7
0.300	5.0	1.000	4.8	2.000	6.6	3.500	8.6	6.000	11.1	8.500	13.0
0.400	4.8	1.200	5.2	2.200	6.9	4.000	9.1	6.500	11.5	9.000	13.4
0.500	4.5	1.400	5.6	2.400	7.2	4.500	9.6	7.000	11.9	9.500	13.8

Storage Structures for Storm

Porous Car Park Manhole: P.P., DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	500.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	26.900	Depression Storage (mm)	5
Max Percolation (l/s)	422.2	Width (m)	80.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	19.0	Membrane Depth (mm)	0

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

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 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) 19.400 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 100.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

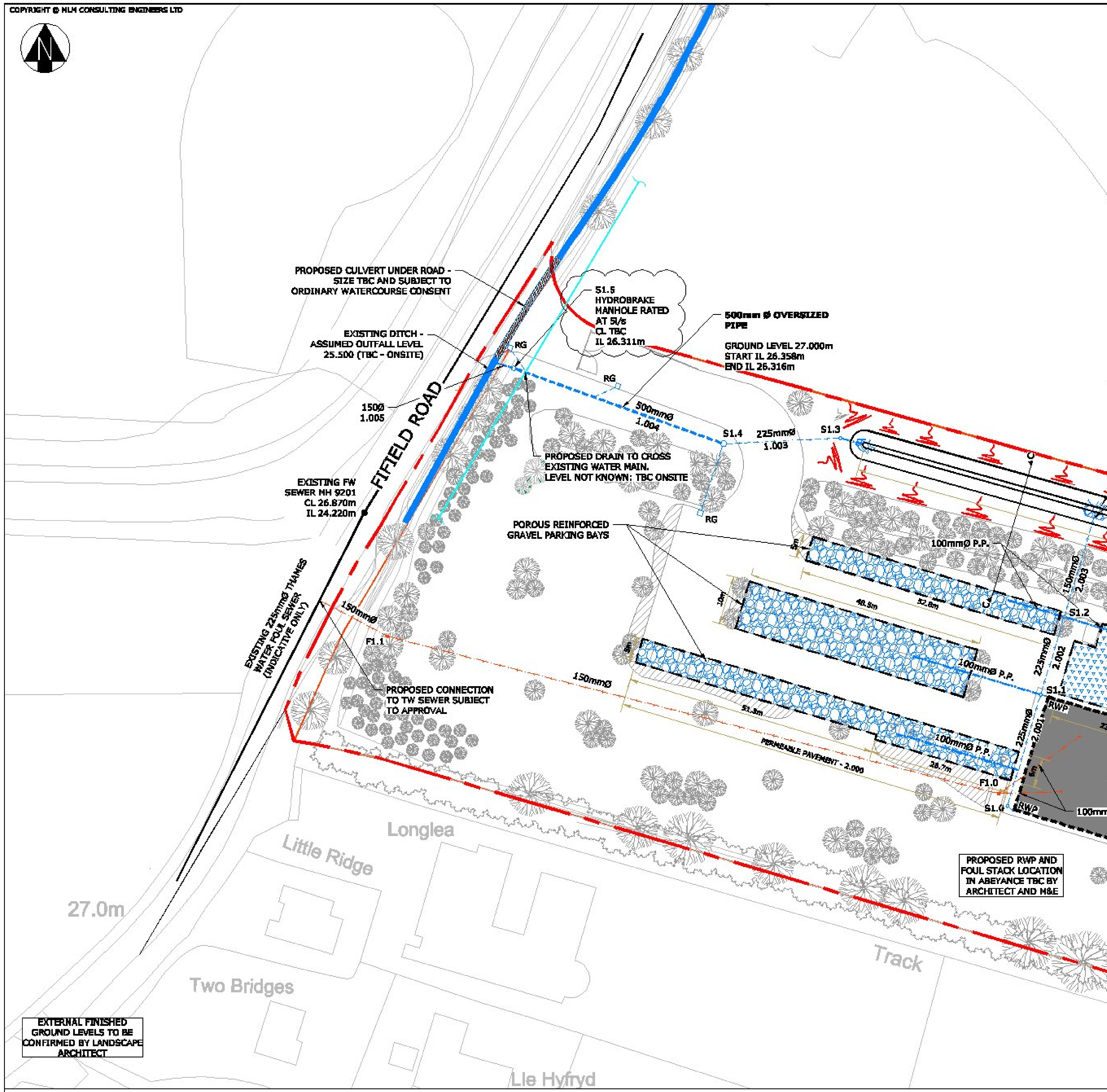
Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440, 2880, 4320, 7200, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

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)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	Swale 1	60 Winter	100	+30%					27.116	-0.184	0.000	0.05		17.1
1.001	SW1 -O/L	60 Winter	100	+30%	1/15 Winter				27.115	0.135	0.000	1.50		5.7
2.000	P.P.	120 Winter	100	+30%					27.161	-0.014	0.000	0.92		14.5
2.001	S1.0	15 Winter	100	+30%					27.133	-0.002	0.000	0.32		9.6
2.002	S1.1	15 Winter	100	+30%	1/2880 Summer				27.116	0.075	0.000	0.65		18.9
2.003	S1.2	10080 Winter	30	+30%	1/2880 Summer				27.125	0.225	0.000	-0.23		-2.4
1.002	Swale 2	10080 Winter	30	+30%					27.135	-0.165	0.000	0.00		-5.2
1.003	S1.3	10080 Winter	30	+30%	1/120 Summer				27.135	0.515	0.000	-6.00		-101.3
1.004	S1.4	7200 Winter	1	+30%	1/1440 Summer				27.000	0.142	0.000	0.01		1.6
1.005	S1.5	4320 Winter	1	+30%	1/15 Summer				27.000	0.539	0.000	0.06		0.9

PN	US/MH Name	Status	Level Exceeded
1.000	Swale 1	OK	
1.001	SW1 -O/L	SURCHARGED*	
2.000	P.P.	OK	
2.001	S1.0	OK	
2.002	S1.1	SURCHARGED	
2.003	S1.2	SURCHARGED	
1.002	Swale 2	OK	
1.003	S1.3	SURCHARGED*	
1.004	S1.4	FLOOD RISK*	44
1.005	S1.5	FLOOD RISK*	46

Appendix C

Proposed Drainage Drawing



PRIVATE DRAINAGE LEGEND

FOUL WATER:

- FOUL WATER DRAIN
- PRIVATE MANHOLE
- INSPECTION CHAMBER 450Ø (1.2M MAX DEPTH)
- ACCESS FITTING 225Ø (0.6M MAX DEPTH)
- FOUL CONNECTIONS: SVP=SOIL VENT PIPE, AAV=AIR ADMITTANCE VALVE, BIG=BACK INLET GULLY, FS=FLOOR SOCKET, SS=STUB STACK, FA= FROM ABOVE
- FOUL FLOOR GULLY (TRAPPED AND RODDABLE)

GENERAL:

PIPEWORK OTHER THAN THAT COVERED BY THE NOTES SHALL BE IDENTIFIED THUS:- 150Ø/100

SHOWS INTERNAL DIAMETER OF PIPE IN mm
SHOWS APPROXIMATE GRADIENT E.G. 1 in 100

AT MANHOLES AND INSPECTION CHAMBERS: BD = BACKDROP, UIL = UPPER INVERT LEVEL

SURFACE WATER:

- SURFACE WATER DRAIN
- PERFORATED PIPE LAID WITHIN TYPE 3 SUB-BASE
- PRIVATE MANHOLE
- INSPECTION CHAMBER 450Ø (1.2M MAX DEPTH) C = CATCHPIT MANHOLE S = SILT TRAP 500Ø
- RE RODDING EYE
- RWP RAINWATER DOWNPIPE
- RG ROAD GULLY (TRAPPED AND RODDABLE)
- DRAINAGE CHANNEL
- REINFORCED GRASS
- PERMEABLE PARKING BAYS

EXISTING:

- Ex. PIPEWORK MAINTAINED
- Ex. PIPEWORK TO BE ABANDONED

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND SPECIALIST'S DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

- IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.
- SERVICES TO BE LOCATED
- MANUAL LIFTING/ HANDLING
- HOT MATERIAL WORKING
- CUTTING/ DUST
- LIVE SEWER FLOWS/ LEPTOSPIROSIS
- DEEP EXCAVATIONS, COLLAPSE/ FALLING
- LIVE TRAFFIC FLOWS

ALL WORKS TO BE CARRIED OUT BY SUITABLY TRAINED OPERATIVES PROVIDED WITH CORRECT PPE.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.
REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

GENERAL DRAINAGE NOTES

1. ALL DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH 'THE BUILDING REGULATIONS APPROVED DOCUMENT H' AND BRITISH STANDARD EN 752.
2. PRIOR TO COMMENCEMENT OF THE WORKS THE CONTRACTOR SHALL LIAISE WITH ALL RELEVANT AUTHORITIES TO OBTAIN THEIR REQUIREMENTS AND TO OBTAIN APPROVAL FOR HIS METHOD OF WORKING AND WHERE APPROPRIATE HIS INTENDED CHOICE OF MATERIALS.
3. REFER TO SITE SURVEY FOR DETAILS OF EXISTING SITE CONDITIONS AND BENCH MARKS.
4. PRIOR TO COMMENCEMENT OF THE WORKS THE CONTRACTOR SHALL LIAISE WITH ALL RELEVANT AUTHORITIES TO LOCATE, PROTECT AND WHERE NECESSARY DIVERT ALL EXISTING SERVICES AFFECTED BY THE WORKS.
5. ALL EXCAVATIONS SHALL BE KEPT FREE OF STANDING WATER.
6. THE CONTRACTOR SHALL ENSURE THE STABILITY OF ALL EXCAVATIONS IS MAINTAINED AT ALL TIMES.
7. ALL WORKS IN OR ADJACENT TO THE PUBLIC HIGHWAY SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE HIGHWAY AUTHORITY. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY LICENCES TO CARRY OUT WORKS WITHIN THE PUBLIC HIGHWAY.
8. ALL WORKS TO NEW OR EXISTING PUBLIC SEWERS SHALL BE TO THE APPROVAL OF THE WATER AUTHORITY AND IN ACCORDANCE WITH 'SEWERS FOR ADOPTION 6TH EDITION' + INTERIM TECHNICAL ADDENDUM NO.1.
9. PRIOR TO COMMENCEMENT OF THE WORKS ALL DRAINAGE OUTFALL POINTS, WHETHER EXISTING SEWER, DRAIN OR WATERCOURSE, SHALL BE VERIFIED ON SITE BY THE CONTRACTOR. IF THE OUTFALL POINT IS FOUND TO BE HIGHER OR SIGNIFICANTLY LOWER THAN SHOWN ON THE DRAWINGS THEN THE CONTRACT ADMINISTRATOR SHALL BE NOTIFIED IMMEDIATELY. (SIGNIFICANT REDESIGN OF DRAINAGE AND LEVELS MAY BE NECESSARY). PRIOR TO COMMENCEMENT OF CONSTRUCTION ON-SITE THE CONTRACTOR SHALL INSTALL ALL OFF-SITE DRAINAGE CONNECTIONS, OR SATISFY HIMSELF THAT THERE ARE NO OBSTRUCTIONS OR OTHER REASONS WHY, THE DRAIN CONNECTIONS CAN NOT BE MADE.
10. ALL COVER LEVELS SHOWN ON THIS DRAWING ARE APPROXIMATE. EXACT LEVELS OF NEW COVERS AND FRAMES TO BE DETERMINED ON SITE TO MATCH LEVEL AND PROFILE OF FINISHED SURFACE.
11. THE CONSTRUCTION OF ALL EXISTING CHAMBERS, GULLIES ETC. AND THEIR COVERS, GRATINGS AND FRAMES TO BE IMPROVED, REPAIRED OR REPLACED AS NECESSARY TO SUIT THEIR LOCATION WITHIN THE FINISHED DEVELOPMENT.
12. ALL COVERS, GRATINGS AND FRAMES TO CHAMBERS, GULLIES, CHANNELS ETC. SHALL BE OF THE CORRECT LOAD CLASS TO SUIT THEIR LOCATION.
    - LOAD CLASS B125 PEDESTRIAN AREAS / CAR PARKING (NOT ACCESSIBLE BY HEAVY GOODS VEHICLES)
    - LOAD CLASS D400 AREAS ACCESSIBLE TO HGVS.
    - GRATINGS IN PEDESTRIAN AREAS TO BE DESIGNED FOR PEDESTRIAN USE, AND VICE VERSA FOR GRATINGS IN ROADS.
13. ALL EXISTING CHAMBERS, GULLIES CHANNELS, PIPES AND OTHER DRAINAGE APPARATUS SHALL BE PROTECTED FROM DAMAGE DURING THE WORKS. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO ENSURE THAT NO MATERIAL ENTERS THE DRAINS (OTHER THAN THAT WHICH THEY ARE DESIGNED TO CARRY).
14. REFER TO SITE INVESTIGATION REPORT FOR EXISTING GROUND CONDITIONS AND ANY SPECIAL REQUIREMENTS FOR BURIED CONCRETE (SPECIAL REQUIREMENTS FOR BURIED CONCRETE SHALL INCLUDE ALL PRE-CAST AND IN-SITU CONCRETE AND MORTARS). WHERE APPROPRIATE REFER TO CONTAMINATION REPORTS FOR DETAILS OF CHEMICALS AFFECTING CHOICE OF MATERIALS AND OTHER ADDITIONAL REQUIREMENTS.
15. ALL PRE-CAST AND IN-SITU CONCRETE AND MORTARS USED IN THE CONSTRUCTION OF FOUL DRAINS AND SEWERS SHALL BE MADE FROM SULPHATE RESISTING CEMENT.
16. UNLESS NOTED OTHERWISE ALL SURFACE WATER DRAINAGE PIPEWORK SHALL BE 150MM DIAMETER LAID TO A FALL OF 1 IN 150 OR STEEPER.
17. UNLESS NOTED OTHERWISE FOUL WATER DRAINS SHALL BE 100MM DIAMETER LAID TO A FALL OF 1 IN 40 OR GREATER. FOUL DRAINS WITH ONE OR MORE W.C. CONNECTED MAY BE LAID AT 1 IN 80 OR STEEPER.
18. UNLESS NOTED OTHERWISE PIPE WORK CAN BE CONSTRUCTED FROM ANY OF THE FOLLOWING:
    - UPVC TO BS EN 1401
    - POLYPROPYLENE TO BS EN 1852
    - 'SUPER STRENGTH' VITRIFIED CLAY TO BS 65,BS EN 295
    - DUCTILE IRON TO BS 598
    - CLASS H CONCRETE TO BS 5911
19. THE CONTRACTORS ATTENTION IS DRAWN TO DIAGRAMS 7 AND 8 OF 'THE BUILDING REGULATIONS APPROVED DOCUMENT H' SHOWING DETAILS OF DRAINS LAID BELOW AND NEAR TO BUILDINGS. WHERE GROUND BEAMS ARE USED, THEIR LEVEL SHALL BE SET TO AVOID CLASHING WITH DRAIN CONNECTIONS.
20. EXACT LOCATION OF GULLIES TO BE DETERMINED ON SITE TO SUIT LOW POINTS. THE CONTRACTOR SHALL ENSURE THAT ALL FINISHED SURFACE ARE LAID TO FALLS THAT ARE SUFFICIENT FOR ALL SURFACE WATER TO DRAIN WITHOUT SURFACE PONDING.
21. FOR THE EXACT LOCATION OF SOIL PIPES, STUBSTACKS, W.C.'S AND OTHER DRAINAGE CONNECTIONS REFER TO THE LARGE SCALE ARCHITECTURAL BUILDING PLANS.
22. RAINWATER DOWNPIPES THAT DO NOT CONNECT DIRECTLY TO AN ACCESS POINT, SHALL BE FITTED WITH A RODDING ACCESS.
23. ALL DRAINAGE CHANNELS TO BE ACO OR SIMILAR APPROVED AND TO BE OF A TYPE SIZE AND CAPACITY SUITABLE FOR THEIR LOCATION.
24. THE HEAD OF EACH PROPOSED FOUL SEWER IS TO BE VENTED.
25. ALL CATCHPITS AND SILT TRAPS TO BE REGULARLY CLEANED AND MAINTAINED FOLLOWING INSTALLATION TO ALLOW THE SW SYSTEM TO OPERATE AT ITS FULL CAPACITY. UN-MAINTAINED SILT BUILD UP CAN LEAD TO INSUFFICIENT PIPE FLOWS DUE TO RESTRICTED ACCESS AND CAN RESULT IN SURFACE PONDING.

Issue	Date	Description	Made	Checked
P3	20/12/2016	DIMENSIONS OF SWALES 1 & 2 AMENDED, DIMENSIONS OF PERMEABLE PARKING AND HYDROBRAKE MANHOLE ADDED	DOC	CB
P2	23/09/2016	ORIFICE PLATE S3.0 ADDED, SWALE 3 REMOVED AND REPLACED WITH OVERSIZED PIPE AS CLOUDED	DOC	BF
P1	02/09/2016	ISSUED FOR INFORMATION	CC	BF

Drawing Status: **INFORMATION**

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Client: FELTHAM CONSTRUCTION LTD.

Project: NEW PHOENIX GYMNASTICS CLUB

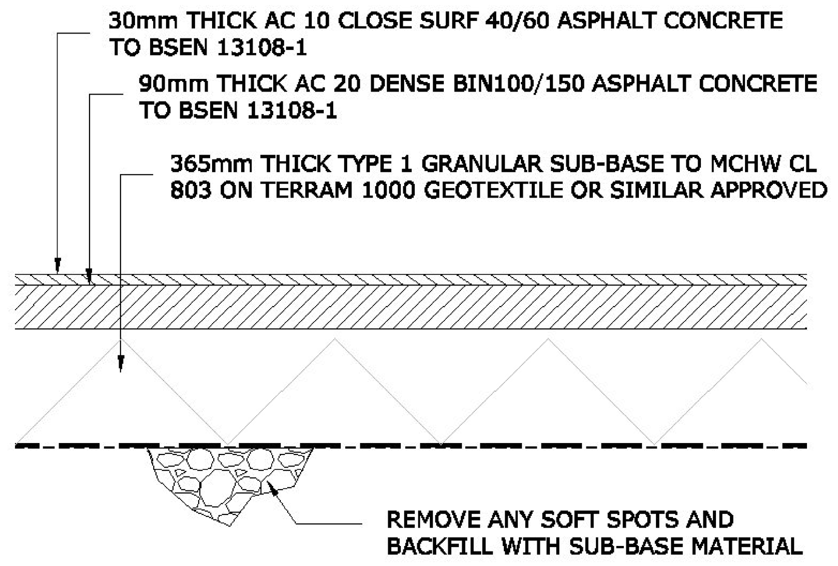
Drawing Title: BELOW GROUND DRAINAGE LAYOUT

Drawn/Design	DOC/CC	Date	SEPTEMBER 2016	Scales	1:500 @ A1
Checked	BF	Approved	BF		1:1000 @ A3

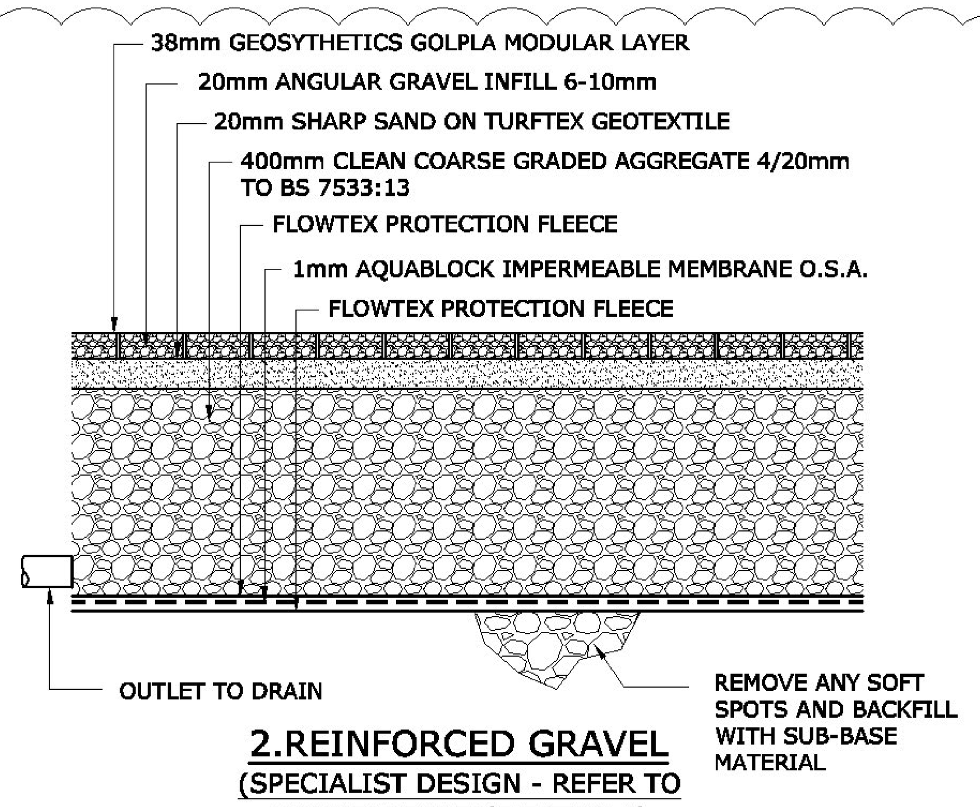
Drawing No. 667769-DWG-SBU-C-100 Rev P3

Appendix D

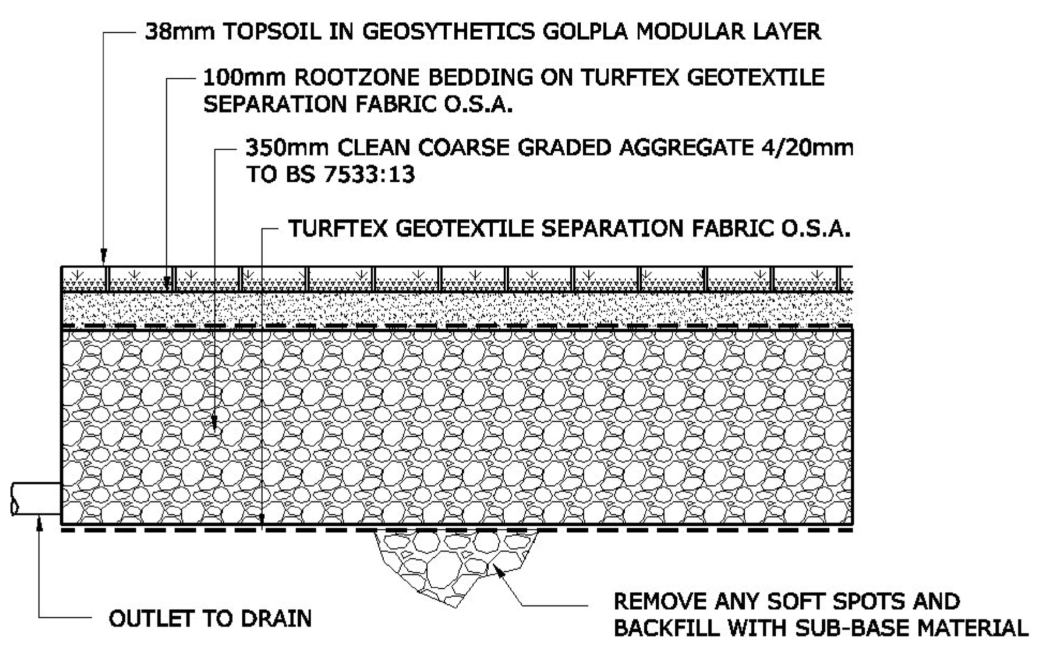
Proposed Construction Details



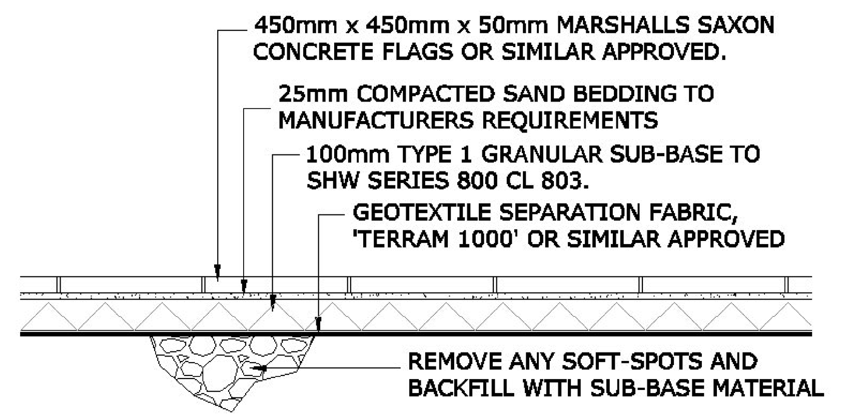
1. PRIVATE ROAD - ASPHALT
(HGV ACCESS)



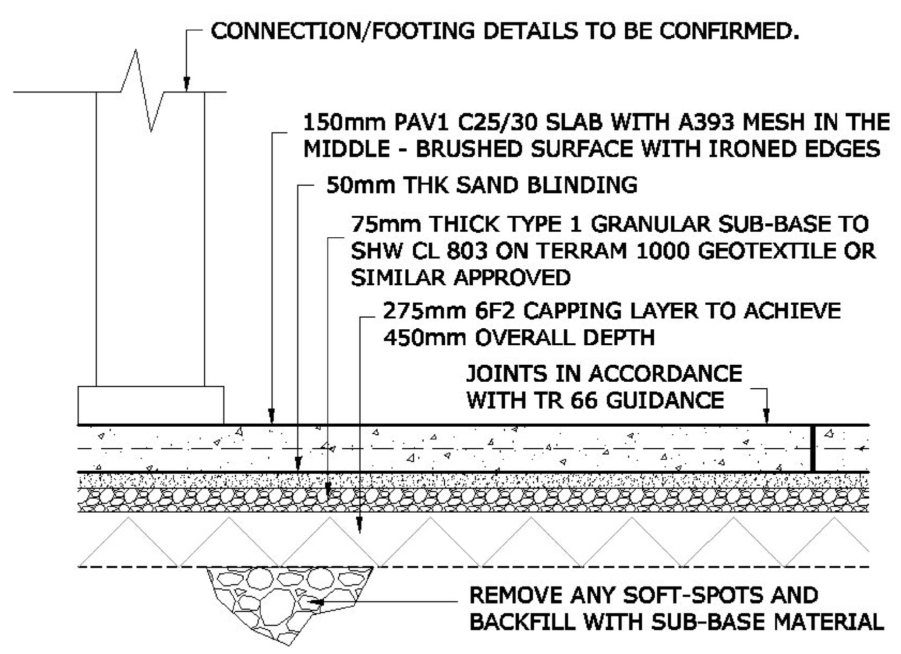
2.REINFORCED GRAVEL
(SPECIALIST DESIGN - REFER TO MANUFACTURER'S DETAILS)



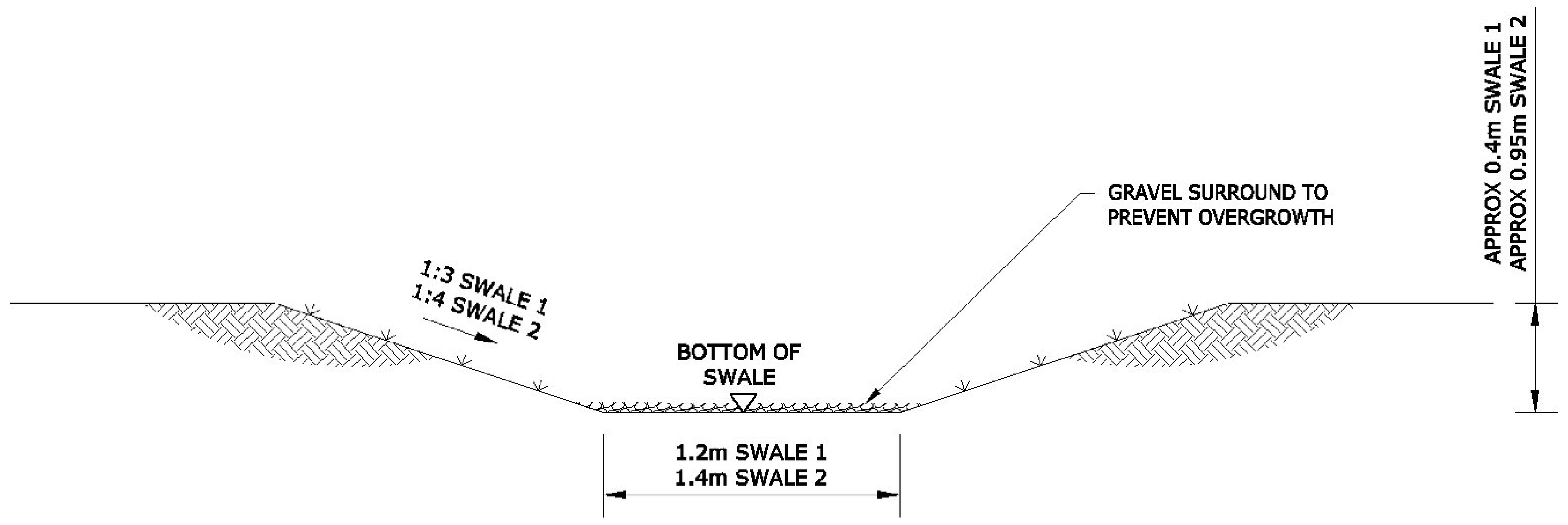
3.REINFORCED GRASS
(SPECIALIST DESIGN - REFER TO MANUFACTURER'S DETAILS)



4. PRE-CAST CONCRETE FLAG PAVING
(PEDESTRIAN USE ONLY)
(USE TO BE CONFIRMED BY CLIENT/LANDSCAPE ARCHITECT)



5. IN-SITU CONCRETE CONSTRUCTION
(CYCLE & BIN STORES/EDGE PERIMETER)



TYPICAL SECTION THROUGH SWALE

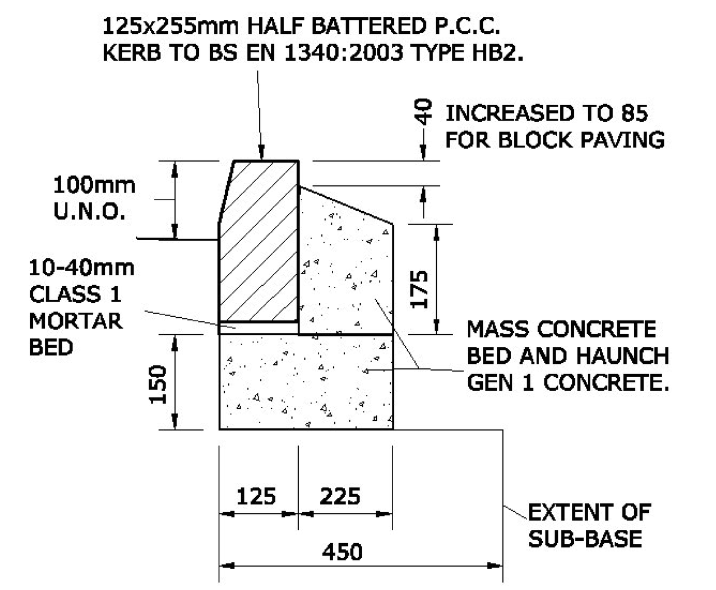
ALL DETAILS ARE BASED ON THE CBR VALUE OF 2%. CONTRACTOR TO INFORM DESIGN TEAM IF EXCAVATED STRATA DIFFERS FROM THAT IDENTIFIED IN THE SOILS/PERMEABILITY REPORTS.

ALL DETAILS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE PRINCIPLES SET OUT IN HD 26/06, HD 39/01 AND IAN 73/06 WHERE APPLICABLE

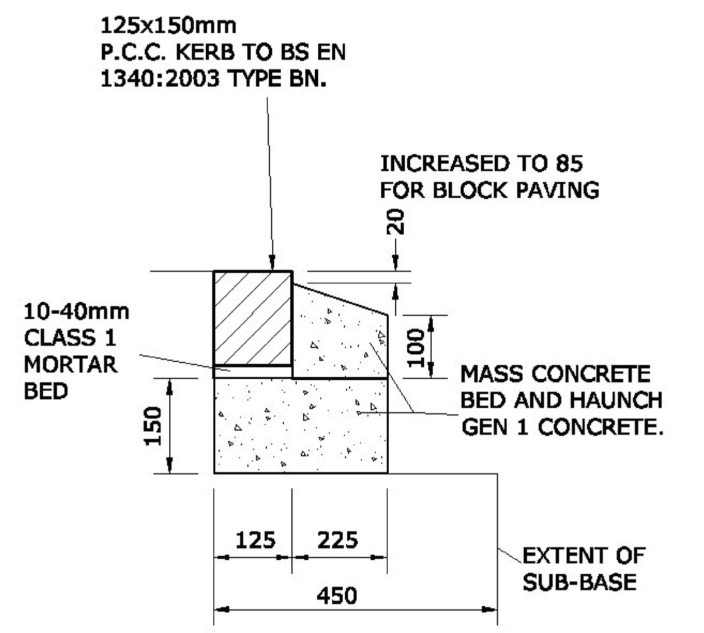
CBR TABLE

CBR VALUE	CAPPING	SUB-BASE
<2%	450mm	150mm
2% - 3%	315mm	150mm
3% - 5%	240mm	150mm
5% - 10%	200mm	150mm
10%-14%	150mm	150mm
>15%	-	150mm

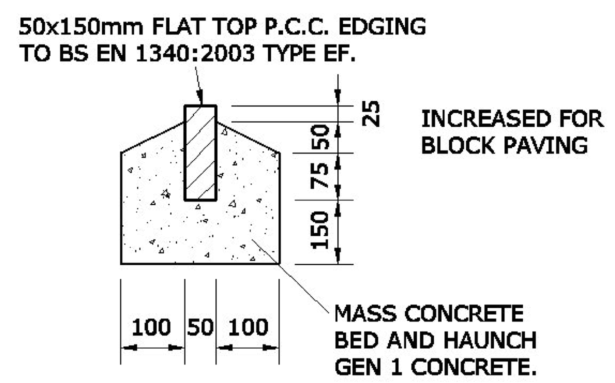
MATERIAL WITHIN 450mm OF THE FINISHED ROAD SURFACE MUST NOT BE FROST SUSCEPTIBLE



KERB TYPE HB2



KERB TYPE BN (DROPPED KERB)



EDGING TYPE EF1

TYPICAL KERB BEDDING DETAILS - FOR SPECIFIC KERBS, CHANNELS AND EDGINGS DETAILS REFER TO LANDSCAPE ARCHITECTS DRAWINGS

NOTE: JUNCTION BETWEEN KERBING TYPES TO BE MADE USING PURPOSE MADE TRANSITION KERBS TO BS EN 1340:2003

KERB DETAILS

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND SPECIALIST'S DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

- IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.
- SERVICES TO BE LOCATED
- MANUAL LIFTING/ HANDLING
- HOT MATERIAL WORKING
- CUTTING/ DUST
- LIVE SEWER FLOWS/ LEPTOSPIROSIS
- DEEP EXCAVATIONS, COLLAPSE/ FALLING
- LIVE TRAFFIC FLOWS

ALL WORKS TO BE CARRIED OUT BY SUITABLY TRAINED OPERATIVES PROVIDED WITH CORRECT PPE.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.
REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

Issue	Date	Description	Made	Checked
P4	22/12/16	TYPICAL SWALE SECTION ADDED, MINOR AMENDEDMENTS TO DETAILS	CC	CB
P3	20/12/16	PAVEMENT BUILDUPS REVISED FOR SUBMISSION OF THE DRAINAGE STATEMENT	DOC	CB
P2	24/10/16	CONCRETE BUILDUP REVISED AND PAVING FLAGS ADDED	DOC	CB
P1	20/10/16	ISSUED FOR INFORMATION (FOR SUDS STATEMENT	DOC	BF

Drawing Status: INFORMATION

MLM
Multidisciplinary Consulting
3rd Floor Eldon House, 2 Eldon Street, London EC2M 7LS
Tel: 020 7422 7800 Fax: 020 7426 2095
Website: www.mlm.uk.com

Client
FELTHAM CONSTRUCTION LIMITED

Project
PHOENIX GYMNASIUM MAIDENHEAD

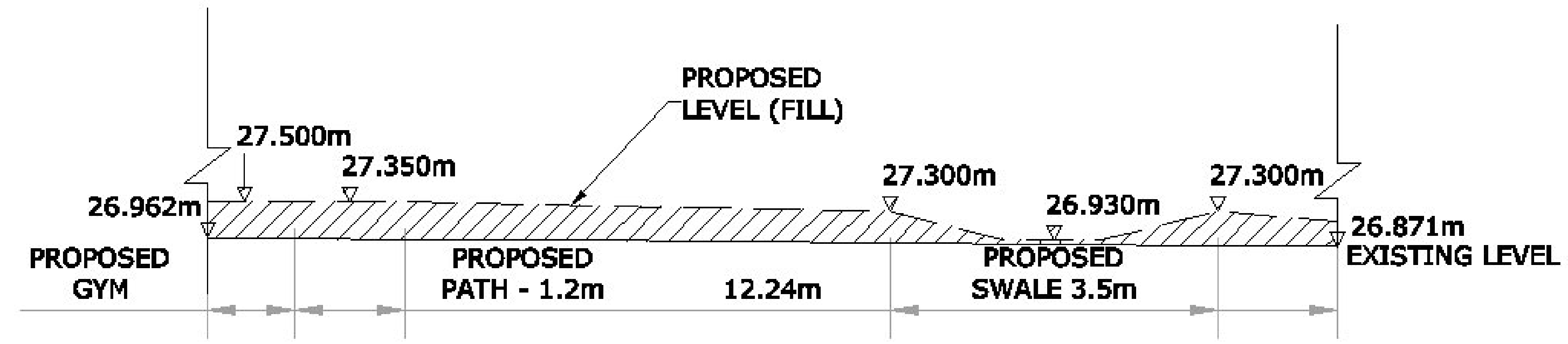
Drawing Title
EXTERNAL WORKS DETAILS

Drawn/Design	BK	Date	02.09.2016	Scales	NTS	@ A1
Checked	DOC	Approved	BF			

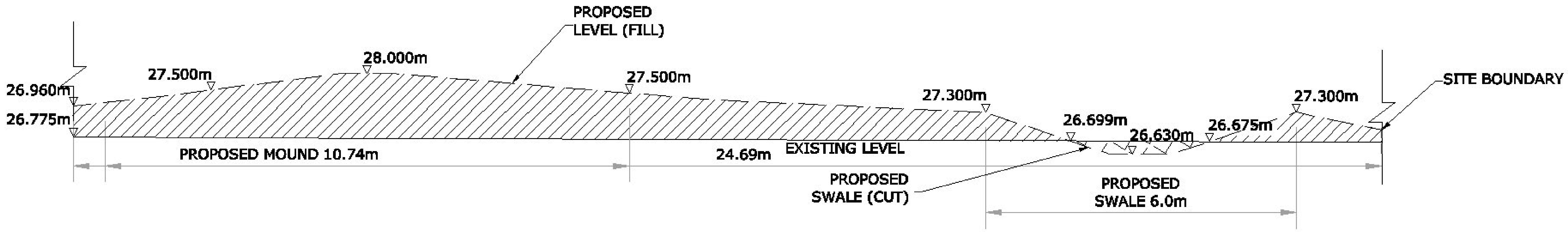
Drawing No. 667769-DWG-SBU-C-125 Rev P4

Appendix E

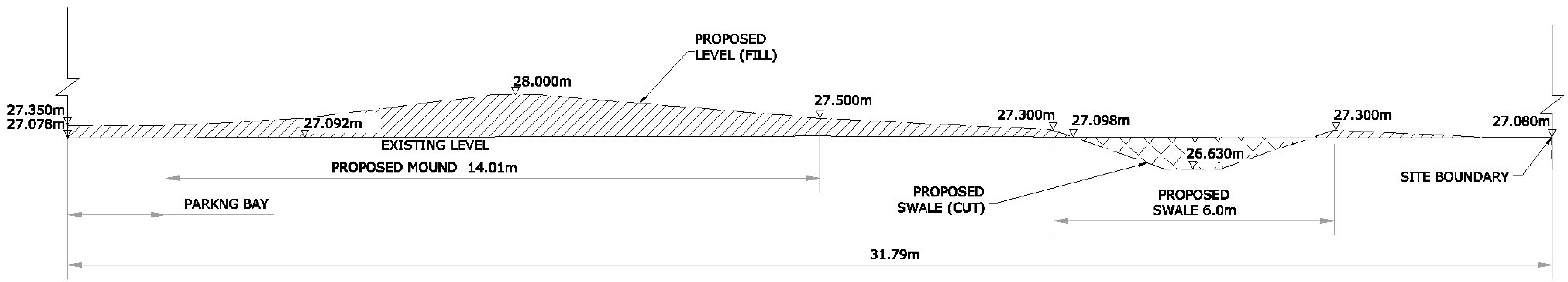
Proposed Swale Sections



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER'S, ARCHITECT'S AND SPECIALIST'S DRAWINGS AND THE SPECIFICATION.
2. DO NOT SCALE FROM THIS DRAWING MANUALLY OR ELECTRONICALLY. WRITTEN PERMISSION MUST BE OBTAINED FROM MLM PRIOR TO SCALING ELECTRONICALLY OR USING THIS ELECTRONIC FILE.

CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015

DESIGNERS HAZARD INFORMATION FOR CONSTRUCTION

- IF YOU DO NOT FULLY UNDERSTAND THE RISKS INVOLVED DURING THE CONSTRUCTION OF THE ITEMS INDICATED ON THIS DRAWING ASK YOUR MANAGER, HEALTH & SAFETY ADVISOR OR A MEMBER OF THE DESIGN TEAM BEFORE PROCEEDING.
- SERVICES TO BE LOCATED
- MANUAL LIFTING/ HANDLING
- HOT MATERIAL WORKING
- CUTTING/ DUST
- LIVE SEWER FLOWS/ LEPTOSPIROSIS
- DEEP EXCAVATIONS, COLLAPSE/ FALLING
- LIVE TRAFFIC FLOWS

ALL WORKS TO BE CARRIED OUT BY SUITABLY TRAINED OPERATIVES PROVIDED WITH CORRECT PPE.

THE ABOVE NOTES REFER SPECIFICALLY TO THE INFORMATION SHOWN ON THIS DRAWING.
REFER TO THE HEALTH AND SAFETY PLAN FOR FURTHER INFORMATION.

FOR PLAN DRAWING OF SECTIONS
DRAWING 667769-DWG-SBU-C-100-P3

SCALE - 1:50

Issue	Date	Description	Made	Checked
P3	20/12/2016	ISSUED FOR INFORMATION	BK	DOC
P2	06/10/2016	ISSUED FOR INFORMATION	BK	DOC
P1	07/09/2016	ISSUED FOR INFORMATION	DOC	BF

Drawing Status: **INFORMATION**

MLM
Multidisciplinary Consulting
3rd Floor Eldon House, 2 Eldon Street, London EC2M 7LS
Tel: 020 7422 7800 Fax: 020 7426 2095
Website: www.mlm.uk.com

Client
FELTHAM CONSTRUCTION LTD.

Project
NEW PHOENIX GYMNASTICS CLUB

Drawing Title
SECTIONS THROUGH PROPOSED SWALE

Drawn/Design	BK	Date	SEPTEMBER 2016	Scales	1:50	@ A1
Checked	DOC	Approved	BF		1:100	@ A3

Drawing No. 667769-DWG-SBU-C-127 Rev P3

Appendix F

Correspondence with Royal Borough of Windsor and Maidenhead

Darragh O'Connell

From: Darragh O'Connell
Sent: 18 October 2016 14:49
To: 'emma.chilton@RBWM.gov.uk'
Cc: 'Simon Lavin'
Subject: 667769 - Phoenix Gym - Discharge to an Ordinary Watercourse

Good Afternoon Emma,

It was good speaking with you this afternoon.

Just to confirm, as discussed, permission is not required from the Environment Agency to discharge to a drainage ditch (ordinary watercourse) and the discharge rate from the proposed development will be agreed with the Royal Borough of Windsor and Maidenhead Planning division.

Please contact me if you would like to discuss further.

Kind regards,

Darragh O'Connell MSc. BEng. MIEI
Civil Engineer
T: 020 7422 7800
M: +44 (0)7825 386364
E: darragh.oconnell@mlm.uk.com
A: MLM, Eldon House, 2 Eldon Street, London, EC2M 7LS
W: www.mlm.uk.com

Darragh O'Connell

From: Simon Lavin <Simon.Lavin@RBWM.gov.uk>
Sent: 14 October 2016 11:32
To: Victoria Gibson; Darragh O'Connell
Subject: RE: 667769 - Phoenix Gym: Discharge to a Watercourse Consent

Good morning,

The rate of discharge of surface water to the ditch adjacent to Fifiled Road will be assessed as part of the discharge of condition 6 of planning application number 15/02107.

As indicated previously any works effecting the cross section of the watercourse adjacent to Fifiled Road will require formal consent under Section 23 of the Land Drainage Act 1991. Copies of the appropriate application forms have been previously supplied and the completed forms should be submitted to the Borough's Flood Risk Management Team.

If the outfall headwall does not protect into the watercourse it will not require consent under Section 23 of the Land Drainage Act. Issues such as scour will however need to be considered in its construction.

It is also highly likely that the proposed access road crossing the ditch will require consent under Section 23 of the Land Drainage Act.

Kind regards

Simon Lavin
Flood Risk Manager
Highways and Transport
Royal Borough of Windsor & Maidenhead
Town Hall
St Ives Road
Maidenhead
Berkshire
SL6 1RF
Tel: 01628 796817
Fax: 01628 796774

From: Victoria Gibson
Sent: 11 October 2016 17:07
To: Simon Lavin
Subject: FW: 667769 - Phoenix Gym: Discharge to a Watercourse Consent
Importance: High

Can you help with this matter.

Thanks

Vicky

From: Darragh O'Connell [mailto:darragh.oconnell@mlm.uk.com]
Sent: 11 October 2016 15:59

To: Environmental Protection
Subject: 667769 - Phoenix Gym: Discharge to a Watercourse Consent

To whom it may concern,

We are currently working on the design of a development on greenfield land adjacent to Fifield Road, Bray, SL6 2PG. It is proposed to construct a new Gymnasium and associated access road, parking and hard landscaped areas. The greenfield site currently discharges to a drainage ditch which runs adjacent to the site along Fifield Road. It is proposed that the new site will reduce the storm water discharging from the site to 5 l/s which is commonly recognised as the minimum discharge to prevent blockages in the system. This will be achieved through the use of permeable paving, swales and flow restrictions.

As part of the works, part of the existing drainage ditch will be culverted to allow the construction of the access road to the site. We are currently in the process of design of this culvert and submittal of the Ordinary Watercourse Consent.

The reason I am writing to you is that I require further information about stormwater discharge consent. When discharging to a storm water sewer, consent is granted by Thames Water. However, as this site will be discharging to a drainage ditch, Thames Water do not grant consent. Can you confirm if we require formal consent from RBWM for the 5 l/s discharge rate? The document attached (*"Consent for Works on Ordinary Watercourses Cross Sections of Consentable Activities")* shows that the works we are proposing do not require consent. Can you confirm if this is the case?

If you have any comments or queries, or wish to discuss further please don't hesitate to contact me.

Kind regards,

Darragh O'Connell MSc. BEng. MIEI
Civil Engineer
T: 020 7422 7800
M: +44 (0)7825 386364
E: darragh.oconnell@mlm.uk.com
A: MLM, Eldon House, 2 Eldon Street, London, EC2M 7LS
W: www.mlm.uk.com

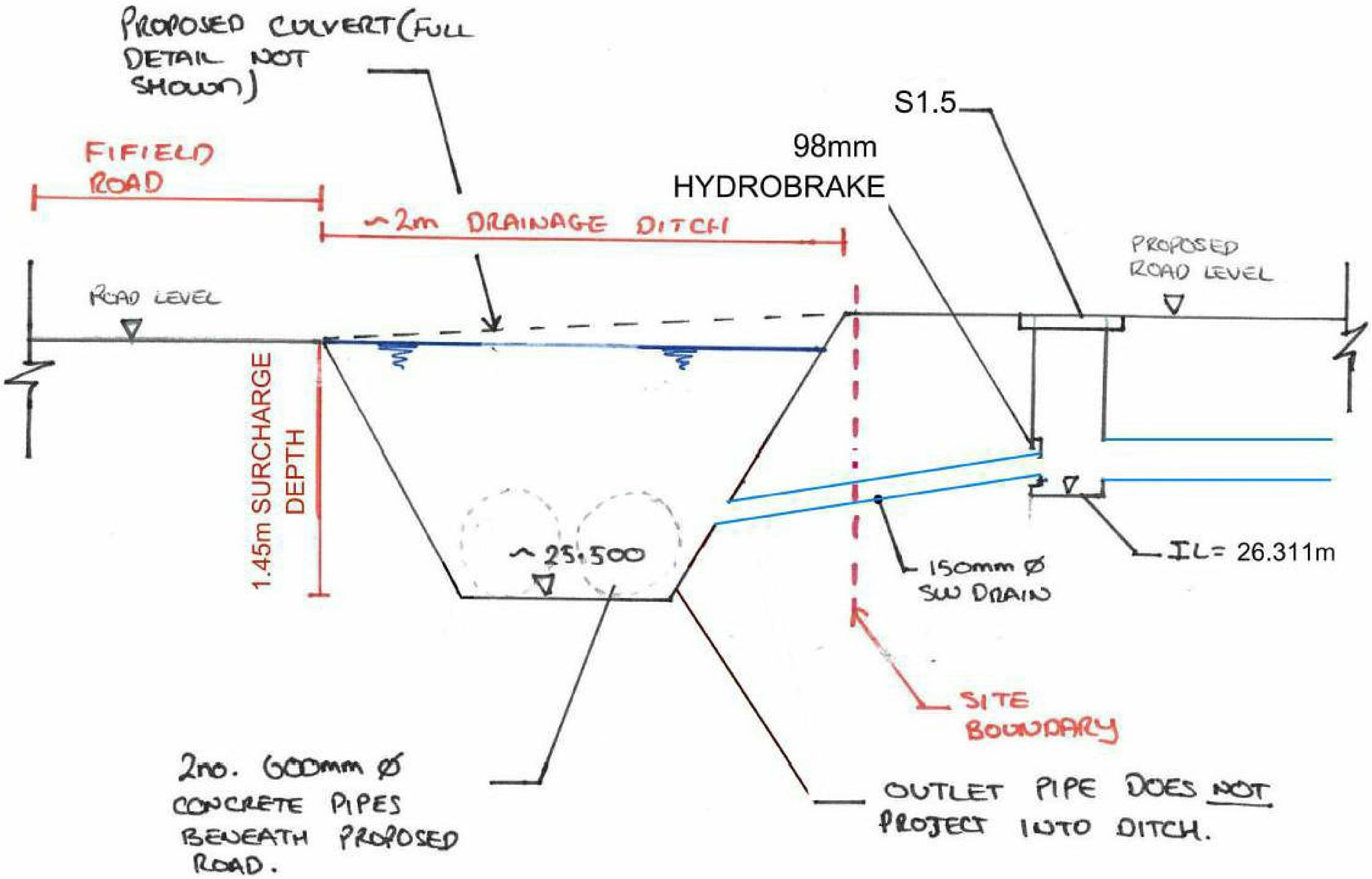
Appendix G

Proposed Outfall Details

Project		Made	Ref.	
Phoenix Gymnasium		DOC	667769	MLM
Section		Checked	Sheet No.	www.mlm.uk.com
SURCHARGED OUTFALL SECTION		BF	- SK - 01 - SURCHARGED - OUTFALL	
		Date 22/12/16		

Rev	Date	Description	Made	Checked

N.T.S.



This is not a working detail
Do not use dimensions or other information for construction

Appendix H

Meeting Minutes – 14 December 2016

FARMGLADE

MINUTES

Date: 14 DECEMBER 2016	Location: PHOENIX HOUSE	Re: PHOENIX GYMNASTICS CLUB

PRESENT:

PRESENT:	Martin Wheeler (MW)	-	WSP
	Ben Freedman (BF)	-	MLM
	Phil Rowe (PR)	-	Phoenix Gymnastics Club
	Ian Dobie (ID)	-	Consultant

DISTRIBUTION: Those present + Victoria Gibson (RBWM), Vernon Robinson (Feltham Construction), Neil Ainsworth (MLM).

ITEM	DESCRIPTION	ACTION
1	**PURPOSE OF MEETING** To review drainage strategy and outstanding information requirements for details reserved by Condition 6 (Sustainable Drainage Solution).	
2	**INTRODUCTION** ID thanked everyone for attending. Scheme background presented by BF; ID noted need for Engineers to agree on outstanding points following WSP letter dated 07/10/16 (attached) and to close out any outstanding issues swiftly. It was noted that RBWM had been invited to the meeting, but had declined to attend on basis of WSP attendance and WSP being delegated to comment on behalf of RBWM.	
3	**SUMMARY OF CURRENT STATUS** BF noted that there were six outstanding points raised in the letter of 07/10/16, as follows:- **Item 1: WinDes Model** It was noted that WinDes calculations were to be updated by BF for clarity of information. BF noted new document will include labelling of the pipes on the model for clarity. MW confirmed he was happy with this and would review once received. **Item 2: Diameter of Flow Control** There was discussion on the diameter of the flow control and request from	 **BF/MW** **BF**

	MW for a Vortex flow control to be reviewed/possibly included. MW commented that his concern at a diameter less than 75mm was at risk of blockage. BF noted guidance document C753 – the SUDS manual, allows less than 75mm subject to appropriate maintenance and reduction of blockage risk. BF to review and capture solution in updated report. MW confirmed he was in agreement with the above. **Item 3: Clarification of Storage Structures in Analysis Model** BF to update model, as discussed in meeting. MW confirmed he was in agreement with this approach. **Item 4: Surcharge Outfall** BF confirmed updated document will include set of calculations for the surcharged outfall into the ditch. **Item 5: Additional Information Required of Construction Details** BF tabled additional details and agreed to submit the same. **Item 6: Permission to Discharge** MW noted that this issue is now resolved and discharge is permitted. BF sought clarification that the 5 l/s discharge to the ditch/watercourse was therefore agreed. MW confirmed that that was acceptable. A brief discussion took place, after the above general items were discussed and the WSP letter reviewed to ensure no further items needed to be discussed; everyone agreed all issues had now been discussed. BF proposed that the Minutes of the meeting were appended to the final submission document. ID to issue draft Minutes this afternoon.	**BF** **BF** **BF** **BF** **BF** **ID**
4	**TIMESCALE** BF confirmed that the above information would be submitted to RBWM on 19 December 2016 and MW asked that a direct copy be sent to WSP.	**BF**
5	**A.O.B.** MW noted he was away next week and that the WSP copy should be sent to Steve Riley.	