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Project title	Haverstock Hill	Job number
		268265-00
сс	George Adamopoulos Simon Jughard Laura Morris	File reference
Prepared by	Raluca Olariu	Date
		15 October 2020
Subject	Pre-planning - Condition 21	

## 1 Introduction

Arup has been commissioned by OD Hotels Camden Ltd. to produce the documentation needed to meet Planning Condition 21 for the 5-17 Haverstock Hill site, NW3 2BL, London.

#### **Condition 21 – SUDS**

Condition 21 was defined by London Borough of Camden (LBC) and is worded as follows:

"Prior to commencement of the development, full details of the sustainable drainage system shall be submitted to and approved in writing by the local planning authority. Such a system should be designed to accommodate all storms up to and including a 1:100 year storm with a 30% provision for climate change, such that flooding does not occur in any part of a building or in any utility plant susceptible to water, and to achieve 50% reduction in run off (targeting a maximum of 14l/s runoff in all storm events up to and including the 1 in 100 year 6 hour storm). The system shall include blue/green roofs (providing 23m<sup>3</sup> of storage) and an attenuation tank (providing 47m<sup>3</sup> of storage). And shall thereafter be retained and maintained in accordance with the approved maintenance plan."

#### **2 Planning condition response**

Please refer to Appendix A for the plan layout of the drainage design proposed for the development, and Appendix B for the modelling results of the drainage network, as modelled using MicroDrainage.

#### 2.1 Existing Surface Water Runoff Rate

The existing hardstanding area to be drained has been determined to be 0.21ha.

The existing surface water runoff from the site are unknown. Using the Modified Rational Method, the surface water discharge was estimated for the existing site:

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Q=2.78Cv Cr iA

Where:

Q=Peak discharge (/s)

Cv=Volumetric runoff coefficient

Cr=Dimensionless routing coefficient

i=Rainfall Intensity (mm/hr)

A=Catchment area (ha)

The Wallingford Procedure recommends that when used in urban catchments the following values can be used:

 $C_v=0.75$  (range between 0.6 to 0.9)

Cr=1.3

The existing total site area is approximately 0.21ha and is assumed 100% impermeable. Therefore, the existing site runoff rate for the 100-year storm is calculated as:

A=0.21ha

i=88.14mm/hr (for 100-year return period 6 hour duration)

On this basis the pre-development runoff rate, Q, for the 1 in 100-year return period storm event of 30-minute duration is estimated to be 50.17l/s. Table 1 below presents the surface water run-off rates for the existing site for various rainfall events.

Return period	<b>Rainfall intensity</b>	<b>Existing Run-off Rate</b>			
	mm/hr	l/s			
1 year	26.36	15.00			
30 year	63.19	35.97			
100-year	88.14	50.17			

Table 1 Surface water run-off rates for different return periods

### 2.2 Proposed Drainage Strategy

The proposed development will have the same impermeable area as the existing site. In order to comply with the guidance outlined by LBC, it is proposed to attenuate surface water runoff in green/blue roofs and in below ground attenuation tank. The surface water runoff discharged from the site to the existing combined sewer owned by Thames Water will be through the use of a vortex flow control in the final surface water manhole.

The flow control device has been designed to limit the surface water runoff from the site to a maximum 14l/s for all rainfall events up to and including 100 year return period + 30% climate change allowance.

Condition 21 states that 23m<sup>3</sup> of attenuation needs to be provided in blue or green roofs and 47m<sup>3</sup> of attenuation will have to be provided below ground. Using MicroDrainage, the proposed surface

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water drainage network was modelled based on the required attenuation volumes and the discharge flow rate stated in the Planning Condition 21.

The special requirements for attenuation have assumed, blue, green roof and the below ground attenuation as presented in Table 2:

Attenuation Type	Required area m2	Depth m	Storage coefficient	Volume m3				
Blue Roof	220	0.1	90%	19.8				
Green roof	54	0.08	84%	3.6				
Below ground	75	0.66	96%	48				
Total volume of attenuation provided								

Table 2 Attenuation breakdown for the proposed Site

Table 3 provides a summary of the percentage reduction in surface water runoff between the existing and proposed site. The proposed run-off rates have calculated based on the FEH data available for the site.

Return period	Existing Run-off Rate I/s	Proposed runoff rate l/s	Runoff reduction
1 year	15.00	6	60%
30 year	35.97	10	72.2%
100-year	50.17	14	72.1%
100-year+30%CC	65.22	14	78.5%

Table 3 Existing and Proposed Surface Runoff Reduction

As it can be seen in Table 3, the proposed development will reduce the existing runoff rate to more than 50%. As it is presented in Appendix B, MicroDrainage modelling results show no flooding on site for any of the events, including 100year+30% CC event. Therefore, the requirements of Condition 21 have been met.

## **3** Maintenance Strategy

The ongoing maintenance and management of the proposed surface water drainage system will fall under the responsibility of the site owner. Best practice information is provided in the CIRIA SUDS Manual, excerpts of which have been included below for:

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- Regular Maintenance
- Occasional Maintenance
- Remedial Actions

#### **3.1 Green Roofs**

The SUDS Manual 2015 Table 12.5 (below in Figure 10) gives a recommended maintenance schedule for green roofs. Following further design development of the green/blue roof solutions on the building roofs, the maintenance requirements and a detailed plan can be prepared.

	on and maintena	nce requirements for green roofs	
5 Mainter	nance schedule	Required action	Typical frequency
		Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
Regular	inspections	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
		Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
		Inspect underside of roof for evidence of leakage	Annually and after severe storms
		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
		During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
Regular	Regular maintenance	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
riogaiai		Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as require
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as require
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as require
Remedia	Remedial actions	As required	
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Figure 1 Typical maintenance for green roofs (CIRIA SUDS Manual 2015)

#### **3.2** Attenuation storage tank

Attenuation tanks are used to collect and store water prior discharging to the combined sewer on Adelaide Road. The SUDS Manual 2015 Table 21.3 (below in Figure 11) gives a recommended maintenance schedule for attenuation tanks:

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Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, the annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as requi

Figure 2 Typical maintenance of attenuation tanks (CIRIA SUDS Manual 2015)

#### **3.3** Flow control device

The flow control device is located at the end of the system to restrict surface water flows discharging from the site. The maintenance schedule was compiled from the Hydro-International website. Typical maintenance is presented in Table 7.

Table 4 Typical maintenance of vortex flow control

Maintenance schedule	Required action	Frequency
Regular Maintenance	Debris removal (leaves, rubbish, tree branches) from the drainage network	Monthly
Remedial Actions	When flooding occurs dur to blockages in the drainage network, drain down manhole(s) and jet pipes to remove blockages.	As required
Monitoring	Inspect unit and hose down if required	Monthly for the first three months; Every six months after

#### **3.4 Gullies**

Inspection and removal of debris from silt trap once a year, preferable after the leaf fall in autumn.

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#### **3.5** Drainage pipes, manholes & silt traps

Inspect manholes & silt traps for build-up of silt and general debris (once a year, preferably after leaf fall in the autumn). If silt/debris is building up, a regular clean with jetting lorry / gully sucker is required. Pipe inspection after jetting should be undertaken and repeat cleaning if required. If the pipes to be jetted are plastic then a high flow, low pressure setting should be used so that the pipes are not damaged.

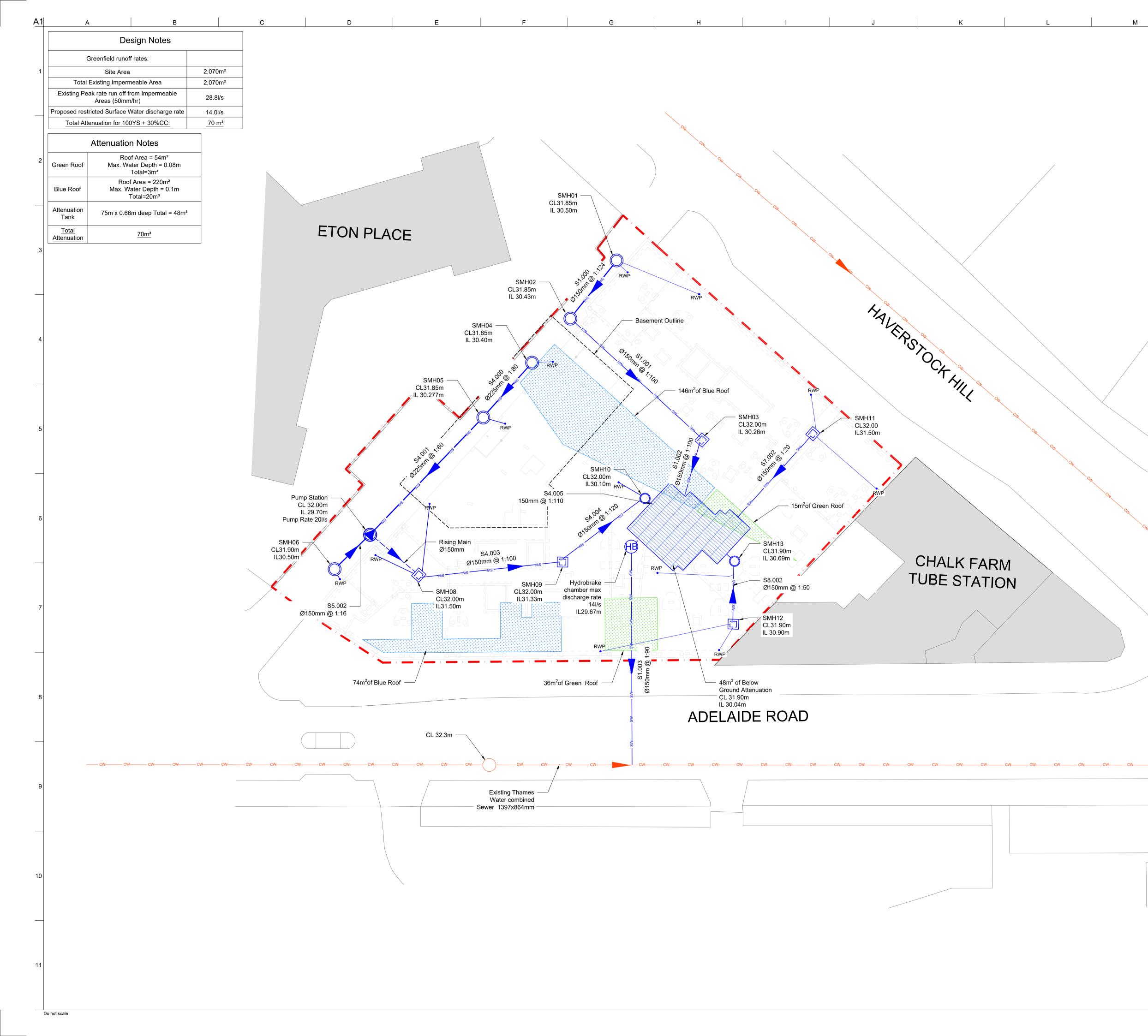
NOTE: Manhole covers can be heavy and suitable lifting equipment / procedures should be used. Untrained personnel should not enter manholes to carry out maintenance.

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**Appendix A – Drainage Strategy Layout** 

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	Job Title
	<sub>Client</sub> Best Star Real Estate 2
	Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924 www.arup.com
	13 Fitzroy Street London W1T 4BQ
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	(Private Asset)
	Foul Water Sewer & Manhole
	Combined Sewer & Manhole (Thames Water Asset)
	Existing Utilities
	Blue Roof Outlet/Rainwater Pipe
	Biodiversity Roof
	Blue Roof Attenuation
	Flow Control/Hydrobrake Chamber (HB)
	Stormwater Attenuation Tank
	Stormwater Rising Main
	Stormwater Sewer & Manhole
	Proposed Utilities
	Site Boundary
	LEGEND
	"2140870-X-00-DR-S-1100_P3" by Conisbee dated 07.05.19
	required to be accounted for. 8. The proposed building layout is based on drawing
	combined sewer and Thames Water sewer on site to determine any additional connections
	<ul><li>a new or existing tree the sewer shall be concrete encased against root intrusion.</li><li>7. CCTV survey to be undertaken on the private</li></ul>
	<ul><li>locally to suit finished ground level.</li><li>6. Where new sewers are constructed within 5m of a new or existing tree the sewer shall be concrete</li></ul>
	<ul><li>existing underground services.</li><li>5. Cover levels are indicative and shall be adjusted locally to suit finished ground level</li></ul>
	<ul><li>confirm the exact locations as appropriate.</li><li>4. Proposed drainage to be coordinated with existing underground services</li></ul>
	indicative. Architect and/or MEP engineer to
	site prior to the commencement of any works. 3. The position of the blue/green roof outfalls are
	<ol> <li>Do not scale from this drawing.</li> <li>Position and invert levels of existing Thames Water chambers and sewers to be confirmed on</li> </ol>
	1. Do not scale from this drawing.
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**Appendix B - MicroDrainage Results** 

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				<u>Networ</u>	<u>k Desi</u>	<u>gn Table 1</u>	<u>for St</u>	lorm										
				« - Inc	dicates	pipe capaci	ty < f	« - Indicates pipe capacity < flow										
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)			Section	on Type	Auto Design						
	(m)	(m)	(1:X)		(mins)	Flow (l/s)		SECT	(mm)		<b>on Type</b> Conduit	Design						
S1.000	(m)	(m) 0.070	(1:X) 124.2	(ha)	(mins) 5.00	<b>Flow (l/s)</b> 0.0	(mm)	SECT O	<b>(mm)</b> 150	Pipe/		Design						
S1.000	(m) 8.697	(m) 0.070 0.000	(1:X) 124.2 0.0	<b>(ha)</b> 0.028	(mins) 5.00	Flow (1/s) 0.0 0.0	<b>(mm)</b> 0.600	<b>SECT</b> 0	(mm) 150 100	Pipe/	Conduit	Design						
s1.000 s2.000 s2.001	(m) 8.697 2.180	(m) 0.070 0.000 9.370	(1:X) 124.2 0.0 0.4	(ha) 0.028 0.008 0.000	(mins) 5.00 5.00	Flow (1/s) 0.0 0.0 0.0	(mm) 0.600 0.600	<b>SECT</b> 0	(mm) 150 100 100	Pipe/ Pipe/ Pipe/	Conduit Conduit	Design						
S1.000 S2.000 S2.001 S1.001	(m) 8.697 2.180 3.309 16.922	(m) 0.070 0.000 9.370 0.169	(1:X) 124.2 0.0 0.4 100.1	(ha) 0.028 0.008 0.000 0.000	(mins) 5.00 5.00 0.00 0.00	Flow (1/s) 0.0 0.0 0.0 0.0	(mm) 0.600 0.600 0.600 0.600	<b>SECT</b> 0 0 0 0	(mm) 150 100 100 150	Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit Conduit	Design						
\$1.000 \$2.000 \$2.001 \$1.001 \$3.000	(m) 8.697 2.180 3.309 16.922	(m) 0.070 0.000 9.370 0.169 0.000	(1:X) 124.2 0.0 0.4 100.1	<pre>(ha) 0.028 0.008 0.000 0.000 0.000</pre>	(mins) 5.00 5.00 0.00	Flow (1/s) 0.0 0.0 0.0 0.0	(mm) 0.600 0.600 0.600	<b>SECT</b> 0 0 0	(mm) 150 100 100 150 100	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit	Design						
S1.000 S2.000 S2.001 S1.001 S3.000 S3.001	(m) 8.697 2.180 3.309 16.922 3.281 3.806	(m) 0.070 9.370 0.169 0.000 9.539	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4	<pre>(ha) 0.028 0.008 0.000 0.000 0.000 0.008 0.000</pre>	(mins) 5.00 5.00 0.00 0.00 5.00 0.00	Flow       (1/s)         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0	(mm) 0.600 0.600 0.600 0.600 0.600	<b>SECT</b> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(mm) 150 100 100 150 100 100	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit Conduit Conduit Conduit	Design						
S1.000 S2.000 S2.001 S1.001 S3.000 S3.001	<pre>(m)     8.697     2.180     3.309     16.922     3.281</pre>	(m) 0.070 9.370 0.169 0.000 9.539	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4	<pre>(ha) 0.028 0.008 0.000 0.000 0.008 0.000 0.001</pre>	(mins) 5.00 5.00 0.00 0.00 5.00 0.00 0.00	Flow       (1/s)         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0         0.0       0.0	(mm) 0.600 0.600 0.600 0.600 0.600 0.600	<b>SECT</b> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(mm) 150 100 100 150 100 100	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit Conduit Conduit	Design						
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S1.000 S2.000 S2.001 S1.001 S3.000 S3.001	(m) 8.697 2.180 3.309 16.922 3.281 3.806 15.056	(m) 0.070 9.370 0.169 0.000 9.539 0.147	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4 102.4 P.C.	<pre>(ha) 0.028 0.008 0.000 0.000 0.008 0.000 0.001</pre>	(mins) 5.00 5.00 0.00 0.00 5.00 0.00 0.00 0.0	Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Results T	(mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 able Foul	SECT 0 0 0 0 0 0 0 0 0 0 0 0 0	(mm) 150 100 150 100 100 150 Flow	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/	Conduit Conduit Conduit Conduit Conduit Conduit Conduit	Design						
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\$1.000 \$2.001 \$1.001 \$3.000 \$3.001 \$1.002 PN \$1.0 \$2.0	<pre>(m) 8.697 2.180 3.309 16.922 3.281 3.806 15.056 Rai (mm/ 00 177 00 172 01 172</pre>	(m) 0.070 9.370 0.169 0.000 9.539 0.147 (m .48 .94 .89	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4 102.4 2.C. 5 5.16 5.52 3	(ha) 0.028 0.008 0.000 0.000 0.008 0.000 0.011 <u>Ne</u> US/IL E (m) 30.500 39.850 39.850	(mins) 5.00 5.00 0.00 0.00 0.00 0.00 0.00 etwork I.Area (ha) 0.028 0.008	Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	(mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 <b>able</b> <b>Foul</b> (l/s) 0.0 0.0	SECT 0 0 0 0 0 0 0 0 0 0 0 0 0	(mm) 150 100 150 100 150 150 Flow (s) 0.0 0.0	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 0.90 0.07	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit (1/s) 15.9 0.5«	Design						
\$1.000 \$2.001 \$1.001 \$3.000 \$3.001 \$1.002 <b>PN</b> \$1.0 \$2.0 \$2.0	<pre>(m) 8.697 2.180 3.309 16.922 3.281 3.806 15.056 Rai (mm/ 00 177 00 172 01 172 01 169</pre>	(m) 0.070 9.370 0.169 0.000 9.539 0.147 (m .48 .94 .89 .57	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4 102.4 2.C. 5.16 5.52 5.53 3	(ha) 0.028 0.008 0.000 0.000 0.008 0.000 0.011 <u>Ne</u> US/IL 2 (m) 30.500 39.850 39.850 39.850 39.850	(mins) 5.00 5.00 0.00 0.00 5.00 0.00 0.00 0.0	Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 <u>Results T</u> <u>E Base</u> Flow (1/s) 0.0 0.0 0.0	(mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.00 0.0 0.	SECT 0 0 0 0 0 0 0 0 0 0 0 0 0	(mm) 150 100 150 100 150 150 <b>Flow</b> (s) 0.0 0.0 0.0 0.0	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 0.90 0.07 13.14	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 15.9 0.5« 103.2	Design						
\$1.000 \$2.001 \$1.001 \$3.000 \$3.001 \$1.002 <b>PN</b> \$1.0 \$2.0 \$2.0 \$2.0 \$1.0	<pre>(m) 8.697 2.180 3.309 16.922 3.281 3.806 15.056  Rai (mm/ 00 177 00 172 01 172 01 169 00 169</pre>	(m) 0.070 9.370 0.169 0.000 9.539 0.147 0.147 (m .48 .94 .89 .57 .81	(1:x) 124.2 0.0 0.4 100.1 0.0 0.4 102.4 2.C. 5.16 5.52 5.53 5.81 3	(ha) 0.028 0.008 0.000 0.000 0.001 0.011 <u>Ne</u> US/IL 2 (m) 30.500 39.850 39.850 39.850 39.850	(mins) 5.00 5.00 0.00 0.00 0.00 0.00 0.00 etwork I.Area (ha) 0.028 0.008 0.008 0.008	Flow (1/s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 <u>Results T</u> <u>E Base</u> Flow (1/s) 0.0 0.0 0.0	(mm) 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.00 0.0 0.	SECT 0 0 0 0 0 0 0 Add (1)	(mm) 150 100 150 100 150 150 <b>Flow</b> (s) 0.0 0.0 0.0 0.0 0.0	Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Pipe/ Vel (m/s) 0.90 0.07 13.14 1.00	Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit Conduit 15.9 0.5« 103.2 17.7	Design						

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XP Sol	uti	ons				Net	work 2020	.1				
Network Design Table for Storm												
PN	Leng (m	-	Fall (m)	Slop (1:X	e I.Area ) (ha)		Base Flow (l/s)	k (mm)	HYD D SECT (m		tion Typ	e Auto Design
s4.000	9.	835	0.123	80.	0.015	5.00	0.0	0.600	o 2	25 Pip	e/Condui	t 🔒
S4.001	18.	645	0.233	80.	0.028	0.00	0.0	0.600	o 2	25 Pip	e/Condui	t 🧴
S5.000	1	183	0.000	0.	0.004	5.00	0 0	0.600	o 1	00 Pin	e/Condui	t 🤒
s5.001			8.950			0.00		0.600		-	e/Condui	
S5.002	6.	040	0.381	15.	9 0.023	0.00	0.0	0.600	o 1	50 Pip	e/Condui	
S4.002	6.	163 -	1.356	-4.	5 0.015	0.00	0.0	0.600	o 1	50 Pin	e/Condui	t 🔒
s4.003						0.00		0.600			e/Condui	t 🤮
C.C. 0.0.0	0	000	0 000	0		E 00	0.0	0 600	- 1	00 54	0/000-1'	_
S6.000 S6.001			0.000			5.00 0.00		0.600		-	e/Condui e/Condui	
S4.004 S4.005	13.			120.		0.00		0.600		-	e/Condui e/Condui	
54.005	9.	400	0.005	110.	/ 0.000	0.00	0.0	0.000	o 1	JO FID	e/condui	t 🥚
S7.000			0.000			5.00		0.600		-	e/Condui	
S7.001 S7.002			7.950			0.00		0.600			e/Condui e/Condui	
37.002	10.	527	0.007	19.	9 0.031	0.00	0.0	0.000	0 1	JO LID	e/condui	t 🤒
S8.000	7.3	280	0.000	0.	0.004	5.00	0.0	0.600	o 1	00 Pip	e/Condui	t 🤮
					N∈	etwork	Results Ta	able				
PI		Rai: (mm/h			US/IL Σ (m)		Σ Base Flow (l/s)		Add Flo (l/s)		-	Flow (1/s)
S4.		178.			30.400	0.015	0.0			0 1.4		7.1
S4.	001	175.	39	5.32	30.277	0.043	0.0	0.0	0.	0 1.4	6 58.2	20.5
S5.	000	175.	91	5.28	39.500	0.004	0.0	0.0	0.	0 0.0	7 0.5«	1.9
S5.	001	175.	90		39.500	0.004	0.0	0.0	0.	0 21.4	9 168.7	1.9
S5.	002	175.	40	5.32	30.500	0.027	0.0	0.0	0.	0 2.5	4 44.9	12.6
S4.	002	162.	73	6.43	30.119	0.085	0.0	0.0	0.	0 0.0	9 1.6«	37.5
S4.		159.			31.500	0.085	0.0	0.0			1 17.8«	
S6.	000	173.	47	5 4 8	39.500	0.004	0.0	0.0	Ω	0 0 0	7 0.5«	1.9
S6.0		173.			39.500	0.004	0.0	0.0			6 131.7	1.9
	0.0.4	1	4 5	c	21 222	0 0 0 0 0		<u> </u>	-	0 0 5		
S4.0 S4.0		157. 155.			31.328 30.099	0.092 0.092	0.0	0.0	0. 0.		1 16.2« 5 16.9«	39.3 39.3
									0.			
S7.		168.			39.500	0.002	0.0	0.0	0.			0.9
S7.0 S7.0		168. 167.			39.500 31.500	0.002	0.0	0.0	0. 0.		2 60.6 7 40.1	0.9 15.1
S8.	000	159.	54	6.75	39.500	0.004	0.0	0.0	0.	0 0.0	7 0.5«	1.7
					C	01982-2	020 Innov	yze				

Ove Arup & Partners Internationa	Page 3	
The Arup Campus		
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Solihull B90 8AE		Mirro
Date 21/10/2020 12:45	Designed by Raluca.Olariu	Drainage
File Connisbee MD_condition	Checked by	Diamage
XP Solutions	Network 2020.1	

#### Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (1		k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.001	4.176	8.550	0.5	0.000	0.00		0.0	0.600	0	100	Pipe/Conduit	ð
S8.002	10.359	0.207	50.0	0.017	0.00		0.0	0.600	0	150	Pipe/Conduit	ě
s7.003	9.259	0.579	16.0	0.000	0.00		0.0	0.600	0	150	Pipe/Conduit	ď
s1.003	8.140	0.099	82.2	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	<b>e</b>
S1.004	2.569	0.026	98.8	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ě
S1.005	15.238	0.190	80.2	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ě

#### Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (l/s)		Cap (1/s)	Flow (l/s)
S8.001 S8.002	159.48 158.29		39.500 30.900	0.004 0.021	0.0	0.0		11.17 1.43	87.7 25.2	1.7 9.1
S7.003	157.70	6.93	30.693	0.055	0.0	0.0	0.0	2.53	44.7	23.4
S1.003 S1.004	155.02 154.72	=	30.039 29.940	0.201 0.201	0.0	0.0 0.0	0.0		57.4« 52.3«	
S1.005	153.15	7.42	29.914	0.201	0.0	0.0	0.0	1.46	58.1«	84.6

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XP Soluti	ons		Netw	ork 202	20.1				
<u>l year R</u>	<u>eturn Period</u>	Summary o		<u>tical Re</u> Storm	esults	by Max	kimum Lev	el (Rank 1	<u>1)</u>
	Hot S Hot Start Le Headloss Coe L Sewage per he Number of 2 Number o:	tion Factor tart (mins) Level (mm) ff (Global)	1.000 0 0.500 0.000 raphs trols	MA Flow per 0 Number 8 Number	onal Fl DD Fact Person of Stor of Time	or * 10 Inlet per Da rage Str e/Area I	m³/ha Stor Coeffieci y (l/per/d ructures 7 Diagrams 0	age 2.000 ent 0.800	
			netic R	ainfall I					
	Rainfa	all Model				atio R (			
	М	Region Er 5-60 (mm)		and Wales 20.600					
	11.	5 66 (nun)		20.000	0 CV (M.	LIICCL) (	0.010		
	Margin for Fl	ood Risk War	ning (	mm)			300	0.0	
		-		-	Second 1	Incremer	nt (Extende	ed)	
			DTS Sta				C	DFF	
			VD Sta					ON	
		Inert	ia Sta	tus			C	)FF	
		Profile	(s)		2	Summer a	and Winter		
		tion(s) (mir		30, 60,	120, 18				
		iod(s) (year					), 30, 100		
	Clim	ate Change (	(8)			υ,	0, 0, 30		
	US/MH			Climate		t (X)		First (Z)	
PN	Name	Storm	Period	Change	Surcl	harge	Flood	Overflow	
S1.000	SMH01	15 Winter	1	+0%	100/15	Summer			
S2.000	SRoofBlueN.1	360 Winter	1	+0%					
S2.001	SOrificeN.1	360 Winter	1	+0%					
S1.001			1		100/15	Summer			
S3.000			1						
S3.001			1		00/05				
S1.002			1			Winter			
S4.000		15 Winter 15 Winter	1 1		100/15				
S4.001 S5.000	SMH05 SRoodBlueS.1		1		20/12	Summer			
S5.000 S5.001			1						
s5.001	SOIIIICES.I SMH06	15 Winter	1		100/15	Summer			
	SPump station		1			Summer			
S4.003	SMH08	15 Winter	1			Summer			
S6.000	SRoofBlueS.2	240 Winter	1	+0%					
S6.001	SOrificeS.2	240 Winter	1	+0%					
S4.004			1			Summer			
S4.005	SMH10	15 Winter	1	+0%	10/15	Summer			
			982-20	20 Inno	WW70				
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	utions			Networ		-				
AF 501				Networ	_K 2	2020.1				
<u>1 yea</u>	ir Return Per	iod Summ	ary of				s by M	laximum Le	evel (Ran	<u>k 1)</u>
				<u>for S</u>	itor	<u>°m</u>				
			Water	Surcharg	ged	Flooded		:	Half Drain	Pipe
	US/MH	Overflow	Level	Depth	L	Volume		Overflow	Time	Flow
PN	Name	Act.	(m)	(m)		(m³)	Cap.	(l/s)	(mins)	(l/s)
S1.000	SMH01		30.556	-0.0	194	0.000	0.29			4.1
S1.000 S2.000	SRoofBlueN.1		39.863	-0.0		0.000	0.29		337	4.1 0.1
S2.000	SOrificeN.1		39.863	-0.0		0.000	0.00		551	0.1
S1.001	SMH002		30.481	-0.0		0.000	0.25			4.1
S3.000	SRoofBlueN.2		39.864	-0.0		0.000	0.02		330	0.1
S3.001	SOrificeN.2		39.863	-0.0		0.000	0.00			0.1
S1.002	SMH03		30.321	-0.0		0.000	0.34			5.5
S4.000	SMH04		30.431	-0.1	194	0.000	0.04			2.2
S4.001	SMH05		30.327	-0.1	175	0.000	0.11			5.7
S5.000	SRoodBlueS.1		39.512	-0.0	88C	0.000	0.01		173	0.0
S5.001	SOrificeS.1		39.511	-0.0	089	0.000	0.00			0.0
S5.002	SMH06		30.527	-0.1	123	0.000	0.08			2.8
S4.002	SPump station		30.172	-0.0	097	0.000	1.27			10.5
S4.003	SMH08		31.587	-0.0	063	0.000	0.63			10.5
S6.000	SRoofBlueS.2		39.512	-0.0	880	0.000	0.01		191	0.0
S6.001	SOrificeS.2		39.511	-0.0	089	0.000	0.00			0.0
S4.004	SMH09		31.424	-0.0			0.73			10.8
S4.005	SMH10		30.195	-0.0	054	0.000	0.73			10.8
			us	/мн			Level			
		PN	Na	ame	S	status	Exceede	ed		
		S1.000		SMH01		OK				
		S2.000	SRoof	BlueN.1	FLC	OD RISK				
		S2.001	SOri		FLC	OD RISK				
		S1.001		SMH002		OK				
		S3.000				OD RISK				
		S3.001	SOri		FLC	OD RISK				
		S1.002		SMH03		OK				
		S4.000		SMH04		OK				
		S4.001 S5.000	CDcc-1	SMH05		OK				
				BlueS.1		OK				
		S5.001 S5.002	SUTI	ficeS.1 SMH06		OK OK				
			SPiimp	station		OK				
		S4.002 S4.003	Srump	SCACION SMH08		OK				
		S4.003 S6.000	SRoof	BlueS.2		OK				
		s6.001		ficeS.2		OK				
		S4.004		SMH09		OK				
		\$4.005		SMH10		OK				
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XP Sol	lutions			I	Networl	< 2020.1				
	US/MH					First (X)	• •			
PN	US/MH Name	s			Climate Change	• •	• •			
<b>PN</b> S7.000	Name		torm	Period			• •			
	Name SRoofGreenN	120	<b>torm</b> Winter	Period	Change		• •			
s7.000	Name SRoofGreenN SOrificeGN	120 120	<b>torm</b> Winter	Period 1 1	<b>Change</b> +0응		• •			
\$7.000 \$7.001 \$7.002 \$8.000	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2	120 120 15 120	torm Winter Winter Winter Winter	Period 1 1 1 1	<b>Change</b> +0% +0% +0% +0%		• •			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2	120 120 15 120 120	torm Winter Winter Winter Winter Winter	Period 1 1 1 1 1	<b>Change</b> +0% +0% +0% +0% +0%		• •			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12	120 120 15 120 120 15	Winter Winter Winter Winter Winter Winter	Period 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0%	Surcharge	• •			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13	120 120 15 120 120 15 15	Winter Winter Winter Winter Winter Winter Winter	Period 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003 \$1.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14	120 120 15 120 120 15 15 60	Winter Winter Winter Winter Winter Winter Winter Winter	Period 1 1 1 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14	120 120 15 120 120 15 15 60 60	Winter Winter Winter Winter Winter Winter Winter	Period 1 1 1 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	SRoofGreenN	39.510	-0.090	0.000	0.01		111	0.0	OK
S7.001	SOrificeGN	39.509	-0.091	0.000	0.00			0.0	OK
S7.002	SMH11	31.533	-0.117	0.000	0.11			3.9	OK
S8.000	SRoofGreen.2	39.518	-0.082	0.000	0.03		93	0.1	OK
S8.001	SOrifice G2	39.515	-0.085	0.000	0.00			0.1	OK
S8.002	SMH12	30.931	-0.119	0.000	0.10			2.2	OK
s7.003	SMH13	30.732	-0.110	0.000	0.15			6.1	OK
S1.003	SMH14	30.175	-0.089	0.000	0.13		33	5.9	OK
S1.004	SMH15	30.007	-0.158	0.000	0.20			5.9	OK
S1.005	SMH16	29.964	-0.175	0.000	0.11			5.9	OK

PN	US/MH Name	Level Exceeded
S7.000	SRoofGreenN	
S7.001	SOrificeGN	
S7.002	SMH11	
S8.000	SRoofGreen.2	
S8.001	SOrifice G2	
S8.002	SMH12	
S7.003	SMH13	
S1.003	SMH14	
S1.004	SMH15	
S1.005	SMH16	

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<u>10 year Ret</u>	<u>urn Perioc</u>	l Summary		<u>tical R</u> Storm	<u>esults</u>	by Ma	ximum Lev	vel (Rank
	Hot S	tion Factor tart (mins) Level (mm) ff (Global)	1.000 0 0.500	MA	onal Fl DD Fact	or * 10 Inlet	m³/ha Stor Coeffieci	age 2.000 ent 0.800
	Number of	Input Hydrog f Online Cor Offline Cor	ntrols 8	3 Number	of Time	e/Area I	iagrams O	
		Strn+1	hetic P	ainfall I	Detaile			
		all Model Region En 5-60 (mm)	ngland a	FSE and Wales	R Ra		.750	
M:	argin for Fl	ood Bisk Wa	rning (r	nm)			300	) ()
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	Return Per	Profile tion(s) (min iod(s) (yea: ate Change	ns) 15, rs)	30, 60,		30, 240, 1, 10	and Winter 360, 480 0, 30, 100 0, 0, 30	
PN	US/MH Name	Storm		Climate Change		: (X) harge	First (Y) Flood	First (Z) Overflow
	Name		Period	Change	Surch	harge		
S1.000	Name SMH01	15 Winter	Period	<b>Change</b> +0응		harge		
S1.000 S2.000 S	Name SMH01 SRoofBlueN.1	15 Winter 180 Winter	<b>Period</b> 10 10	<b>Change</b> +0응 +0응	Surch	harge		
S1.000	Name SMH01	15 Winter 180 Winter	Period	<b>Change</b> +0% +0% +0%	Surch	Summer		
S1.000 S2.000 S S2.001 S1.001	Name SMH01 SRoofBlueN.1 SOrificeN.1	15 Winter 180 Winter 180 Winter 15 Winter	<b>Period</b> 10 10 10	<b>Change</b> +0% +0% +0%	<b>Surch</b>	Summer		
S1.000 S2.000 S S2.001 S1.001 S3.000 S S3.001	Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2 SOrificeN.2	15 Winter 180 Winter 180 Winter 15 Winter 180 Winter 180 Winter	<b>Period</b> 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15	Summer Summer		
S1.000 S2.000 S S2.001 S1.001 S3.000 S S3.001 S1.002	Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2 SOrificeN.2 SMH03	15 Winter 180 Winter 180 Winter 15 Winter 180 Winter 180 Winter 15 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30	Summer Summer Winter		
S1.000 S2.000 S S2.001 S1.001 S3.000 S S3.001 S1.002 S4.000	Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2 SOrificeN.2 SMH03 SMH04	15 Winter 180 Winter 180 Winter 15 Winter 180 Winter 180 Winter 15 Winter 15 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15	Summer Summer Winter Summer		
S1.000 S2.000 S S2.001 S1.001 S3.000 S S3.001 S1.002 S4.000 S4.001	Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2 SOrificeN.2 SMH03 SMH04 SMH05	15 Winter 180 Winter 180 Winter 15 Winter 180 Winter 180 Winter 15 Winter 15 Winter 15 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15	Summer Summer Winter		
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			Water	Surcharg		ooded			Half Drain	Pipe
	US/MH	Overflow		Depth				Overflow		Flow
PN	Name	Act.	(m)	(m)		(m³)	Cap.	(1/s)	(mins)	(1/s)
s1.000	SMH01		30.582	-0.0	68	0.000	0.57			8.0
s2.000	SRoofBlueN.1		39.871	-0.0		0.000	0.04		210	0.1
S2.001	SOrificeN.1		39.870	-0.0		0.000	0.00			0.1
s1.001	SMH002		30.504	-0.0		0.000	0.48			8.0
s3.000	SRoofBlueN.2		39.872	-0.0		0.000	0.04		203	0.2
s3.001	SOrificeN.2		39.871	-0.0	79	0.000	0.00			0.2
S1.002	SMH03		30.353	-0.0	58	0.000	0.68			11.0
S4.000	SMH04		30.445	-0.1	80	0.000	0.09			4.2
S4.001	SMH05		30.375	-0.1	27	0.000	0.24			12.7
S5.000	SRoodBlueS.1		39.518	-0.0	82	0.000	0.03		119	0.1
S5.001	SOrificeS.1		39.518	-0.0	82	0.000	0.00			0.1
S5.002	SMH06		30.543	-0.1	07	0.000	0.18			6.9
S4.002	SPump station		30.354	0.0		0.000	2.41			20.0
S4.003	SMH08		31.821	0.1		0.000	1.20			19.9
S6.000	SRoofBlueS.2		39.519	-0.0		0.000			122	0.1
S6.001	SOrificeS.2		39.518	-0.0		0.000	0.00			0.1
S4.004	SMH09		31.571	0.0		0.000				20.4
S4.005	SMH10		30.408	0.1	29	0.000	1.34			20.0
			US	/мн			Level			
		PN	Na	ame	Sta	tus	Exceede	≥d		
		S1.000		SMH01		OK				
				BlueN.1						
		S2.001		ficeN.1	FLOOD					
		S1.001		SMH002		OK				
		S3.000		BlueN.2						
		S3.001		ficeN.2	FLOOD					
		S1.002		SMH03		OK				
		S4.000		SMH04		OK				
		S4.001		SMH05		OK				
				BlueS.1		OK				
		S5.001 S5.002		ficeS.1 SMH06		OK OK				
				station	SURCH					
		S4.002 S4.003	-	SCACION SMH08						
				BlueS.2	1000	OK				
				ficeS.2		OK				
		S4.004		SMH09						
		S4.005		SMH10						
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	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	US/MH Name	Storm		Climate Change	First (X) Surcharge	First (Y) Flood		
	Name		Period	Change		• •		
S7.000	Name SRoofGreenN	60 Winter	Period	<b>Change</b> +0응		• •		
	Name SRoofGreenN SOrificeGN	60 Winter	<b>Period</b> 10 10	<b>Change</b> +୦୫ +୦୫		• •		
S7.000 S7.001 S7.002	Name SRoofGreenN SOrificeGN	60 Winter 60 Winter 15 Winter	<b>Period</b> 10 10 10	<b>Change</b> +0% +0% +0%		• •		
S7.000 S7.001 S7.002	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2	60 Winter 60 Winter 15 Winter 60 Winter	<b>Period</b> 10 10 10 10	<b>Change</b> +0% +0% +0%		• •		
S7.000 S7.001 S7.002 S8.000	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2	60 Winter 60 Winter 15 Winter 60 Winter	<b>Period</b> 10 10 10 10 10	<b>Change</b> +0% +0% +0% +0%		• •		
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12	60 Winter 60 Winter 15 Winter 60 Winter 60 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10	<b>Change</b> +0% +0% +0% +0% +0%		• •		
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003 \$1.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer 60 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •		
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003 \$1.003 \$1.004	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14 SMH15	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer 60 Winter 60 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •		
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003 \$1.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14 SMH15	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer 60 Winter	<b>Period</b> 10 10 10 10 10 10 10 10 10 10 10 10 10	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge	• •		

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.000	SRoofGreenN	39.516	-0.084	0.000	0.02		75	0.1
S7.001	SOrificeGN	39.515	-0.085	0.000	0.00			0.1
S7.002	SMH11	31.552	-0.098	0.000	0.26			9.6
S8.000	SRoofGreen.2	39.529	-0.071	0.000	0.08		53	0.2
S8.001	SOrifice G2	39.525	-0.075	0.000	0.00			0.2
S8.002	SMH12	30.949	-0.101	0.000	0.24			5.3
S7.003	SMH13	30.757	-0.086	0.000	0.38			14.9
S1.003	SMH14	30.317	0.053	0.000	0.19		38	8.3
S1.004	SMH15	30.020	-0.145	0.000	0.28			8.3
S1.005	SMH16	29.974	-0.165	0.000	0.16			8.3

PN	US/MH Name	Status	Level Exceeded
S7.000	SRoofGreenN	OK	
S7.001	SOrificeGN	OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	OK	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	
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<u>30 year Return Pe</u>	eriod Su	ummary		<u>tical R</u> Storm	<u>esults</u>	by Ma	ximum Lev	<u>vel (Rank</u>	1)
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Return	n Period		ns) 15, rs)	30, 60,		30, 240, 1, 10	and Winter 360, 480 , 30, 100 0, 0, 30		
US/MH PN Name		Storm		Climate Change		: (X) harge	First (Y) Flood	First (Z) Overflow	
PN Name			Period	Change	Surch	harge			
PN         Name           \$1.000         \$	SMH01 15	Winter	Period 30	<b>Change</b> +0응		harge			
PNName\$1.000\$\$2.000\$RoofBlue		Winter Winter	Period	Change	Surch	harge			
PN         Name           \$1.000         \$           \$2.000         \$           \$2.001         \$           \$1.001         \$	SMH01 15 1eN.1 180 2eN.1 180 4H002 15	Winter Winter Winter Winter	<b>Period</b> 30 30 30 30 30	<b>Change</b> +0% +0% +0% +0%	Surch	Summer			
PN         Name           \$1.000         \$           \$2.000         \$           \$2.001         \$           \$1.001         \$           \$3.000         \$	SMH01 15 aeN.1 180 ceN.1 180 4H002 15 aeN.2 120	<ul><li>Winter</li><li>Winter</li><li>Winter</li><li>Winter</li><li>Winter</li><li>Winter</li></ul>	<b>Period</b> 30 30 30 30 30	<b>Change</b> +0% +0% +0% +0%	<b>Surch</b>	Summer			
PN         Name           \$1.000         \$           \$2.000         \$           \$2.001         \$           \$1.001         \$           \$3.000         \$           \$3.001         \$           \$         \$	SMH01 15 DeN.1 180 CeN.1 180 MH002 15 DeN.2 120 CeN.2 120	<ul> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> </ul>	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15	Summer Summer			
PN         Name           \$1.000         \$           \$2.000         \$RoofBlue           \$2.001         \$Sorific           \$1.001         \$M           \$3.000         \$RoofBlue           \$3.001         \$Sorific           \$1.002         \$	SMH01 15 LeN.1 180 CeN.1 180 HH002 15 LeN.2 120 CeN.2 120 SMH03 60	<ul> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> <li>Winter</li> </ul>	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30	Summer Summer Winter			
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PN         Name           \$1.000         \$           \$2.000         \$RoofBlue           \$2.001         \$Orific           \$1.001         \$M           \$3.000         \$RoofBlue           \$3.000         \$RoofBlue           \$3.001         \$Orific           \$1.002         \$           \$4.000         \$           \$4.001         \$           \$5.000         \$RoodBlue           \$5.001         \$Orific	SMH01 15 beN.1 180 beN.1 180 dH002 15 beN.2 120 beN.2 120 beN.2 120 beN.3 60 beN40 15 beN405 15 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15 30/15 100/15 10/15	Summer Summer Winter Summer Summer Summer			
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PN         Name           \$1.000         \$           \$2.000         \$RoofBlue           \$2.001         \$Orific           \$1.001         \$M           \$3.000         \$RoofBlue           \$3.000         \$RoofBlue           \$3.001         \$Orific           \$3.001         \$Orific           \$1.002         \$           \$4.000         \$           \$5.000         \$RoodBlue           \$5.001         \$Orific           \$5.002         \$           \$4.003         \$           \$4.003         \$           \$6.000         \$	SMH01 15 beN.1 180 beN.1 180 dH002 15 beN.2 120 beN.2 120 beN.2 120 beN.2 120 beN.3 60 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.2 120	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15 30/15 100/15 10/15 10/15	Summer Summer Winter Summer Summer Summer			
PN         Name           \$1.000         \$           \$2.000         \$RoofBlue           \$2.001         \$Orific           \$1.001         \$M           \$3.000         \$RoofBlue           \$3.000         \$RoofBlue           \$3.001         \$Orific           \$3.001         \$Orific           \$3.001         \$Orific           \$3.001         \$Orific           \$3.001         \$Orific           \$4.000         \$           \$5.001         \$Orific           \$5.002         \$           \$4.003         \$           \$4.003         \$           \$6.000         \$           \$0.001         \$	SMH01 15 beN.1 180 beN.1 180 beN.2 120 beN.2 120 beN.2 120 beN.2 120 beN.2 120 beN.3 60 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.2 120 beS.2 120 beS.2 120	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15 30/15 100/15 10/15 10/15	Summer Summer Winter Summer Summer Summer Summer			
PN         Name           \$1.000         \$           \$2.000         \$RoofBlue           \$2.001         \$Orific           \$1.001         \$M           \$3.000         \$RoofBlue           \$3.000         \$RoofBlue           \$3.001         \$Orific           \$3.001         \$Orific           \$3.001         \$Orific           \$1.002         \$           \$4.000         \$           \$5.000         \$RoodBlue           \$5.001         \$Orific           \$5.002         \$           \$4.003         \$           \$6.000         \$RoofBlue           \$6.001         \$Orific           \$4.004         \$	SMH01 15 beN.1 180 beN.1 180 dH002 15 beN.2 120 beN.2 120 beN.2 120 beN.2 120 beN.3 60 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.1 120 beS.2 120	Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	Surch 100/15 100/15 30/30 100/15 30/15 10/15 10/15 10/15	Summer Summer Winter Summer Summer Summer			

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<u>30 yea</u>	ar Return Pe	riod Sum	<u>mary of</u>			ts by 1	<u>Maximum I</u>	<u>evel (Rar</u>	nk 1)
				<u>for Sto</u>	<u>rm</u>				
			Water	Surcharged	Flooded			Half Drain	Pipe
	US/MH	Overflow	Level	Depth		Flow /	Overflow	Time	Flow
PN	Name	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(1/s
s1.000	SMH01		30.596	-0.054	0.000	0.72			10.
s2.000	SRoofBlueN.1		39.876	-0.074		0.06		177	0.
s2.001	SOrificeN.1		39.875	-0.075		0.00			0.
s1.001	SMH002		30.516	-0.064		0.61			10.
53.000	SRoofBlueN.2		39.877	-0.073		0.06			Ο.
s3.001	SOrificeN.2		39.875	-0.075	0.000	0.00			0.
51.002	SMH03		30.422	0.011	0.000	0.44			7.
54.000	SMH04		30.613	-0.012	0.000	0.10			4.
S4.001	SMH05		30.607	0.105		0.25			13.
\$5.000			39.522	-0.078		0.04		102	0.
s5.001	SOrificeS.1		39.522	-0.078		0.00			0.
55.002	SMH06		30.598	-0.052		0.23			8.
	SPump station		30.586	0.317		2.41			20.
s4.003	SMH08		31.827	0.177		1.21		105	20.
S6.000	SRoofBlueS.2		39.523	-0.077		0.04		105	0.
s6.001 s4.004	SOrificeS.2		39.522	-0.078		0.00			0. 20.
S4.004 S4.005	SMH09 SMH10		31.577 30.510	0.099 0.261		1.40 1.35			20.
		PN		/MH ame	Status	Level Exceede			
						DACEEUR	iu ii		
		S1.000		SMH01	OK DICK				
				BlueN.1 FL					
		S2.001 S1.001		ficeN.1 FL SMH002	OOD RISK OK				
		S1.001 S3.000		BlueN.2 FL					
				ficeN.2 FL					
		s1.002		SMH03 SU					
		S4.000		SMH04	OK				
		S4.001		SMH05 SU					
				BlueS.1	OK				
		S5.001	SOri	ficeS.1	OK				
		S5.002		SMH06	OK				
		S4.002	SPump	station SU	RCHARGED				
		S4.003		SMH08 FL	OOD RISK				
				BlueS.2	OK				
				ficeS.2					
		S4.004		SMH09 SU					
		S4.005		SMH10 SU	RCHARGED				
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<u>30 yea</u>	<u>ai ketuin re</u>	<u>1100 Sulli</u>	mary O	for S	<u>cal Results )</u> torm	<u>Jy Maximu</u>	UU TEAST	
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	US/MH Name	Storm		Climate Change				
<b>PN</b> S7.000	Name		Period					
s7.000	Name	60 Winter	Period 30	Change				
s7.000	Name SRoofGreenN SOrificeGN	60 Winter	<b>Period</b> 30 30	<b>Change</b> +0% +0%				
S7.000 S7.001 S7.002	Name SRoofGreenN SOrificeGN	60 Winter 60 Winter 15 Winter	<b>Period</b> 30 30 30	<b>Change</b> +0% +0%				
S7.000 S7.001 S7.002 S8.000 S8.001	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2	60 Winter 60 Winter 15 Winter 60 Winter	<b>Period</b> 30 30 30 30 30 30	<b>Change</b> +0% +0% +0% +0% +0%				
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.001 \$8.002	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0%	Surcharge			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0%	Surcharge			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003 \$1.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer 60 Winter	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge			
\$7.000 \$7.001 \$7.002 \$8.000 \$8.001 \$8.002 \$7.003	Name SRoofGreenN SOrificeGN SMH11 SRoofGreen.2 SOrifice G2 SMH12 SMH13 SMH14 SMH15	60 Winter 60 Winter 15 Winter 60 Winter 15 Winter 15 Summer	<b>Period</b> 30 30 30 30 30 30 30 30 30 30 30 30 30	Change +0% +0% +0% +0% +0% +0% +0%	Surcharge			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
s7.000	SRoofGreenN	39.520	-0.080	0.000	0.03		64	0.1
S7.001	SOrificeGN	39.518	-0.082	0.000	0.00			0.1
S7.002	SMH11	31.559	-0.091	0.000	0.33			12.3
S8.000	SRoofGreen.2	39.535	-0.065	0.000	0.12		47	0.3
S8.001	SOrifice G2	39.531	-0.069	0.000	0.00			0.3
S8.002	SMH12	30.956	-0.094	0.000	0.30			6.7
S7.003	SMH13	30.766	-0.076	0.000	0.48			19.0
S1.003	SMH14	30.412	0.148	0.000	0.22		43	9.6
S1.004	SMH15	30.027	-0.138	0.000	0.32			9.6
S1.005	SMH16	29.980	-0.159	0.000	0.19			9.6

PN	US/MH Name	Status	Level Exceeded
S7.000	SRoofGreenN	OK	
S7.001	SOrificeGN	OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	OK	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	

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	sbee MD_con	dition						
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<u>100 year</u>	<u>Return Peri</u>	od Summar	-	<u>ritical</u> or Storr		ts by	Maximum I	Level (Rank
				on Crite				
		tion Factor						
	HOT Start	tart (mins) Level (mm)	0	MA	DD Fact		Coeffieci	
Manhole	e Headloss Coe			Flow per	Person			
	Sewage per he			F		T		
	Number of	Input Hydrog	graphs (	) Number	of Stor	rage Str	uctures 7	
	Number o	f Online Cor	ntrols 8	8 Number	of Time	e/Area I	)iagrams 0	
	Number of	Offline Cor	ntrols (	) Number	of Real	l Time C	Controls 0	
		Syntl	hetic Ra	ainfall I	<u>Details</u>			
	Rainfa	all Model		FSF	R Ra	atio R (		
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	Margin for Fl	ood Risk Wa	rnina (r	nm)			300	).0
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		]	DTS Stat	cus			C	DFF
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		tion(s) (min	ns) 15,	30, 60,		30, 240,	360, 480	
	Return Per		ns) 15, rs)	30, 60,		30, 240, 1, 10		
	Return Per	tion(s) (min iod(s) (yea:	ns) 15, rs)	30, 60,		30, 240, 1, 10	360, 480 ), 30, 100	
	Return Per	tion(s) (min iod(s) (yea:	ns) 15, rs) (%)		120, 18	30, 240, 1, 10 0,	360, 480 ), 30, 100 0, 0, 30	First (Z)
PN	Return Per Clim	tion(s) (min iod(s) (yea:	ns) 15, rs) (%) Return	30, 60, Climate Change	120, 18 Firs	30, 240, 1, 10	360, 480 ), 30, 100 0, 0, 30	First (Z) Overflow
<b>PN</b> S1.000	Return Per Clim <b>US/MH</b>	tion(s) (min iod(s) (yea: ate Change	(%) 15, rs) (%) Return Period	Climate Change	120, 18 Firs	80, 240, 1, 10 0, t (X) harge	360, 480 0, 30, 100 0, 0, 30 First (Y)	
	Return Per Clim US/MH Name	tion(s) (min iod(s) (yea: ate Change <b>Storm</b> 60 Winter	(%) 15, rs) (%) Return Period 100	Climate Change	120, 18 Firs Surch	80, 240, 1, 10 0, t (X) harge	360, 480 0, 30, 100 0, 0, 30 First (Y)	
S1.000	Return Per Clim US/MH Name SMH01	tion(s) (min iod(s) (yea: ate Change <b>Storm</b> 60 Winter 120 Winter	(%) 15, rs) (%) Return Period 100 100	Climate Change +30% +30% +30%	120, 18 Firs Surcl 100/15	80, 240, 1, 10 0, t (X) harge Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
S1.000 S2.000 S2.001 S1.001	Return Per Clim <b>US/MH</b> Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002	tion(s) (min iod(s) (yea: ate Change <b>Storm</b> 60 Winter 120 Winter 120 Winter 60 Winter	Return Period 100 100 100 100	Climate Change +30% +30% +30% +30%	120, 18 Firs Surch	80, 240, 1, 10 0, t (X) harge Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
S1.000 S2.000 S2.001 S1.001 S3.000	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2	tion(s) (min iod(s) (yea: ate Change Storm 60 Winter 120 Winter 120 Winter 60 Winter 120 Winter	Return Period 100 100 100 100 100	Climate Change +30% +30% +30% +30% +30%	120, 18 Firs Surcl 100/15	80, 240, 1, 10 0, t (X) harge Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
S1.000 S2.000 S2.001 S1.001 S3.000 S3.001	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SMH002 SRoofBlueN.2 SOrificeN.2	tion(s) (min iod(s) (yea: ate Change Storm 60 Winter 120 Winter 120 Winter 60 Winter 120 Winter 120 Winter	Return Period 100 100 100 100 100 100	Climate Change +30% +30% +30% +30% +30% +30%	120, 18 Firs Surcl 100/15	80, 240, 1, 10 0, t (X) harge Summer Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
\$1.000 \$2.000 \$1.001 \$3.000 \$3.001 \$1.002	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SNH002 SRoofBlueN.2 SOrificeN.2 SOrificeN.2 SMH03	tion(s) (min iod(s) (yea: ate Change Storm 60 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 60 Winter	Return Period 100 100 100 100 100 100 100	Climate Change +30% +30% +30% +30% +30% +30%	120, 18 Firs Surch 100/15 100/15 30/30	80, 240, 1, 10 0, t (X) harge Summer Summer Winter	360, 480 0, 30, 100 0, 0, 30 First (Y)	
S1.000 S2.000 S1.001 S3.000 S3.001 S1.002 S4.000	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SNH002 SRoofBlueN.2 SOrificeN.2 SOrificeN.2 SMH03 SMH04	tion(s) (min iod(s) (yea: ate Change Storm 60 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 15 Winter	Return Period 100 100 100 100 100 100 100 100 100	Climate Change +30% +30% +30% +30% +30% +30% +30% +30%	120, 18 Firs Surch 100/15 100/15	30, 240, 1, 10 0, t (X) harge Summer Summer Winter Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
\$1.000 \$2.000 \$1.001 \$3.000 \$3.001 \$1.002 \$4.000 \$4.001	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SNH002 SRoofBlueN.2 SOrificeN.2 SOrificeN.2 SMH03	tion(s) (min iod(s) (yea: ate Change Storm 60 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 60 Winter	Return Period 100 100 100 100 100 100 100 100 100 10	Climate Change +30% +30% +30% +30% +30% +30%	120, 18 Firs Surch 100/15 100/15	80, 240, 1, 10 0, t (X) harge Summer Summer Winter	360, 480 0, 30, 100 0, 0, 30 First (Y)	
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\$1.000 \$2.001 \$1.001 \$3.000 \$3.001 \$1.002 \$4.000 \$4.001 \$5.000 \$5.001 \$5.002 \$4.002 \$4.003 \$6.000	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SOrificeN.2 SOrificeN.2 SOrificeN.2 SOrificeN.2 SNH03 SMH04 SMH05 SRoodBlueS.1 SOrificeS.1 SOrificeS.1 SMH06 SPump station SMH08 SRoofBlueS.2	tion(s) (min iod(s) (yea: ate Change 5 Storm 60 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 15 Winter	Return Period 100 100 100 100 100 100 100 100 100 10	Climate Change +30% +30% +30% +30% +30% +30% +30% +30%	120, 18 Firs Surel 100/15 100/15 30/30 100/15 30/15 10/15 10/15	30, 240, 1, 10 0, t (X) harge Summer Summer Summer Summer Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	
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\$1.000 \$2.000 \$2.001 \$1.001 \$3.000 \$3.001 \$1.002 \$4.000 \$4.001 \$5.000 \$5.001 \$5.002 \$4.002 \$4.003 \$6.000	Return Per Clim US/MH Name SMH01 SRoofBlueN.1 SOrificeN.1 SOrificeN.2 SOrificeN.2 SOrificeN.2 SOrificeN.2 SNH03 SMH04 SMH05 SRoodBlueS.1 SOrificeS.1 SOrificeS.1 SMH06 SPump station SMH08 SRoofBlueS.2	tion(s) (min iod(s) (year ate Change 5 Storm 60 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 120 Winter 15 Winter	Return Period 100 100 100 100 100 100 100 100 100 10	Climate Change +30% +30% +30% +30% +30% +30% +30% +30%	120, 18 Firs: Surcl 100/15 100/15 30/30 100/15 10/15 10/15 10/15	30, 240, 1, 10 0, t (X) harge Summer Summer Summer Summer Summer	360, 480 0, 30, 100 0, 0, 30 First (Y)	

	rup & Partner	LS INTERN	ationa	ιι μτα					Page 1	. 4
Blyth										
	11 B90 8AE								Micro	
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File C	onnisbee MD	_conditic	on							
XP Sol	utions			Networ	ck 2	2020.1				
<u>100 y</u>	year Return	Period Su	_				ults by	<u>y Maximu</u>	m Level (F	<u>Rank</u>
				<u>1) for</u>	St	<u>orm</u>				
					-	Flooded			Half Drain	-
DN	US/MH Name	Overflow		Depth			•	Overflow		Flow
PN	Name	Act.	(m)	(m)		(m³)	Cap.	(l/s)	(mins)	(1/s)
s1.000	SMH01		30.986	0.3		0.000	0.62			8.
s2.000	SRoofBlueN.1		39.890	-0.0	060	0.000	0.13		115	0.5
s2.001	SOrificeN.1		39.888	-0.0	062					0.5
S1.001	SMH002		30.980	0.4						8.6
53.000	SRoofBlueN.2		39.891	-0.0					110	0.
s3.001	SOrificeN.2		39.889	-0.0						0.5
51.002	SMH03		30.970		559	0.000				10.
S4.000	SMH04		31.749		124		0.10			4.
S4.001	SMH05		31.743		241					14.
55.000	SRoodBlueS.1		39.534	-0.0					64	0.
35.001	SOrificeS.1		39.534	-0.0		0.000				0.
\$5.002	SMH06		31.734 31.721		084					10. 20.
54.002 54.003	SPump station SMH08		31.848		452 198					20.
S6.000			39.534	-0.0					66	20.
s6.000	SOrificeS.2		39.533	-0.0					00	0.4
s4.004	SMH09		31.599	0.1						21.0
s4.005	SMH10		30.996		747	0.000				20.0
		PN		/MH ame		*****	Level Exceede			
		PN	IN	ane		Status	Fxceede	a		
		S1.000				RCHARGED				
						OD RISK				
				ficeN.1						
		S1.001				RCHARGED				
				BlueN.2						
				ficeN.2						
		S1.002				CHARGED				
		S4.000				OD RISK				
		S4.001		SMH05 BlueS.1		OD RISK OK				
				ficeS.1		OK OK				
		S5.001 S5.002				OD RISK				
				station						
		S4.002	-			OD RISK				
				BlueS.2		OK OK				
				ficeS.2		OK				
		S4.004		SMH09	SUF	RCHARGED				
		S4.005		SMH10	SUF	RCHARGED				

Ove Arup & Partners Internationa	l Ltd	Page 15
The Arup Campus		
Blyth Gate		
Solihull B90 8AE		Mirro
Date 21/10/2020 12:45	Designed by Raluca.Olariu	Drainage
File Connisbee MD_condition	Checked by	Diamage
XP Solutions	Network 2020.1	

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

PN	US/MH Name	Storm		Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
s7.000	SRoofGreenN	60 Winter	100	+30%				
S7.001	SOrificeGN	60 Winter	100	+30%				
S7.002	SMH11	15 Winter	100	+30%				
S8.000	SRoofGreen.2	30 Winter	100	+30%				
S8.001	SOrifice G2	30 Winter	100	+30%				
S8.002	SMH12	15 Winter	100	+30%				
S7.003	SMH13	60 Winter	100	+30%	100/60 Winter			
S1.003	SMH14	60 Winter	100	+30%	10/15 Winter			
S1.004	SMH15	30 Winter	100	+30%				
S1.005	SMH16	60 Summer	100	+30%				

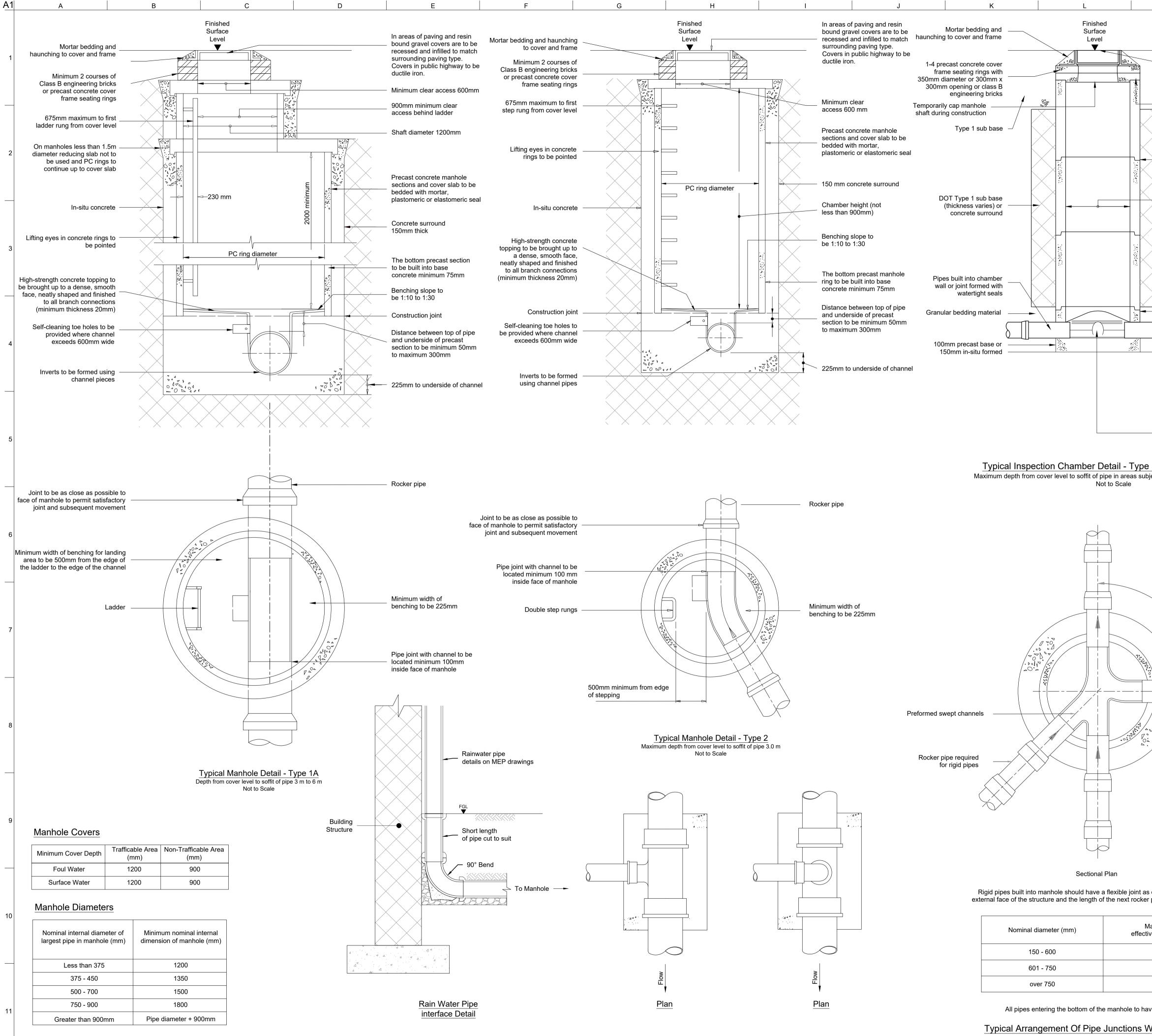
	US/MH	Water Level	Surcharged Depth	Volume	- •	Overflow	Half Drain Time	Pipe Flow
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)
s7.000	SRoofGreenN	39.530	-0.070	0.000	0.07		46	0.3
S7.001	SOrificeGN	39.528	-0.072	0.000	0.00			0.3
S7.002	SMH11	31.580	-0.070	0.000	0.56			20.7
S8.000	SRoofGreen.2	39.552	-0.048	0.000	0.25		28	0.7
S8.001	SOrifice G2	39.547	-0.053	0.000	0.01			0.7
S8.002	SMH12	30.976	-0.074	0.000	0.51			11.4
S7.003	SMH13	30.969	0.126	0.000	0.40			15.8
S1.003	SMH14	30.955	0.691	0.000	0.32		57	14.0
S1.004	SMH15	30.048	-0.117	0.000	0.47			14.0
S1.005	SMH16	29.994	-0.145	0.000	0.27			14.0

PN	US/MH Name	Status	Level Exceeded
s7.000	SRoofGreenN	OK	
S7.001		OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	SURCHARGED	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	

268265-00 15 October 2020

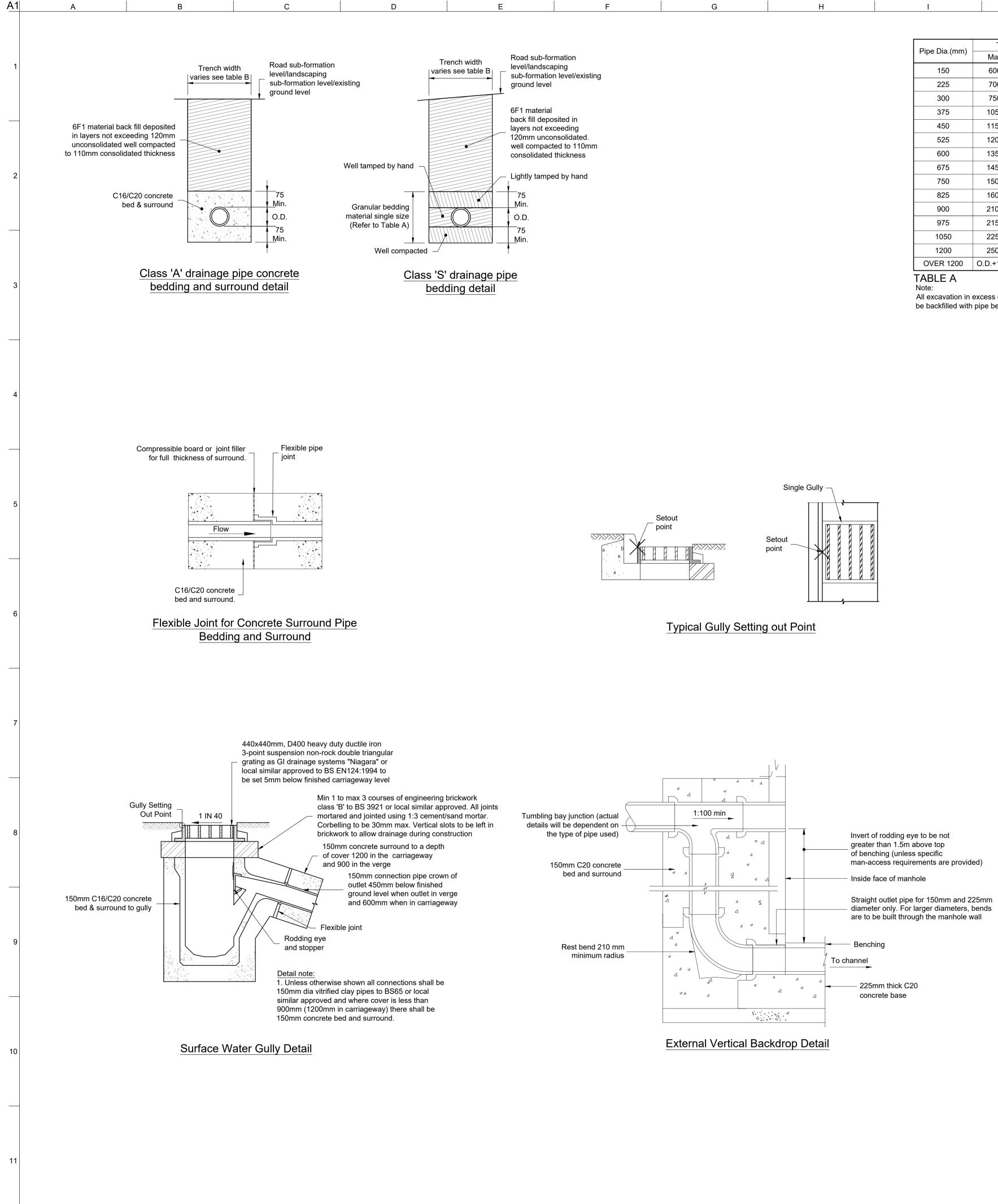
**Appendix C - Drainage Details** 

\GLOBALARUP.COM\LONDON\BEL\JOBS\200000\268200\268265-00 HAVERSTOCK HILL\4 INTERNAL DATA\05 REPORTS\03 CIVIL\HH-ARP-REP-602.DOCX



Do not scale

Μ	N	
		NOTES
		1. All dimensions are in millimetres unless otherwise
	In areas of paving and resin bound gravel covers are to be	<ul><li>noted.</li><li>2. Unless otherwise indicated, all construction</li></ul>
	recessed and infilled to match surrounding paving type.	details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association.
	Covers in public highway to be ductile iron.	For the purpose of this drawing, Thames Water standards have been used in the design.
	Cover slab with access opening	อเลเกิดสาสอากสขอ been นออน in the ueoigh.
	restricted to 350mm diameter or 300mm x 300mm if depth of	
	chamber to invert is > 1m	
	Precast concrete sections to	
	<ul> <li>be jointed with elastomeric or plastomeric seals</li> </ul>	
	Minimum internal dimensions	
	<ul> <li>450mm diameter or 450mm x</li> <li>450mm</li> </ul>	
	Deep with the trace of the	
1	Base unit to have all connections with soffit	
	levels set no lower than that of the main pipe	
	Joint to be as close as	
	possible to face of chamber to permit satisfactory joint	
	and subsequent movement	
	— Rocker pipe	
	Invert of connecting pipe	
	<ul> <li>at least 50mm above that of the main pipe</li> </ul>	
Rigid mate	vrial datail)	
	ng 3m, non-entry No junction less than 90°	
	ng 3m, non-entry No junction less than 90° from outgoing sewer	P01       23/10/20       TB       RO       TMcD         For Information
	No junction less than 90°	For Information         Issue       Date       By       Chkd       Appd         ARUP         13 Fitzroy Street         London W1T 4BQ         Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924         www.arup.com
	No junction less than 90°	For Information         Issue       Date       By       Chkd       Appd         ARCUP         13 Fitzroy Street         London W1T 4BQ       Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924         Www.arup.com         Client         Best Star Real Estate 2         Job Title
e as feasible to	No junction less than 90° from outgoing sewer	For Information         Issue       Date       By       Chkd       Appd         ARDP         ARDP         Issue       Date       By       Chkd       Appd         ARDP         ARDP       Issue       Date       By       Chkd       Appd         ARDP       Issue       Date       By       Chkd       Appd         Issue       Date       By       Chkd       Appd         Issue       Start Pase       Date       Date       Date       Date         Issue       Date
	No junction less than 90° from outgoing sewer	For Information         Issue       Date       By       Chkd       Appd         ARCUP         13 Fitzroy Street       London W1T 4BQ         Tel +44(0)20 7580 3924         www.arup.com         Client         Best Star Real Estate 2         Job Title         Haverstock Hill         Key Plan
te as feasible to	No junction less than 90° from outgoing sewer	For Information         Issue       Date       By       Chkd       Appd         ARCUP         ARCUP         13 Fitzroy Street         London W1T 4BQ         Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924         www.arup.com         Client         Best Star Real Estate 2         Job Title         Haverstock Hill         Key Plan
ee as feasible to should be as	No junction less than 90° from outgoing sewer	For Information         Issue       Date       By       Chkd       Appd         ARDUP         13 Fitzroy Street       London W1T 4BQ       Tel +44(0)20 7580 3924         Under W1T 4BQ       Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924         Www.arup.com       Client         Best Star Real Estate 2         Job Title         Haverstock Hill         Key Plan         Drawing Title         Proposed Drainage         Details
e as feasible to should be as	No junction less than 90° from outgoing sewer	For Information         Isue       Date       By       Chkd       Appd         Chkd       Appd         Appd         Appd         Appd         Diate         Job Title         Haverstock Hill         Key Plan         Drawing Title         Proposed Drainage
ee as feasible to should be as	No junction less than 90° from outgoing sewer	For Information         Issue Date By Chkd Appd         Appd Chkd Appd         Chkd Appd         Chkd Appd Chkd Appd         Department of the Proposed Drainage Details Sheet 1         State 41
e as feasible to should be as	No junction less than 90° from outgoing sewer	For Information         Issue Date By Child Appd         Appd Child Appd Child Appd         Appd Child Appd Child Appd         Data Is appd Child Appd Chil
e as feasible to should be as num ngth (m)	No junction less than 90° from outgoing sewer	For Information         Issue Date By Child Appd         Appd Child Appd Child Appd         Appd Child Appd Child Appd         Appd Child Appd C
te as feasible to	No junction less than 90° from outgoing sewer	For Information         Issue Date By Child Appd         Appd Child Appd Child Appd         Appd Child Appd Child Appd         Appd Child
e as feasible to should be as num ngth (m)	No junction less than 90° from outgoing sewer	For Information         Issue       Date       By       Chkd       Appd         Chkd       Appd         Appd         Appd         Appd         Appd         Details         Job Title         Haverstock Hill         Key Plan         Drawing Title         Proposed Drainage         Details         Sheet 1         Scale at A1         1:200         Discipline       Civil         Job No         Drawing Status



Do not scale

	-	
Pipe Dia.(mm)	Trencl	n Width
Fipe Dia.(IIIIII)	Max	Min
150	600	490
225	700	580
300	750	680
375	1050	950
450	1150	1030
525	1200	1120
600	1350	1240
675	1450	1330
750	1500	1400
825	1600	1490
900	2100	1900
975	2150	1950
1050	2250	2050
1200	2500	2250
OVER 1200	O.D.+1000	O.D.+800

All excavation in excess of those stated shall be backfilled with pipe bedding material

	-			
Pipe Size	<300	300-800		
Sieve size	% by Mass passing	% by Mass pas		
25mm	-	-		
20mm	-	100		
14mm	90-100	80-100		
10mm	50-85	60-85		
5mm	10-40	20-55		
2.36mm	0-10	10-30		
0.300mm	-	0-10		

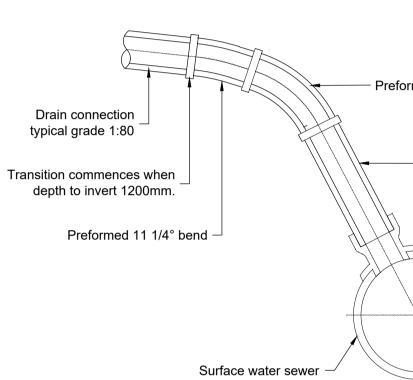
### TABLE B

κ

	Sand Grading (100% < 2mm)			
Use of Material	<2µm	<20µm	<63µm	
Sand fpr use in trenches ("zand in zandbed")		<=3 *	<=15	
* Proportion of 63µm: 10% to 15%				

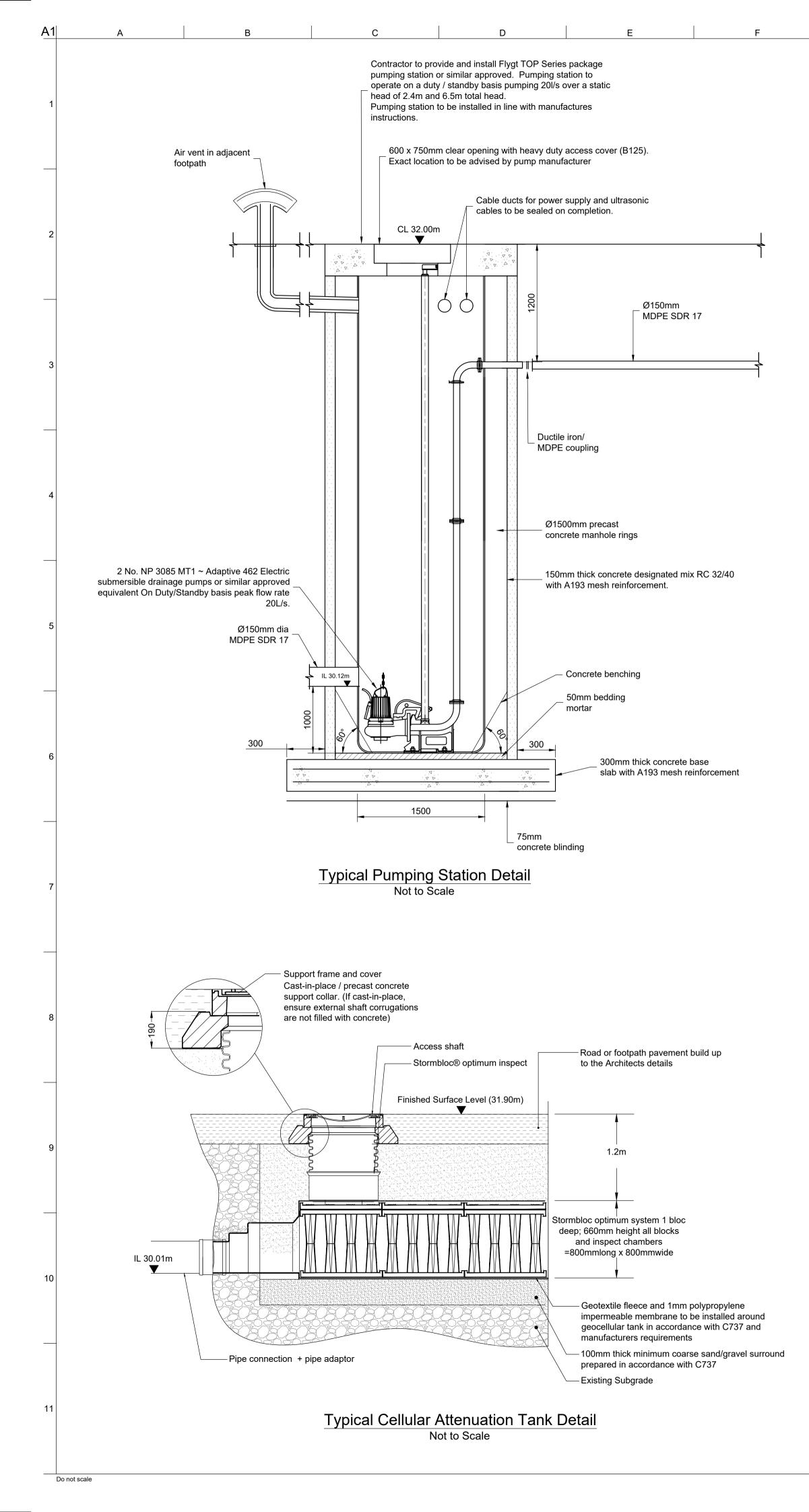
TABLE C

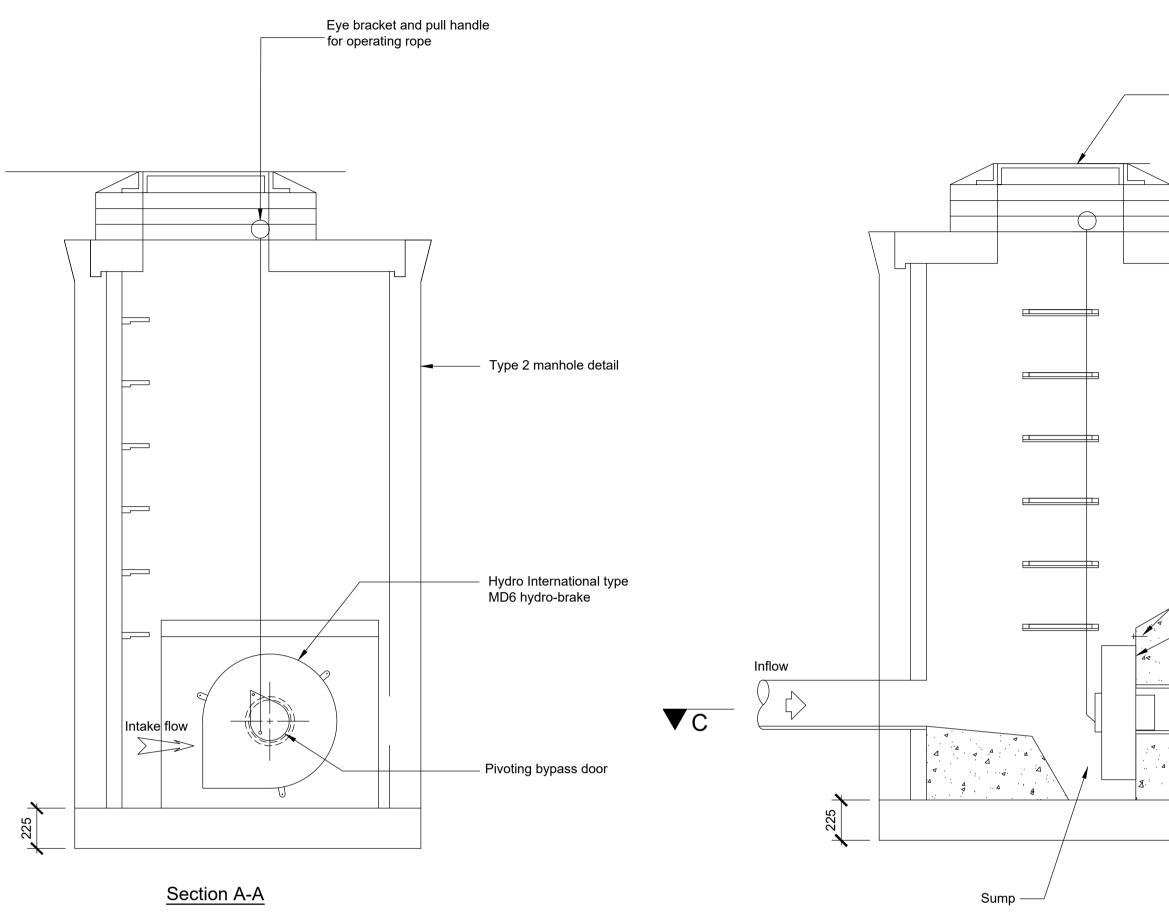
Pipe Material		
<400mm	uPVC	
>400mm	Concrete	
TABLE D		



Typical Gully Saddle Connecti

М		Ν	
			<ul> <li><u>NOTES</u></li> <li>1. All dimensions are in millimetres unless otherwise</li> </ul>
			noted. 2. Unless otherwise indicated, all construction
1			details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association.
% by Ma	∙800 ass passing		For the purpose of this drawing, Thames Water standards have been used in the design.
90	100 0-100		
4	50-80 10-70		
1	25-60 0-40		
(	0-15		
250µm	Organic		
200µ11	content (%) <=15		
d 45° bend			
Slope 2:1	Мах		
Slope 2:1 1:40 Min.	Max.		
n Detail			
II Detail			P01 23/10/20 TB RO TMcD
			For Information
			Issue Date By Chkd Appd
			ARUP
			ΛΙΟΙ
			13 Fitzroy Street London W1T 4BQ Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924
			Client
			Best Star Real Estate 2
			Job Title
			Haverstock Hill
			Key Plan
			Drawing Title
			Proposed Drainage Details
			Sheet 2
			Scale at A1 1:200
			Discipline
			Job No Drawing Status 268265-00 For Information





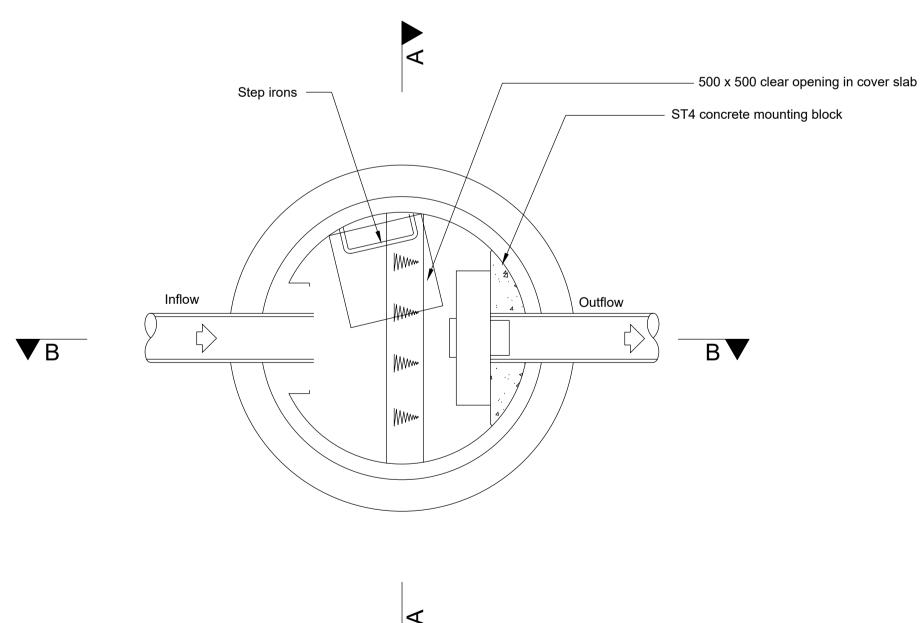
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Section B-B

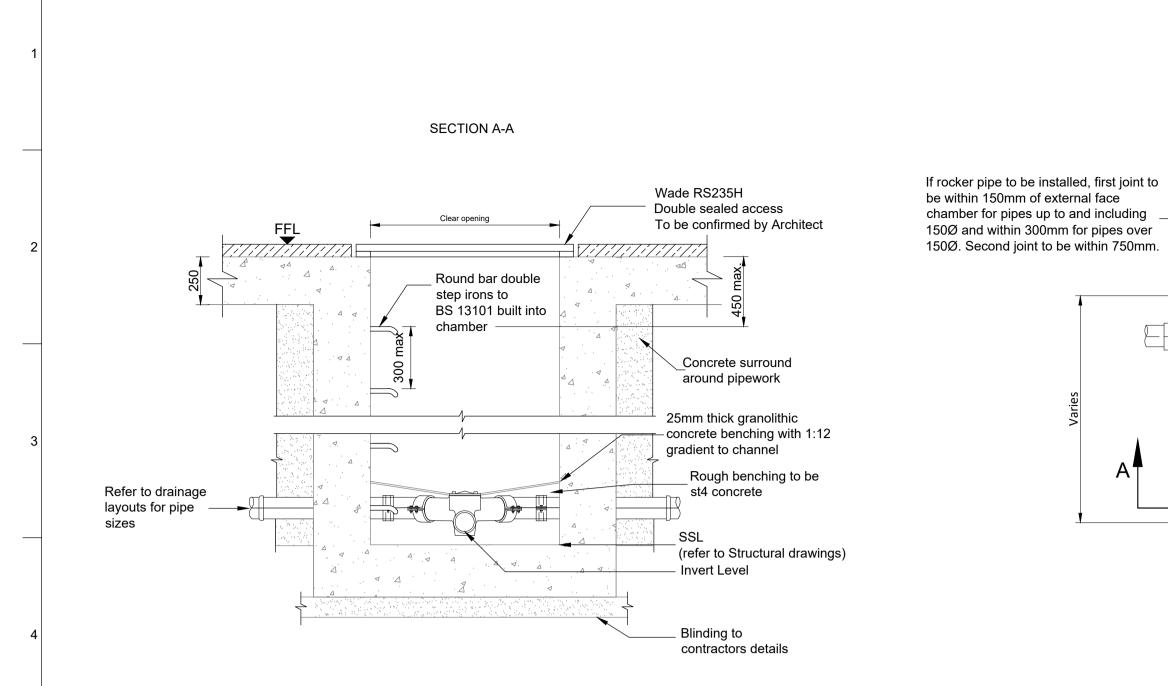


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Section C-C

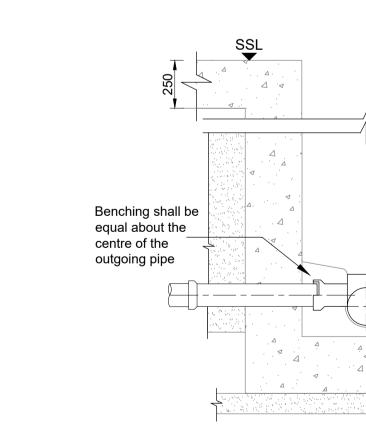
Hydro-Brake Detail for Outfall Not to Scale

	<ol> <li><u>NOTES</u></li> <li>All dimensions are in millimetres unless otherwise noted.</li> <li>Unless otherwise indicated, all construction details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association. For the purpose of this drawing, Thames Water standards have been used in the design.</li> </ol>
Access to be positioned above pivoting by-pass door	
Type 2 manhole detail	
Fixing lugs (supplied with hydrobrake)	
Neoprene rubber gasket (supplied with hydrobrake)	
Outflow CV	
	P01 23/10/20 TB RO TMcD
	For Information
	Issue Date By Chkd Appd
	Issue Date By Chkd Appd Appd ARUP I3 Fitzroy Street London W1T 4BQ
	Issue Date By Chkd Appd Appd IS Fitzroy Street
	Issue     Date     By     Chkd     Appd       ARDP       13 Fitzroy Street       London W1T 4BQ       Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924       www.arup.com
	IssueDateByChkdAppdARCUP13 Fitzroy Street London W1T 4BQ Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924 www.arup.comClientBest Star Real Estate 2Job Title
	IssueDateByChkdAppdACROPACROP13 Fitzroy Street London W1T 4BQ Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924 www.arup.comClientBest Star Real Estate 2Job TitleHaverstock Hill
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	Issue       Date       By       Chkd       Appd         Appd

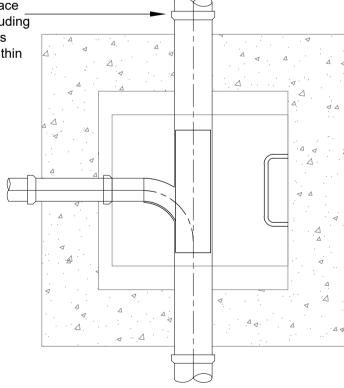


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SECTION



**INSITU MANHOLE WITH OPEN CHANNEL** (LESS THAN 3.0M. TO TOP OF PIPE CROWN)



PLAN

If rocker pipe to be installed, first joint to be within 150mm of external face \_ chamber for pipes up to and including 150Ø and within 300mm for pipes over 150Ø. Second joint to be within 750mm.

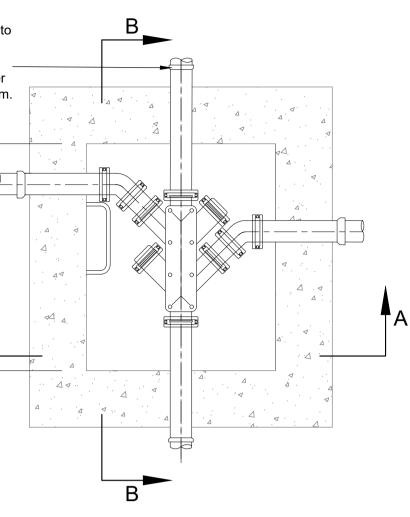
Do not scale

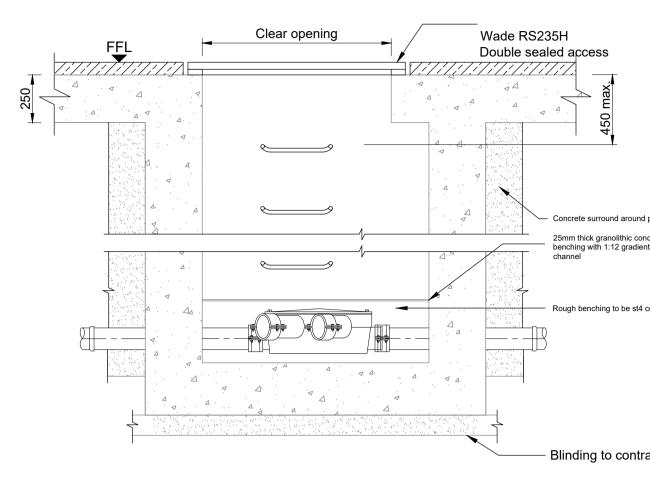
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PLAN

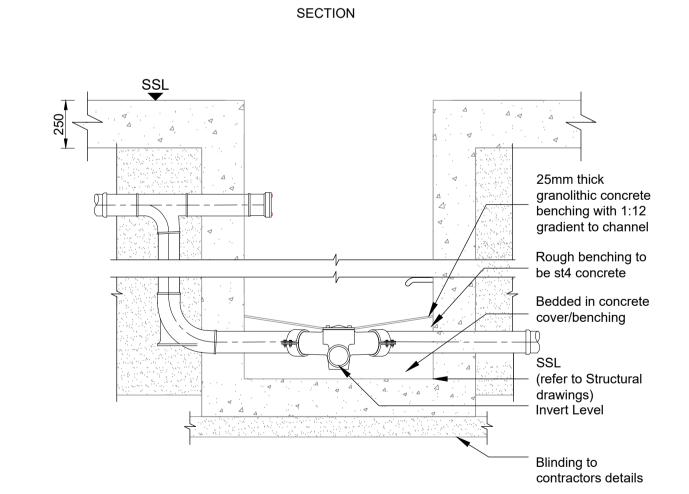
SECTION B-B

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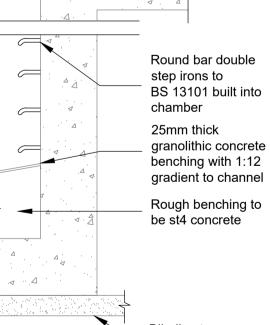




# TYPICAL INSITU MANHOLE WITH CAST IRON CHAMBER CONNECTIONS

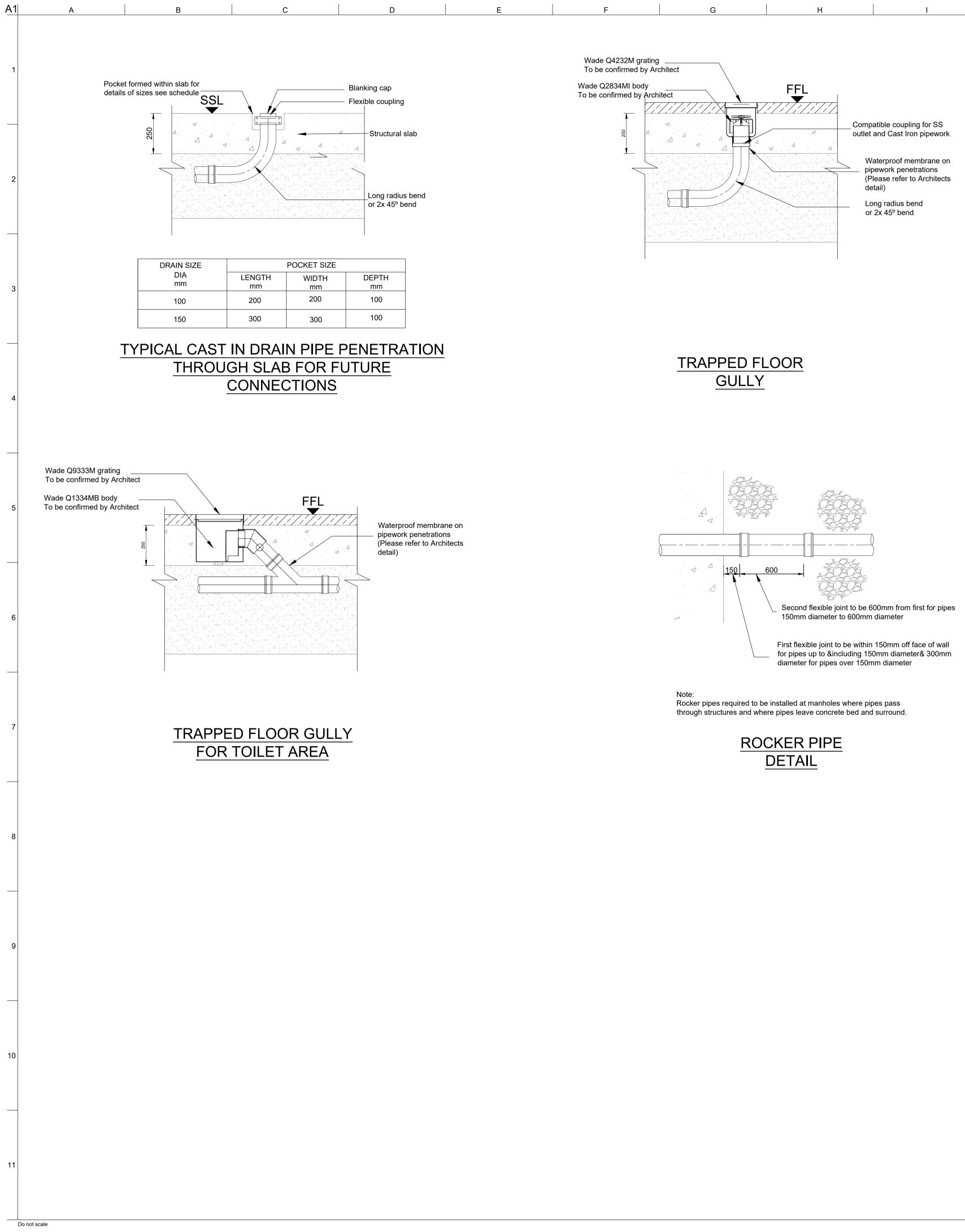


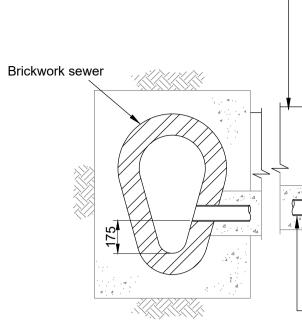
# TYPICAL DETAIL VERTICAL BACKDROP INTO MANHOLE



\_ Blinding to contractors details

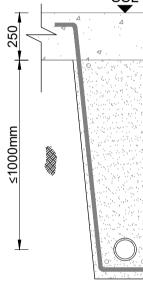
М	N	<b>I</b>			
			<ol> <li><u>NOTES</u></li> <li>All dimensions are in millimetres unless otherwise noted.</li> <li>Unless otherwise indicated, all construction details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association.</li> </ol>		
			For the purpos	ed by Water Services As e of this drawing, Thame e been used in the desigr	s Water
pework ete o					
ncrete					
ctors details					
			P01 23/10/20 For Information	TB RO	
					Appd
			ARU	Р	
			13 Fitzroy Street London W1T 4BQ Tel +44(0)20 7636 1531	Fax +44(0)20 7580 3924	
			Client	al Estato 2	
			Best Star Re	ai Estate 2	
			Job Title		
			Haverstock F	lill	
Max. Lower Pipe Dia	Trench Width Bd max		Key Plan		
Ø100	525mm				
Ø150	600mm				
			<sup>Drawing Title</sup> Proposed Dr Details Sheet 4	ainage	
			Scale at A1 1:200		
			Discipline Civil	Drawing Status	
			268265-00	For Information	
			1:200 Discipline Civil Job No 268265-00		P01





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Note: Detail shows trenching for single pip reinforcing will vary for situations wh

# UNDERSLAB DRAINAGE FOR SINGLE

M N	
Heading to be min. 1.3m x 0.75m Min 150Ø cast iron pipe to BS437 with flexible couplings Flexible couplings to BS6087 Nitrlie rubber gaskets to BS2494 Set screws and nuts to BS970 Part 2 Min. 150Ø C.I interceptor 150Ø drain to fall at 1:60	NOTES         1. All dimensions are in millimetres unless otherwise noted.         2. Unless otherwise indicated, all construction details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association. For the purpose of this drawing, Thames Water standards have been used in the design.
ON TO ON OF WER	
u-bars at 600 centres with 75mm cover @1:10 Mass concrete placed in min 2 layers. 150mm cover to pipe	
pe runs. Dimensions and here more runs are combined.	P0123/10/20TBROTMcDFor InformationIssueDateByChkdAppd
<u>E TYPICAL SUPPORT</u> <u>PIPE RUNS</u>	<section-header><section-header><section-header><text><text><text><text><text></text></text></text></text></text></section-header></section-header></section-header>
	Key Plan
	Details Sheet 5 Scale at A1 1:200
	Discipline
	Discipline     Civil       Job No     Drawing Status       268265-00     For Information

268265-00 15 October 2020

#### **DOCUMENT CHECKING (not mandatory for File Note)**

	Prepared by	Checked by	Approved by
Name	Raluca Olariu	Tristan McDonnell	Tristan McDonnell
Signature	Q.	261	261

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