

British Museum, Archaeological Research Centre, Second Access

Drainage Note

1.0 Introduction

The British Museum's Archaeological Research Centre (BM ARC) is located in Shinfield, south of Reading, in the Borough of Wokingham. A planning application is now being made for a second vehicular access to the site. This would be located at the north of the site, and link to the NHM Access Road, which is being separately constructed by the University of Reading (UoR).

There would be surface water drainage proposals as part of the second access works. This drainage note sets out the surface water drainage proposals, in order to support the planning application for the second access.

2.0 The Site

The BM ARC site is immediately to the east of the University of Reading's Thames Valley Science Park, and Shinfield Studios. The BM ARC facility was given planning permission in 2019 (ref: 182059), and the first phase opened in 2024. This is a ~15,500sqm research and storage facility, along with surface parking, landscaping, and drainage features.

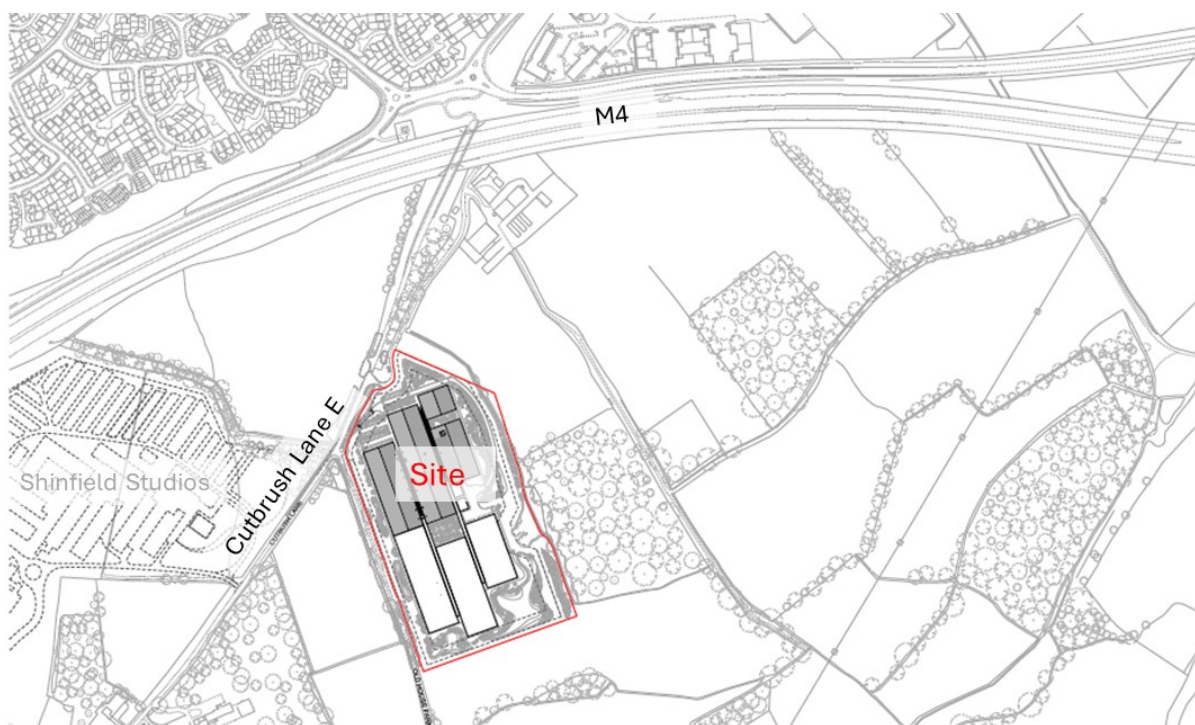


Figure 2-1 Site Location

3.0 Existing Arrangement

Broadly speaking, the site wide storm water drainage network consists of a combination of pipes, swales, offline detention basins and cellular storage tanks. It was designed by Mott Macdonald,

who also produced the Flood Risk Assessment (FRA) for the BM ARC's original planning application. The existing surface water drainage layout is shown in **Appendix A**.

4.0 Proposed Arrangement

The BM ARC second access proposals are to link an area of internal road within the BM ARC site to a new priority junction being delivered as part of the NHM Access Road (to be delivered separately by the University of Reading).

In terms of drainage, the scope is to construct new highway gullies and a linear drainage channel in order to positively drain runoff from this highway link. These will be located parallel to the kerb lines of the new highway link, with typical highway falls used, and surface area catchments within typical maximums. At present, the coach parking falls towards the north, and has a linear drainage channel. As the highway is being regraded, this linear channel would be removed, and replaced with new surface drainage. The new gullies and channel would connect to the existing below ground network. A drainage plan of the proposals is shown in **Appendix B**.

The drainage proposals would result in an additional 130sqm of hardstanding being drained to the site wide storm water drainage network. This has been checked by the original drainage designer Mott MacDonald, who have confirmed that the system can accommodate this, with only a very small increase in water level during extreme rainfall events. A microdrainage note and output is included in **Appendix C**. This states that the additional hardstanding has a "small but insignificant impact on the existing BM ARC system and that both on site and downstream of the BM ARC there is no discernible change in flood risk or final discharge rate from the site."

Beneath the existing coach parking is a geocellular attenuation tank. The proposals for the second access and the additional gullies would not affect this, and the gullies and drain runs have been oriented in plan accordingly. Furthermore, it will be safeguarded during construction.

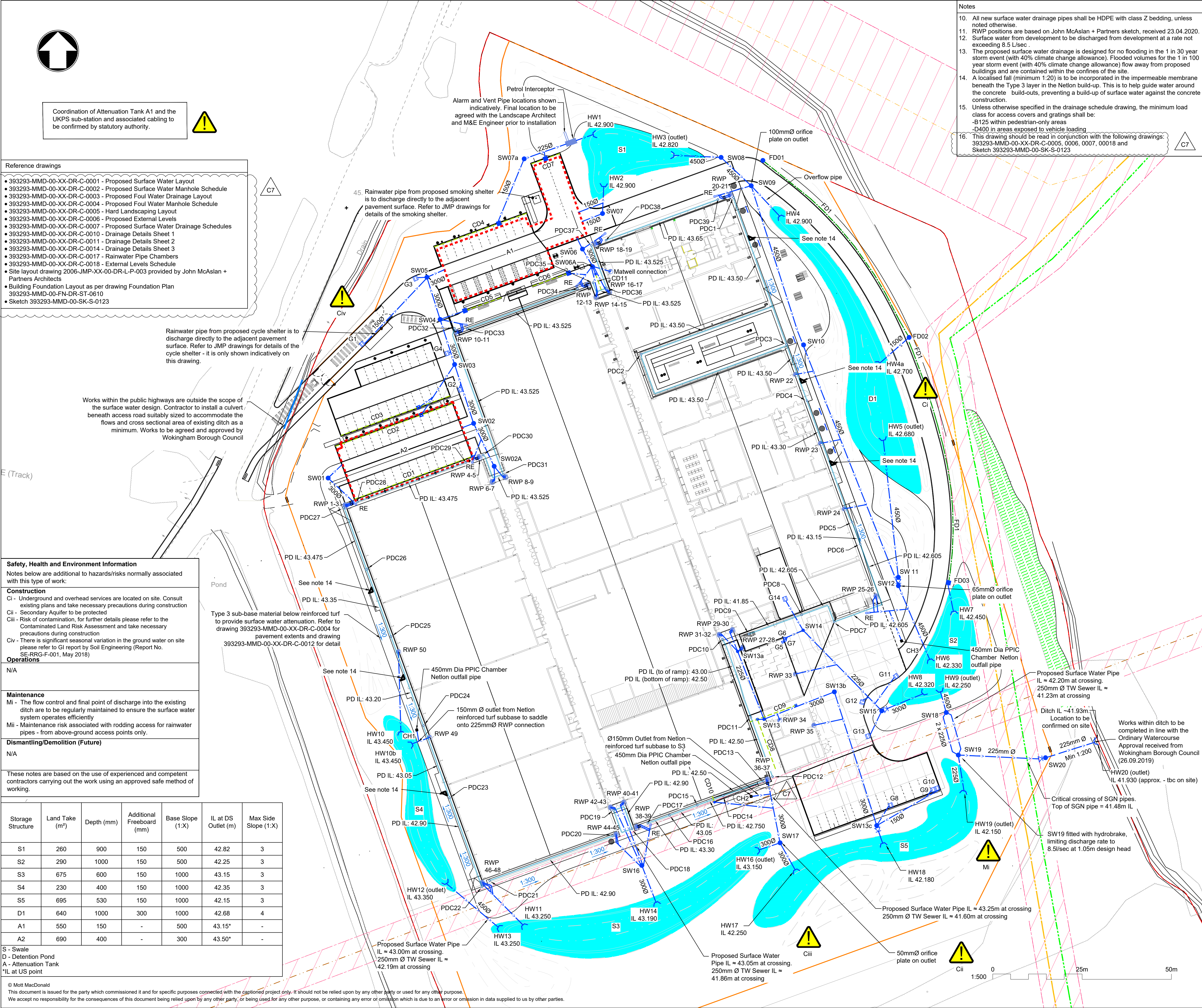
The proposals for the second access would all be within the BM ARC site. The NHM Access Road includes a priority junction, which the second access would link to, and this includes gullies at its boundary in order to catch surface water from this highway.

5.0 Conclusion

The proposal for the second access will include surface drainage provision, consisting of highway gullies and a linear drainage channel which drain areas of hardstanding. This can be accommodated with the existing site wide storm water drainage network on the BM ARC site.

Appendix A

Existing Surface Water Layout



- Notes
- All new surface water drainage pipes shall be HDPE with class Z bedding, unless noted otherwise.
 - RWP positions are based on John McAslan + Partners sketch, received 23.04.2020.
 - Surface water from development to be discharged from development at a rate not exceeding 8.5 L/sec.
 - The proposed surface water drainage is designed for no flooding in the 1 in 30 year storm event (with 40% climate change allowance). Flooded volumes for the 1 in 100 year storm event (with 40% climate change allowance) flow away from proposed buildings and are contained within the confines of the site.
 - A localised fall (minimum 1:20) is to be incorporated in the impermeable membrane beneath the Type 3 layer in the Netlon build-up. This is to help guide water around the concrete build-outs, preventing a build-up of surface water against the concrete construction.
 - Unless otherwise specified in the drainage schedule drawing, the minimum load class for access covers and gratings shall be:
 - B125 within pedestrian-only areas
 - D400 in areas exposed to vehicle loading
 - This drawing should be read in conjunction with the following drawings: 393293-MMD-00-XX-DR-C-0005, 0006, 0007, 00018 and Sketch 393293-MMD-00-SK-S-0123

- Notes
- All dimensions are in millimetres unless specified otherwise.
 - Do not scale from this drawing.
 - Thames Water Asset Data referenced from Landmark Utilities report dated 07/11/17 and received 11/11/17.
 - All levels are in meters above Ordnance Datum (mAOD) unless otherwise specified.
 - Existing service locations, depths and invert levels from Plowman Craven Survey 3983T-01 Rev B 24/04/18.
 - This drawing shall be read in conjunction with all other MEP, Structural and Architectural drawings, specifications and equipment schedules.
 - Drawing to be read in conjunction with the Flood Risk Assessment and Surface Water Drainage Strategy and Civil Engineering Specification: 393293-MMD-00-XX-RP-D-0001 and 393293-MMD-00-XX-SP-C-0001 respectively.
 - The contractor shall be responsible for locating, protecting and reinstating all utility services and mains.
 - All existing drainage information is shown indicatively. Contractor to prove all invert levels of existing manholes prior to construction and report any discrepancies to the Engineer.

Key to symbols

- Site Boundary
- Existing Thames Water Foul Water Pipe
- Thames Water - 3m offset Easement Boundary
- SGN - LHP Gas Main
- SGN - IP Gas Main
- SGN Easement Boundary
- Existing Ditch
- Proposed Surface Water Drainage
- Proposed RWP Location
- Proposed Surface Water Manhole
- Proposed Attenuation Tank
- Proposed Pond
- Headwall
- Proposed Channel or Slot Drain
- Proposed Filter Drain
- Proposed Sump
- Proposed End Cap Connection
- Non-Return Valve
- Proposed Gully
- Proposed Rodding Eye
- Piped Diversion around Sewer MH (Refer to detail Sheet)
- PT5 - Netlon for Fire Tender Access
- Petrol Interceptor
- Netlon Sub-base fall
- Proposed 100mm dia. perimeter drainage pipe, Delta Aquaduct 100, laid flat in accordance with Delta Membranes' Proposed Waterproofing Details drawings. Perimeter drainage pipe is to have a 100mm bed and surround of 20-40mm clean aggregate, wrapped in a permeable geomembrane. For details of how the Delta NP Drain Membrane connects to the perimeter drain pipes, please refer to the manufacturer. Please note, the perimeter drainage system does not connect to the proposed surface water or foul drainage systems.
- Proposed 100mm dia. vertical access point for perimeter drainage system, with 100mm S74 concrete surround.

C7	07.04.2021	ALM	CH2 and Notes updated	EA	DA
C6	14.12.2020	NY	Rodding eye details change	EA	RF
C5	28.10.2020	NY	JMP Background, Netlon build-out updated Access path build-outs added. CD10,11 added. Amended RWP connections (RWP 1-5, 10-13, 18-21 & 36-39)	AV	AF
C4	08.07.2020	LR	Perimeter drainage system added. Loading bay drainage amended. Connections into pond S3 changed.	EK	RF
C3	15.05.20	LR	For Construction	EK	RF
C2	27/04/2020	AC	For Construction	EK	RF
C1	01.07.2019	WR	For Construction	EK	RF
Rev	Date	Drawn	Description	Ch'k'd	App'd

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Client

British Museum

Title

British Museum ARC

Surface Water Layout

Suitability Description					Suitability Code	
Issued for Construction Approval					S4	
Designed	W. Roy	WR	Eng check	E.Karim	EK	
Drawn	W. Roy	WR	Coordination	W. Roy	WR	
Dwg check	W. Roy	WR	Approved	R.Foord	RF	
Scale at A1		Status	Rev	Security		
1:500		C	C7	STD		
Drawing Number						
393293-MMD-00-XX-DR-C-0001						

Safety, Health and Environment Information

Notes below are additional to hazards/risks normally associated with this type of work:

Construction

- Cl - Underground and overhead services are located on site. Consult existing plans and take necessary precautions during construction
- Cii - Secondary Aquifer to be protected
- Ciii - Risk of contamination, for further details please refer to the Contaminated Land Risk Assessment and take necessary precautions during construction
- Civ - There is significant seasonal variation in the ground water on site please refer to GI report by Soil Engineering (Report No. SE-RRG-F-001, May 2018)

Operations

N/A

Maintenance

- Mi - The flow control and final point of discharge into the existing ditch are to be regularly maintained to ensure the surface water system operates efficiently
- Mii - Maintenance risk associated with rodding access for rainwater pipes - from above-ground access points only.

Dismantling/Demolition (Future)

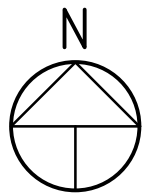
N/A

These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.

Storage Structure	Land Take (m²)	Depth (mm)	Additional Freeboard (mm)	Base Slope (1:X)	IL at DS Outlet (m)	Max Side Slope (1:X)
S1	260	900	150	500	42.82	3
S2	290	1000	150	500	42.25	3
S3	675	600	150	1000	43.15	3
S4	230	400	150	1000	42.35	3
S5	695	530	150	1000	42.15	3
D1	640	1000	300	1000	42.68	4
A1	550	150	-	500	43.15*	-
A2	690	400	-	300	43.50*	-

Appendix B

Proposed Drainage



NEW HIGHWAY GULLIES ON
ADOPTABLE HIGHWAY TO BE
DELIVERED BY OTHERS, AS
PART OF THE PRIORITY
JUNCTION ON CUTBRUSH LANE
EAST

EXISTING DRAIN RUN TO
REMAIN, BUT BE ENCASED IN
CONCRETE

ADDITIONAL 130sqm OF
HARDSTANDING TO BE DRAINED
TO BELOW GROUND STORM
WATER NETWORK

POND

WL 18/03/24
42.88
Pipe 150ø

EXISTING LINEAR DRAINAGE CHANNEL TO BE REMOVED.
NEW LINEAR DRAINAGE CHANNEL TO BE PROVIDED AT THE
SAME LOCATION IN PLAN BUT AT A HIGHER LEVEL, ONCE
CARRIAGEWAY IS REPROFLED, AND CONNECTED TO THE
EXISTING DRAINAGE NETWORK.
CHANNEL TO BE ACO MULTIDRAIN M1000 (SLOPING INVERT)
WITH GALVANIZED STEEL EDGE RAILS, AND A D400 ACO
HEELGUARD MESH GALVANISED STEEL GRATING, OUTFALL UNIT
AT CENTRE TO BE ACO M100 UNIVERSAL SUMP

NEW GULLIES TO CONNECT TO
THE DRAINAGE STUB
PREVIOUSLY USED TO DRAIN
THE LINEAR DRAINAGE
CHANNEL.

notes

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEER'S DRAWINGS AND THE SPECIFICATION.
- DO NOT SCALE FROM THIS DRAWING.
- KEY

- PROPOSED STORM WATER DRAIN RUN
- PROPOSED GULLY
- PROPOSED LINEAR DRAINAGE CHANNEL
- EXISTING STORM WATER DRAINAGE NETWORK
- (ALL DRAINAGE RUNS 150 DIA. UNLESS NOTED OTHERWISE)
- SITE BOUNDARY
- PROPOSED FENCE LINE

NOT FOR
CONSTRUCTION

B	17.12.24	DRAINAGE UPDATED	MBr
A	29.11.24	DRAINAGE UPDATED	MBr
	25.11.24	ISSUED FOR INFORMATION	MBr

job
BRITISH MUSEUM
ARC
SECOND ACCESS

title
DRAINAGE PLAN

drawn CW	checked MBr
date OCT '24	scale (original - A1) 1:100

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Appendix C

Microdrainage Note and Output

Project:	British Museum		
Our reference:	393293-MMD-00-XX-TC-DR-0003	Your reference:	
Prepared by:	A Precious	Date:	31 st January 2025
Approved by:	R Foord	Checked by:	T Fundira
Subject:	Secondary site access road		

1 Introduction

The British Museum's Archaeological Research Centre (BM ARC) is located in Shinfield, south of Reading, in the Borough of Wokingham. A planning application is now being made for a second vehicular access to the site. This would be located at the north of the site, and link to the NHM Access Road, which is being separately constructed by the University of Reading (UoR). This is shown in Figure 1.1.

The construction of the new access will require regrading of the existing on-site access road and will introduce new impermeable area.

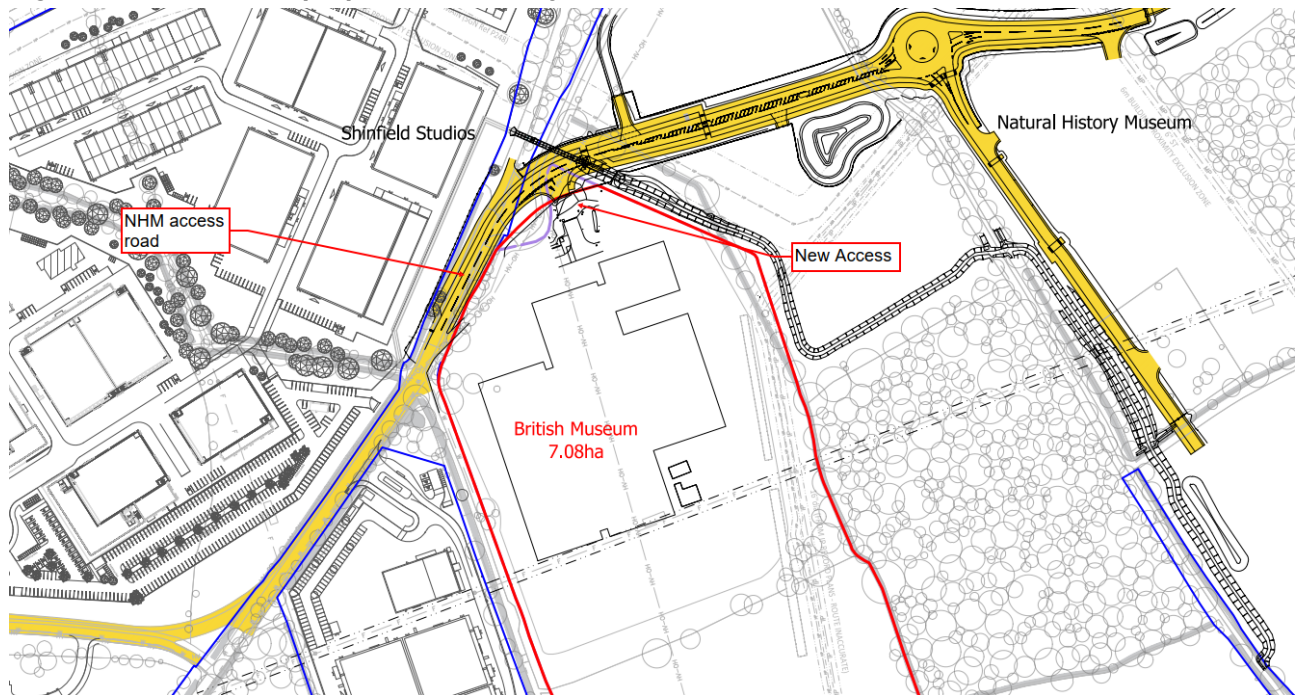
The existing site drainage system for BM ARC was designed by Mott MacDonald Ltd (MML) and installed by Graham's between 2019 and 2021. MML have been approached to assess the impact of the new access road on the existing site drainage system.

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We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

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Figure 1.1: Location of proposed secondary access



Source: Extract from UDS drawing reference 498048-RL003 rev E

2 Proposed Junction

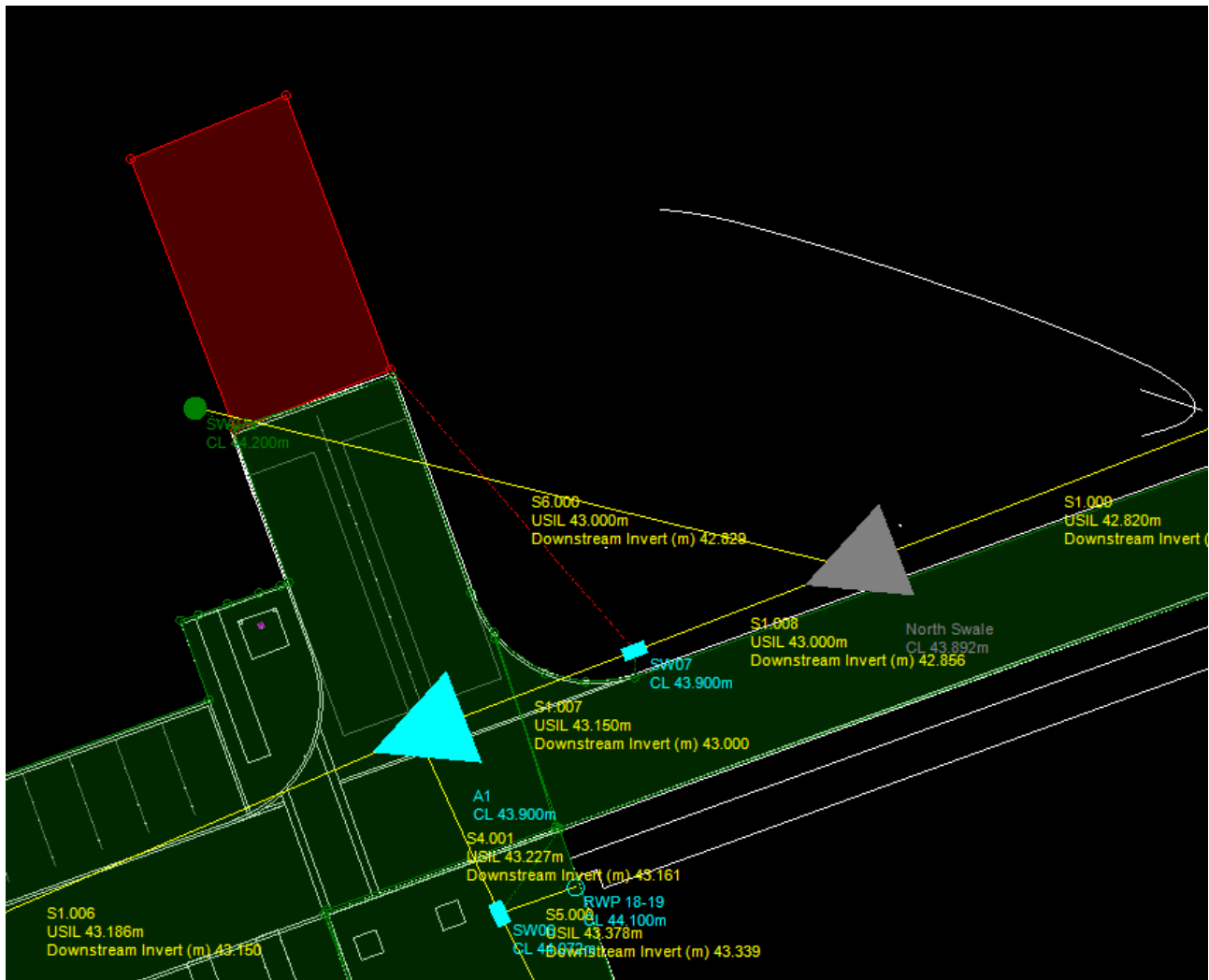
It is proposed that the new junction will be formed by extending an existing turning head on the BM ARC site and forming a bellmouth junction with the new link road.

The current proposed plan of the works is shown on the plan in Appendix A. It will generate approximately 130m² of new impermeable area within the BM ARC site with the remaining impermeable area assumed to be drained to the new drainage system for the link road.

The drawing in Appendix A shows indicative drainage that will be refined as the scheme develops, however, the point of connection to the existing drainage system is proposed to be as shown, namely to the carrier pipe upstream of the North Swale and the installed oil/water separator.

In the hydraulic model this is represented by pipe 1.007. The new area has been applied to MHSW07 as shown in Figure 2.1.

Figure 2.1: Extract from hydraulic model showing new connected area



Source: Extract from MM Model as-built model 1.1

3 Model outputs

3.1 Model setup

The addition of 130m² of new impermeable area represents a less than 1% change in the overall drained impermeable area and as such the impact of the additional flow is unlikely to be significant or extend significant downstream of the connection point.

For assessment the levels in MHSW07, North swale, SW09 and SW12 have been identified as points of reference.

- SW07 as it is the point of connection,
- North swale as it is the first attenuation structure downstream,
- SW09 as it is the first flow control device downstream and,

- SW12 is at the outlet of the East swale and has both a flow control and high-level overflow that manages flow rate and volume to the system to the south of the building.

The model has been run for pre- and post-development scenarios using the following model settings:

FSR characteristics: M5-60 = 18.400
 Ratio R = 0.400
 Summer C_v = 0.750
 Winter C_v = 0.840

Storm Events: 1 in 30-year +40% climate change (summer and winter)
 1 in 100-year +40% climate change (summer and winter)*

* = worst case will be reported

3.2 Model results

The outputs from the model for the key locations in the system are summarised below. The detailed simulation outputs for each system are included in Appendix B for reference.

Location	1 in 30-year+CC modelled water level		Level difference (mm)
	Pre-development	Post-development	
SW07	43.901	43.901	0
North Swale	43.536	43.539	+3
SW09	43.542	43.544	+2
SW12	43.334	43.341	+7

Location	1 in 100-year+CC modelled water level		Level difference (mm)
	Pre-development	Post-development	
SW07	43.901	43.901	0
North Swale	43.636	43.641	+5
SW09	43.640	43.645	+5
SW12	43.469	43.471	+2

The modelling outputs show a very small increase in water level during the extreme rainfall events. It is noted that these are all within the freeboard provided (designed as 150mm) for all the site attenuation features and do not cause any additional surcharging in the piped system.

At MHSW12 – the high-level overflow is noted to discharge approximately 2m³ more during the 1 in 100-year+CC event, again this is massively within the freeboard capacity of the downstream attenuation features.

For all events, the final offsite discharge rate remains unchanged.

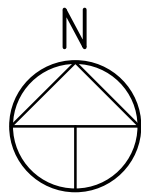
4 Conclusions and recommendations

The modelling of the pre- and post-development addition of the new turning head shows that it has a small but insignificant impact on the existing BM ARC system and that both on site and downstream of the BM ARC there is no discernible change in flood risk or final discharge rate from the site.

4.1 Recommendations

- The design of the access road can be developed further, should the area of the junction be increased this assessment should be re-run to confirm and record the change in water levels associated with the new impermeable area.
- The new drainage to the junction shall be connected upstream of the oil/water separator locally.
- The design of the drainage system serving the new link road section of the junction shall be robustly sized to accommodate an agreed level of service degradation before overflow on to the BM ARC site is permitted and as emergency temporary flows only.
- The existing drainage assets shall be protected at all times during construction and where levels are being changed appropriate structural checks will be required.

A. Proposed Second Access – Drainage Plan



NEW HIGHWAY GULLIES ON
ADOPTABLE HIGHWAY TO BE
DELIVERED BY OTHERS, AS
PART OF THE PRIORITY
JUNCTION ON CUTBRUSH LANE
EAST

EXISTING DRAIN RUN TO
REMAIN, BUT BE ENCASED IN
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DRAWING 1910/911/045).

ADDITIONAL 130sqm OF
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EXISTING LINEAR DRAINAGE
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NEW GULLIES TO CONNECT TO
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notes

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- DO NOT SCALE FROM THIS DRAWING.
- FOR TYPICAL DRAINAGE DETAILS SEE DRAWING 1910/911/045.
- KEY

PROPOSED STORM WATER DRAIN RUN
PROPOSED GULLY
EXISTING STORM WATER DRAINAGE NETWORK

(ALL DRAINAGE RUNS 150 DIA. UNLESS NOTED OTHERWISE)

NOT FOR
CONSTRUCTION

25.11.24 ISSUED FOR INFORMATION MBr

job
BRITISH MUSEUM
ARC
SECOND ACCESS

title
DRAINAGE PLAN

drawn
CW
checked
MBr
date
OCT '24
scale (original - A1)
1:100

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B. Model outputs

B.1 Pre-development model outputs

B.2 Post-development model outputs

Mott MacDonald		Page 1
Mott MacDonald House 8-10 Sydenham Road Croydon CR0 2EE	British Museum Surface Water Drainage As-built model	
Date 31/01/2025 16:38 File As-built model.MDX	Designed by AJP Checked by TAF	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.400	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.800
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.372	4-8	1.185	8-12	0.514	12-16	0.169

Total Area Contributing (ha) = 2.240

Total Pipe Volume (m³) = 83.974

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	10.686	0.027	395.8	0.064	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.001	4.955	0.027	183.5	0.119	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S2.000	39.031	0.050	780.6	0.247	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S1.002	36.865	0.024	1536.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.003	18.311	0.062	295.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.004	7.960	0.145	54.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S3.000	3.998	0.040	100.0	0.064	5.00	0.0	0.600	o	225	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)
S1.000	50.00	5.23	43.568	0.064	0.0	0.0	0.0	0.78	55.4	8.7
S1.001	50.00	5.30	43.542	0.183	0.0	0.0	0.0	1.16	81.8	24.8
S2.000	50.00	6.41	43.550	0.247	0.0	0.0	0.0	0.46	18.3«	33.4
S1.002	50.00	7.98	43.500	0.430	0.0	0.0	0.0	0.39	27.7«	58.2
S1.003	50.00	8.31	43.476	0.430	0.0	0.0	0.0	0.91	64.3	58.2
S1.004	50.00	8.38	43.414	0.430	0.0	0.0	0.0	2.13	150.3	58.2
S3.000	50.00	5.05	43.450	0.064	0.0	0.0	0.0	1.31	52.0	8.7

Mott MacDonald		Page 2
Mott MacDonald House 8-10 Sydenham Road Croydon CR0 2EE	British Museum Surface Water Drainage As-built model	
Date 31/01/2025 16:38 File As-built model.MDX	Designed by AJP Checked by TAF	
Innovyze	Network 2020.1.3	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.005	16.886	0.083	203.4	0.012	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	41.923	0.036	1164.5	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	12.104	0.073	165.8	0.229	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.071	0.039	104.4	0.033	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	9.964	0.066	151.0	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	11.741	0.150	78.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	11.741	0.144	81.5	0.031	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.000	34.151	0.171	199.7	0.078	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	22.208	0.020	1110.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.010	11.309	0.035	323.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	7.087	0.070	101.2	0.069	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	61.214	0.122	500.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.012	63.598	0.243	261.7	0.151	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	34.134	0.069	494.7	0.029	5.00	0.0	0.600	o	450	Pipe/Conduit	
S8.001	6.817	0.051	133.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	9.856	0.100	98.6	0.052	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.013	24.321	0.070	347.4	0.000	0.00	0.0	0.600	o	450	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)
S1.005	49.94	8.63	43.269	0.506	0.0	0.0	0.0	1.10	77.7	68.5
S1.006	45.75	10.18	43.186	0.556	0.0	0.0	0.0	0.45	32.0«	68.9
S4.000	50.00	5.20	43.300	0.229	0.0	0.0	0.0	1.01	40.3	31.0
S5.000	50.00	5.05	43.378	0.033	0.0	0.0	0.0	1.28	50.9	4.5
S4.001	50.00	5.33	43.227	0.293	0.0	0.0	0.0	1.28	90.3	39.7
S1.007	45.33	10.35	43.150	0.849	0.0	0.0	0.0	1.14	20.1«	104.2
S1.008	44.91	10.52	43.000	0.880	0.0	0.0	0.0	1.11	19.7«	107.0
S6.000	50.00	5.62	43.000	0.078	0.0	0.0	0.0	0.92	36.6	10.6
S1.009	43.54	11.14	42.820	0.958	0.0	0.0	0.0	0.60	95.7«	113.0
S1.010	43.19	11.31	42.800	0.958	0.0	0.0	0.0	1.13	179.0	113.0
S7.000	50.00	5.09	43.300	0.069	0.0	0.0	0.0	1.30	51.7	9.3
S1.011	40.95	12.44	42.765	1.027	0.0	0.0	0.0	0.90	143.5	113.9
S1.012	39.45	13.28	42.643	1.178	0.0	0.0	0.0	1.25	199.1	125.9
S8.000	50.00	5.63	42.800	0.029	0.0	0.0	0.0	0.91	144.3	3.9
S8.001	50.00	5.73	42.700	0.029	0.0	0.0	0.0	1.13	44.9	3.9
S9.000	50.00	5.16	43.000	0.052	0.0	0.0	0.0	1.01	17.9	7.0
S1.013	38.82	13.66	42.400	1.259	0.0	0.0	0.0	1.08	172.6	132.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	27.514	0.135	203.8	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S11.000	2.368	0.143	16.6	0.075	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S11.001	3.015	0.027	111.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S10.001	17.477	0.120	145.6	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S12.000	20.154	0.080	251.9	0.031	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S1.014	26.206	0.146	179.5	0.000	0.00	0.0	0.600	oo	-1	Pipe/Conduit	🔒
S13.000	10.859	0.184	59.0	0.105	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S13.001	23.282	0.102	228.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S13.002	41.588	0.139	299.2	0.063	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S14.000	21.605	0.125	172.8	0.267	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S13.003	40.730	0.100	407.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S15.000	16.796	0.475	35.4	0.064	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S13.004	27.695	0.150	184.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S16.000	18.630	0.590	31.6	0.240	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S16.001	18.319	0.190	96.4	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S16.002	36.063	0.200	180.3	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S16.003	6.537	0.040	163.4	0.062	0.00	0.0	0.600	o	300	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)
S10.000	50.00	5.50	42.575	0.034	0.0	0.0	0.0	0.91	36.3	4.6
S11.000	50.00	5.02	42.750	0.075	0.0	0.0	0.0	2.49	44.0	10.2
S11.001	50.00	5.04	42.607	0.075	0.0	0.0	0.0	1.92	305.5	10.2
S10.001	50.00	5.68	42.440	0.109	0.0	0.0	0.0	1.68	267.6	14.7
S12.000	50.00	5.53	42.400	0.031	0.0	0.0	0.0	0.63	11.1	4.2
S1.014	38.22	14.03	42.250	1.399	0.0	0.0	0.0	1.17	165.5	144.8
S13.000	50.00	5.14	44.000	0.105	0.0	0.0	0.0	1.31	23.2	14.2
S13.001	50.00	5.43	43.400	0.105	0.0	0.0	0.0	1.34	213.3	14.2
S13.002	50.00	6.02	43.298	0.168	0.0	0.0	0.0	1.17	186.1	22.7
S14.000	50.00	5.30	43.315	0.267	0.0	0.0	0.0	1.19	84.3	36.2
S13.003	50.00	6.90	43.159	0.435	0.0	0.0	0.0	0.77	54.6	58.9
S15.000	50.00	5.11	42.875	0.064	0.0	0.0	0.0	2.65	187.5	8.7
S13.004	50.00	7.30	42.400	0.499	0.0	0.0	0.0	1.15	81.6	67.6
S16.000	50.00	5.13	43.200	0.240	0.0	0.0	0.0	2.34	92.9	32.5
S16.001	50.00	5.32	42.610	0.257	0.0	0.0	0.0	1.60	113.2	34.8
S16.002	50.00	5.84	42.420	0.261	0.0	0.0	0.0	1.17	82.5	35.4
S16.003	50.00	5.93	42.220	0.324	0.0	0.0	0.0	1.23	86.7	43.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S13.005	28.799	0.046	626.1	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.015	23.424	0.104	225.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.016	14.410	0.069	208.8	0.000	0.00	0.0	0.600	o	225	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)
S13.005	50.00	8.23	42.150	0.841	0.0	0.0	0.0	0.52	20.5	113.9
S1.015	37.53	14.48	42.104	2.240	0.0	0.0	0.0	0.87	34.5	227.6
S1.016	37.13	14.75	42.000	2.240	0.0	0.0	0.0	0.90	35.8	227.6

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.064	0.064	0.064
1.001	User	-	95	0.068	0.064	0.064
	User	-	95	0.057	0.055	0.119
2.000	-	-	100	0.247	0.247	0.247
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.064	0.064	0.064
1.005	User	-	95	0.013	0.012	0.012
1.006	User	-	100	0.050	0.050	0.050
4.000	-	-	100	0.229	0.229	0.229
5.000	-	-	100	0.033	0.033	0.033
4.001	User	-	95	0.032	0.031	0.031
1.007	-	-	100	0.000	0.000	0.000
1.008	User	-	95	0.033	0.031	0.031
6.000	User	-	95	0.083	0.078	0.078
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.069	0.069	0.069
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.151	0.151	0.151
8.000	User	-	95	0.031	0.029	0.029
8.001	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.052	0.052	0.052
1.013	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.021	0.021	0.021
	User	-	95	0.014	0.013	0.034
11.000	User	-	95	0.079	0.075	0.075
11.001	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
12.000	User	-	95	0.032	0.031	0.031
1.014	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.105	0.105	0.105
13.001	-	-	100	0.000	0.000	0.000
13.002	-	-	100	0.063	0.063	0.063
14.000	-	-	100	0.267	0.267	0.267
13.003	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.064	0.064	0.064
13.004	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.240	0.240	0.240
16.001	User	-	95	0.018	0.017	0.017
16.002	User	-	95	0.005	0.004	0.004
16.003	User	-	100	0.062	0.062	0.062
13.005	User	-	100	0.018	0.018	0.018
1.015	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.263	2.240	2.240

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.016	Outfall	42.500	41.931	41.920	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Area Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	2880
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	18.400	Storm Duration (mins)	1440
Ratio R	0.400		

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Online Controls for Storm

Orifice Manhole: SW09, DS/PN: S1.011, Volume (m³): 4.0

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 42.765

Non Return Valve Manhole: sw11, DS/PN: S8.001, Volume (m³): 6.5

Orifice Manhole: SW12, DS/PN: S1.013, Volume (m³): 12.1

Diameter (m) 0.065 Discharge Coefficient 0.600 Invert Level (m) 42.400

Non Return Valve Manhole: SW15 (dummy2), DS/PN: S11.001, Volume (m³): 0.6

Orifice Manhole: SW17, DS/PN: S13.004, Volume (m³): 5.2

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 42.400

Hydro-Brake® Optimum Manhole: SW19, DS/PN: S1.015, Volume (m³): 6.6

Unit Reference	MD-SHE-0135-8500-1046-8500
Design Head (m)	1.046
Design Flow (l/s)	8.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	135
Invert Level (m)	42.104
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.046	8.5	Kick-Flo®	0.688	7.0
Flush-Flo™	0.314	8.5	Mean Flow over Head Range	-	7.3

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)
0.100	4.8	1.200	9.1	3.000	14.0	7.000	21.0
0.200	8.2	1.400	9.7	3.500	15.0	7.500	21.7
0.300	8.5	1.600	10.4	4.000	16.0	8.000	22.3
0.400	8.4	1.800	11.0	4.500	17.0	8.500	23.0
0.500	8.2	2.000	11.5	5.000	17.8	9.000	23.6
0.600	7.8	2.200	12.1	5.500	18.7	9.500	24.3
0.800	7.5	2.400	12.6	6.000	19.5		
1.000	8.3	2.600	13.1	6.500	20.2		

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Storage Structures for Storm

Cellular Storage Manhole: A2, DS/PN: S1.002

Invert Level (m) 43.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	690.0	0.0	0.401	0.0	0.0
0.400	690.0	0.0			

Cellular Storage Manhole: A1, DS/PN: S1.007

Invert Level (m) 43.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	550.0	0.0	0.151	0.0	0.0
0.150	550.0	0.0			

Tank or Pond Manhole: North Swale, DS/PN: S1.009

Invert Level (m) 42.932

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	240.0	0.960	470.0

Tank or Pond Manhole: sw11, DS/PN: S8.001

Invert Level (m) 42.700

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	292.0	1.270	801.0

Tank or Pond Manhole: South East Swale, DS/PN: S1.014

Invert Level (m) 42.253

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	0.0	0.200	88.7	0.400	119.0	0.600	151.9	0.700	169.3
0.100	74.4	0.300	103.6	0.500	135.2	0.636	158.1	0.786	184.8

Tank or Pond Manhole: West Swale, DS/PN: S13.001

Invert Level (m) 43.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	0.0	0.200	183.0	0.300	206.5	0.405	231.9
0.100	160.2	0.255	195.8	0.400	230.7		

Tank or Pond Manhole: New Swale, DS/PN: S13.005

Invert Level (m) 42.150

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Tank or Pond Manhole: New Swale, DS/PN: S13.005

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.210	283.5	0.410	370.4	0.510	414.8
0.110	240.9	0.310	326.7	0.443	385.0	0.593	452.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
S1.000	RWP 1-3	15 Winter	2	+40%			
S1.001	SW01	15 Winter	2	+40%	30/15 Summer		
S2.000	RWP4-9	15 Summer	2	+40%			
S1.002	A2	240 Winter	2	+40%	100/60 Winter		
S1.003	SW02	240 Winter	2	+40%	30/60 Winter		
S1.004	SW03	240 Winter	2	+40%	30/30 Winter		
S3.000	RWP 10-11	15 Winter	2	+40%			
S1.005	SW04	15 Winter	2	+40%	30/15 Summer		
S1.006	SW05	15 Winter	2	+40%	30/15 Summer		
S4.000	RWP 12-17	15 Summer	2	+40%			
S5.000	RWP 18-19	15 Winter	2	+40%			
S4.001	SW06	15 Winter	2	+40%	30/15 Summer		
S1.007	A1	480 Winter	2	+40%	30/30 Summer	30/30 Winter	
S1.008	SW07	480 Winter	2	+40%	2/60 Summer	30/30 Winter	
S6.000	SW07a	480 Winter	2	+40%	2/240 Winter		
S1.009	North Swale	480 Winter	2	+40%	30/60 Summer		
S1.010	SW08	480 Winter	2	+40%	30/60 Summer		
S7.000	RWP 20-21	15 Winter	2	+40%			
S1.011	SW09	480 Winter	2	+40%	2/240 Winter		
S1.012	SW10	60 Winter	2	+40%	2/30 Summer		
S8.000	East Detention Pond	15 Winter	2	+40%	30/480 Winter		
S8.001	sw11	960 Winter	2	+40%	30/120 Winter	100/360 Winter	
S9.000	RWP 25-26	60 Winter	2	+40%			
S1.013	SW12	60 Winter	2	+40%	2/15 Summer	100/720 Winter	2/30 Winter
S10.000	SW14	720 Winter	2	+40%	30/120 Winter	100/600 Winter	
S11.000	SW15 (dummy1)	15 Winter	2	+40%	30/15 Summer		
S11.001	SW15 (dummy2)	720 Winter	2	+40%	100/600 Winter		
S10.001	SW15	720 Winter	2	+40%	30/180 Winter		
S12.000	FD03	720 Winter	2	+40%	2/120 Winter		
S1.014	South East Swale	720 Winter	2	+40%	2/120 Winter		
S13.000	RWP 46-48	15 Winter	2	+40%			
S13.001	West Swale	120 Winter	2	+40%			
S13.002	Null	15 Winter	2	+40%	2/15 Winter	2/15 Winter	
S14.000	SW16 (RWP 38 - 45)	30 Winter	2	+40%	2/15 Summer	100/15 Summer	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	RWP 1-3		43.736	-0.132	0.000	0.30			14.3
S1.001	SW01		43.727	-0.115	0.000	0.69			37.4
S2.000	RWP4-9		43.775	0.000	0.000	2.47			45.2
S1.002	A2		43.609	-0.191	0.000	0.27		218	7.5
S1.003	SW02		43.549	-0.227	0.000	0.13			7.5
S1.004	SW03		43.469	-0.245	0.000	0.08			7.5
S3.000	RWP 10-11		43.563	-0.112	0.000	0.49			14.6
S1.005	SW04		43.420	-0.149	0.000	0.25			16.7
S1.006	SW05		43.404	-0.082	0.000	0.86			25.3
S4.000	RWP 12-17		43.525	0.000	0.000	1.29			49.1
S5.000	RWP 18-19		43.473	-0.130	0.000	0.24			7.3
S4.001	SW06		43.467	-0.060	0.000	0.99			63.9
S1.007	A1		43.294	-0.006	0.000	0.67		258	12.2
S1.008	SW07		43.274	0.124	0.000	0.72			12.8
S6.000	SW07a		43.254	0.029	0.000	0.06			2.1
S1.009	North Swale		43.253	-0.017	0.000	0.11			6.1
S1.010	SW08		43.247	-0.003	0.000	0.05			6.2
S7.000	RWP 20-21		43.403	-0.122	0.000	0.43			15.9
S1.011	SW09		43.235	0.020	0.000	0.05			6.2
S1.012	SW10		43.150	0.057	0.000	0.06			11.6
S8.000	East Detention Pond		42.867	-0.383	0.000	0.05			6.7
S8.001	sw11		42.822	-0.103	0.000	0.13			4.1
S9.000	RWP 25-26		43.150	0.000	0.000	0.35			6.2
S1.013	SW12	68	43.147	0.297	0.000	0.05	3.3		6.8
S10.000	SW14		42.787	-0.013	0.000	0.02			0.7
S11.000	SW15 (dummy1)		42.847	-0.053	0.000	0.72			17.1
S11.001	SW15 (dummy2)		42.780	-0.277	0.000	0.01			1.5
S10.001	SW15		42.790	-0.100	0.000	0.01			2.2
S12.000	FD03		42.789	0.239	0.000	0.06			0.6
S1.014	South East Swale		42.790	0.240	0.000	0.10			15.0
S13.000	RWP 46-48		44.123	-0.027	0.000	1.00			23.2
S13.001	West Swale		43.724	-0.126	0.000	0.03			5.1
S13.002	Null		43.748	0.000	0.201	0.06			9.4
S14.000	SW16 (RWP 38 - 45)		43.873	0.258	0.000	0.55			41.0

PN	US/MH Name	Status	Level Exceeded
S1.000	RWP 1-3	FLOOD RISK*	
S1.001	SW01	OK	
S2.000	RWP4-9	SURCHARGED*	
S1.002	A2	OK	
S1.003	SW02	OK	
S1.004	SW03	OK	
S3.000	RWP 10-11	OK*	
S1.005	SW04	OK	
S1.006	SW05	OK	
S4.000	RWP 12-17	SURCHARGED*	
S5.000	RWP 18-19	OK*	
S4.001	SW06	OK	
S1.007	A1	OK	42
S1.008	SW07	SURCHARGED	43
S6.000	SW07a	SURCHARGED	
S1.009	North Swale	OK	
S1.010	SW08	OK	
S7.000	RWP 20-21	OK*	
S1.011	SW09	SURCHARGED	
S1.012	SW10	SURCHARGED	
S8.000	East Detention Pond	OK	

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

PN	US/MH Name	Status	Level Exceeded
S8.001	sw11	OK	11
S9.000	RWP 25-26	SURCHARGED*	
S1.013	SW12	SURCHARGED	3
S10.000	SW14	FLOOD RISK	4
S11.000	SW15 (dummy1)	OK	
S11.001	SW15 (dummy2)	OK	
S10.001	SW15	OK	
S12.000	FD03	SURCHARGED	
S1.014	South East Swale	SURCHARGED	
S13.000	RWP 46-48	FLOOD RISK*	
S13.001	West Swale	FLOOD RISK	
S13.002	Null	FLOOD	50
S14.000	SW16 (RWP 38 - 45)	FLOOD RISK	4

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S13.003	South Swale	15 Winter	2	+40%	2/15 Summer			
S15.000	RWP 36-37	15 Summer	2	+40%				
S13.004	SW17	30 Winter	2	+40%	2/15 Summer	2/15 Summer		
S16.000	SW13a (RWP 27-32)	15 Winter	2	+40%	30/15 Summer	100/15 Summer		
S16.001	SW13	15 Winter	2	+40%	30/15 Summer	100/15 Summer		
S16.002	MH13B	720 Winter	2	+40%	30/15 Summer			
S16.003	SW13c	720 Winter	2	+40%	2/15 Winter	30/1440 Winter		
S13.005	New Swale	720 Winter	2	+40%	2/15 Summer	30/360 Winter		
S1.015	SW19	720 Winter	2	+40%	2/15 Summer	30/360 Winter		
S1.016	SW20	60 Winter	2	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S13.003	South Swale	43.777	0.318	0.000	0.53			27.0	FLOOD RISK
S15.000	RWP 36-37	43.175	0.000	0.000	0.06			11.0	SURCHARGED*
S13.004	SW17	43.755	1.055	4.927	0.08			6.0	FLOOD
S16.000	SW13a (RWP 27-32)	43.336	-0.089	0.000	0.66			55.1	OK
S16.001	SW13	42.780	-0.130	0.000	0.60			58.2	OK
S16.002	MH13B	42.654	-0.066	0.000	0.07			5.2	OK
S16.003	SW13c	42.655	0.135	0.000	0.10			6.2	FLOOD RISK
S13.005	New Swale	42.655	0.280	0.000	0.59			11.0	FLOOD RISK
S1.015	SW19	42.947	0.618	0.000	0.27			8.5	FLOOD RISK
S1.016	SW20	42.079	-0.146	0.000	0.27			8.5	OK

PN	US/MH Name	Level Exceeded
S13.003	South Swale	
S15.000	RWP 36-37	
S13.004	SW17	53
S16.000	SW13a (RWP 27-32)	3
S16.001	SW13	4
S16.002	MH13B	
S16.003	SW13c	12
S13.005	New Swale	24
S1.015	SW19	24
S1.016	SW20	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.400	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.800
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.372	4-8	1.196	8-12	0.515	12-16	0.169

Total Area Contributing (ha) = 2.252

Total Pipe Volume (m³) = 83.974

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	10.686	0.027	395.8	0.064	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	4.955	0.027	183.5	0.119	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	39.031	0.050	780.6	0.247	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	36.865	0.024	1536.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	18.311	0.062	295.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	7.960	0.145	54.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	3.998	0.040	100.0	0.064	5.00	0.0	0.600	o	225	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)
S1.000	50.00	5.23	43.568	0.064	0.0	0.0	0.0	0.78	55.4	8.7
S1.001	50.00	5.30	43.542	0.183	0.0	0.0	0.0	1.16	81.8	24.8
S2.000	50.00	6.41	43.550	0.247	0.0	0.0	0.0	0.46	18.3«	33.4
S1.002	50.00	7.98	43.500	0.430	0.0	0.0	0.0	0.39	27.7«	58.2
S1.003	50.00	8.31	43.476	0.430	0.0	0.0	0.0	0.91	64.3	58.2
S1.004	50.00	8.38	43.414	0.430	0.0	0.0	0.0	2.13	150.3	58.2
S3.000	50.00	5.05	43.450	0.064	0.0	0.0	0.0	1.31	52.0	8.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.005	16.886	0.083	203.4	0.012	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	41.923	0.036	1164.5	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	12.104	0.073	165.8	0.229	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	4.071	0.039	104.4	0.033	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	9.964	0.066	151.0	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	11.741	0.150	78.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	11.741	0.144	81.5	0.044	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.000	34.151	0.171	199.7	0.078	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	22.208	0.020	1110.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.010	11.309	0.035	323.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.000	7.087	0.070	101.2	0.069	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	61.214	0.122	500.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.012	63.598	0.243	261.7	0.151	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	34.134	0.069	494.7	0.029	5.00	0.0	0.600	o	450	Pipe/Conduit	
S8.001	6.817	0.051	133.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	9.856	0.100	98.6	0.052	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.013	24.321	0.070	347.4	0.000	0.00	0.0	0.600	o	450	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)
S1.005	49.94	8.63	43.269	0.506	0.0	0.0	0.0	1.10	77.7	68.5
S1.006	45.75	10.18	43.186	0.556	0.0	0.0	0.0	0.45	32.0	68.9
S4.000	50.00	5.20	43.300	0.229	0.0	0.0	0.0	1.01	40.3	31.0
S5.000	50.00	5.05	43.378	0.033	0.0	0.0	0.0	1.28	50.9	4.5
S4.001	50.00	5.33	43.227	0.293	0.0	0.0	0.0	1.28	90.3	39.7
S1.007	45.33	10.35	43.150	0.849	0.0	0.0	0.0	1.14	20.1	104.2
S1.008	44.91	10.52	43.000	0.892	0.0	0.0	0.0	1.11	19.7	108.5
S6.000	50.00	5.62	43.000	0.078	0.0	0.0	0.0	0.92	36.6	10.6
S1.009	43.54	11.14	42.820	0.971	0.0	0.0	0.0	0.60	95.7	114.5
S1.010	43.19	11.31	42.800	0.971	0.0	0.0	0.0	1.13	179.0	114.5
S7.000	50.00	5.09	43.300	0.069	0.0	0.0	0.0	1.30	51.7	9.3
S1.011	40.95	12.44	42.765	1.040	0.0	0.0	0.0	0.90	143.5	115.3
S1.012	39.45	13.28	42.643	1.191	0.0	0.0	0.0	1.25	199.1	127.2
S8.000	50.00	5.63	42.800	0.029	0.0	0.0	0.0	0.91	144.3	3.9
S8.001	50.00	5.73	42.700	0.029	0.0	0.0	0.0	1.13	44.9	3.9
S9.000	50.00	5.16	43.000	0.052	0.0	0.0	0.0	1.01	17.9	7.0
S1.013	38.82	13.66	42.400	1.272	0.0	0.0	0.0	1.08	172.6	133.7

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Innovyze	Network 2020.1.3		

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	27.514	0.135	203.8	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
S11.000	2.368	0.143	16.6	0.075	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	3.015	0.027	111.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.001	17.477	0.120	145.6	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	20.154	0.080	251.9	0.031	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.014	26.206	0.146	179.5	0.000	0.00	0.0	0.600	oo	-1	Pipe/Conduit	
S13.000	10.859	0.184	59.0	0.105	5.00	0.0	0.600	o	150	Pipe/Conduit	
S13.001	23.282	0.102	228.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.002	41.588	0.139	299.2	0.063	0.00	0.0	0.600	o	450	Pipe/Conduit	
S14.000	21.605	0.125	172.8	0.267	5.00	0.0	0.600	o	300	Pipe/Conduit	
S13.003	40.730	0.100	407.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.000	16.796	0.475	35.4	0.064	5.00	0.0	0.600	o	300	Pipe/Conduit	
S13.004	27.695	0.150	184.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.000	18.630	0.590	31.6	0.240	5.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	18.319	0.190	96.4	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.002	36.063	0.200	180.3	0.004	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.003	6.537	0.040	163.4	0.062	0.00	0.0	0.600	o	300	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)
S10.000	50.00	5.50	42.575	0.034	0.0	0.0	0.0	0.91	36.3	4.6
S11.000	50.00	5.02	42.750	0.075	0.0	0.0	0.0	2.49	44.0	10.2
S11.001	50.00	5.04	42.607	0.075	0.0	0.0	0.0	1.92	305.5	10.2
S10.001	50.00	5.68	42.440	0.109	0.0	0.0	0.0	1.68	267.6	14.7
S12.000	50.00	5.53	42.400	0.031	0.0	0.0	0.0	0.63	11.1	4.2
S1.014	38.22	14.03	42.250	1.411	0.0	0.0	0.0	1.17	165.5	146.1
S13.000	50.00	5.14	44.000	0.105	0.0	0.0	0.0	1.31	23.2	14.2
S13.001	50.00	5.43	43.400	0.105	0.0	0.0	0.0	1.34	213.3	14.2
S13.002	50.00	6.02	43.298	0.168	0.0	0.0	0.0	1.17	186.1	22.7
S14.000	50.00	5.30	43.315	0.267	0.0	0.0	0.0	1.19	84.3	36.2
S13.003	50.00	6.90	43.159	0.435	0.0	0.0	0.0	0.77	54.6	58.9
S15.000	50.00	5.11	42.875	0.064	0.0	0.0	0.0	2.65	187.5	8.7
S13.004	50.00	7.30	42.400	0.499	0.0	0.0	0.0	1.15	81.6	67.6
S16.000	50.00	5.13	43.200	0.240	0.0	0.0	0.0	2.34	92.9	32.5
S16.001	50.00	5.32	42.610	0.257	0.0	0.0	0.0	1.60	113.2	34.8
S16.002	50.00	5.84	42.420	0.261	0.0	0.0	0.0	1.17	82.5	35.4
S16.003	50.00	5.93	42.220	0.324	0.0	0.0	0.0	1.23	86.7	43.9

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Innovyze	Network 2020.1.3	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S13.005	28.799	0.046	626.1	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.015	23.424	0.104	225.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.016	14.410	0.069	208.8	0.000	0.00	0.0	0.600	o	225	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)
S13.005	50.00	8.23	42.150	0.841	0.0	0.0	0.0	0.52	20.5	113.9
S1.015	37.53	14.48	42.104	2.252	0.0	0.0	0.0	0.87	34.5	228.9
S1.016	37.13	14.75	42.000	2.252	0.0	0.0	0.0	0.90	35.8	228.9

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.064	0.064	0.064
1.001	User	-	95	0.068	0.064	0.064
	User	-	95	0.057	0.055	0.119
2.000	-	-	100	0.247	0.247	0.247
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.064	0.064	0.064
1.005	User	-	95	0.013	0.012	0.012
1.006	User	-	100	0.050	0.050	0.050
4.000	-	-	100	0.229	0.229	0.229
5.000	-	-	100	0.033	0.033	0.033
4.001	User	-	95	0.032	0.031	0.031
1.007	-	-	100	0.000	0.000	0.000
1.008	User	-	95	0.033	0.031	0.031
	User	-	100	0.013	0.013	0.044
6.000	User	-	95	0.083	0.078	0.078
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.069	0.069	0.069
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.151	0.151	0.151
8.000	User	-	95	0.031	0.029	0.029
8.001	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.052	0.052	0.052
1.013	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.021	0.021	0.021
	User	-	95	0.014	0.013	0.034
11.000	User	-	95	0.079	0.075	0.075
11.001	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.000	0.000	0.000
12.000	User	-	95	0.032	0.031	0.031
1.014	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.105	0.105	0.105
13.001	-	-	100	0.000	0.000	0.000
13.002	-	-	100	0.063	0.063	0.063
14.000	-	-	100	0.267	0.267	0.267
13.003	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.064	0.064	0.064
13.004	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.240	0.240	0.240
16.001	User	-	95	0.018	0.017	0.017
16.002	User	-	95	0.005	0.004	0.004
16.003	User	-	100	0.062	0.062	0.062
13.005	User	-	100	0.018	0.018	0.018
1.015	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.276	2.252	2.252

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.016	Outfall	42.500	41.931	41.920	0	0

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Mott MacDonald House 8-10 Sydenham Road Croydon CR0 2EE	British Museum Surface Water Drainage ASB with north access	
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Innovyze	Network 2020.1.3	

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	2880
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	18.400	Storm Duration (mins)	1440
Ratio R	0.400		

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Online Controls for Storm

Orifice Manhole: SW09, DS/PN: S1.011, Volume (m³): 4.0

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 42.765

Non Return Valve Manhole: sw11, DS/PN: S8.001, Volume (m³): 6.5

Orifice Manhole: SW12, DS/PN: S1.013, Volume (m³): 12.1

Diameter (m) 0.065 Discharge Coefficient 0.600 Invert Level (m) 42.400

Non Return Valve Manhole: SW15 (dummy2), DS/PN: S11.001, Volume (m³): 0.6

Orifice Manhole: SW17, DS/PN: S13.004, Volume (m³): 5.2

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 42.400

Hydro-Brake® Optimum Manhole: SW19, DS/PN: S1.015, Volume (m³): 6.6

Unit Reference	MD-SHE-0135-8500-1046-8500
Design Head (m)	1.046
Design Flow (l/s)	8.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	135
Invert Level (m)	42.104
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.046	8.5	Kick-Flo®	0.688	7.0
Flush-Flo™	0.314	8.5	Mean Flow over Head Range	-	7.3

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)
0.100	4.8	1.200	9.1	3.000	14.0	7.000	21.0
0.200	8.2	1.400	9.7	3.500	15.0	7.500	21.7
0.300	8.5	1.600	10.4	4.000	16.0	8.000	22.3
0.400	8.4	1.800	11.0	4.500	17.0	8.500	23.0
0.500	8.2	2.000	11.5	5.000	17.8	9.000	23.6
0.600	7.8	2.200	12.1	5.500	18.7	9.500	24.3
0.800	7.5	2.400	12.6	6.000	19.5		
1.000	8.3	2.600	13.1	6.500	20.2		

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Storage Structures for Storm

Cellular Storage Manhole: A2, DS/PN: S1.002

Invert Level (m) 43.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	690.0	0.0	0.401	0.0	0.0
0.400	690.0	0.0			

Cellular Storage Manhole: A1, DS/PN: S1.007

Invert Level (m) 43.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	550.0	0.0	0.151	0.0	0.0
0.150	550.0	0.0			

Tank or Pond Manhole: North Swale, DS/PN: S1.009

Invert Level (m) 42.932

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	240.0	0.960	470.0

Tank or Pond Manhole: sw11, DS/PN: S8.001

Invert Level (m) 42.700

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	292.0	1.270	801.0

Tank or Pond Manhole: South East Swale, DS/PN: S1.014

Invert Level (m) 42.253

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	0.0	0.200	88.7	0.400	119.0	0.600	151.9	0.700	169.3
0.100	74.4	0.300	103.6	0.500	135.2	0.636	158.1	0.786	184.8

Tank or Pond Manhole: West Swale, DS/PN: S13.001

Invert Level (m) 43.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	0.0	0.200	183.0	0.300	206.5	0.405	231.9
0.100	160.2	0.255	195.8	0.400	230.7		

Tank or Pond Manhole: New Swale, DS/PN: S13.005

Invert Level (m) 42.150

Tank or Pond Manhole: New Swale, DS/PN: S13.005

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.210	283.5	0.410	370.4	0.510	414.8
0.110	240.9	0.310	326.7	0.443	385.0	0.593	452.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
S1.000	RWP 1-3	15 Winter	2	+40%			
S1.001	SW01	15 Winter	2	+40%	30/15 Summer		
S2.000	RWP4-9	15 Summer	2	+40%			
S1.002	A2	240 Winter	2	+40%	100/60 Winter		
S1.003	SW02	240 Winter	2	+40%	30/60 Winter		
S1.004	SW03	240 Winter	2	+40%	30/30 Winter		
S3.000	RWP 10-11	15 Winter	2	+40%			
S1.005	SW04	15 Winter	2	+40%	30/15 Summer		
S1.006	SW05	15 Winter	2	+40%	30/15 Summer		
S4.000	RWP 12-17	15 Summer	2	+40%			
S5.000	RWP 18-19	15 Winter	2	+40%			
S4.001	SW06	15 Winter	2	+40%	30/15 Summer		
S1.007	A1	480 Winter	2	+40%	30/30 Summer	30/30 Winter	
S1.008	SW07	480 Winter	2	+40%	2/60 Summer	30/30 Winter	
S6.000	SW07a	480 Winter	2	+40%	2/180 Winter		
S1.009	North Swale	480 Winter	2	+40%	30/60 Summer		
S1.010	SW08	480 Winter	2	+40%	30/60 Summer		
S7.000	RWP 20-21	15 Winter	2	+40%			
S1.011	SW09	480 Winter	2	+40%	2/180 Winter		
S1.012	SW10	60 Winter	2	+40%	2/30 Summer		
S8.000	East Detention Pond	15 Winter	2	+40%	30/360 Winter		
S8.001	sw11	960 Winter	2	+40%	30/120 Summer	100/360 Winter	
S9.000	RWP 25-26	60 Winter	2	+40%			
S1.013	SW12	60 Winter	2	+40%	2/15 Summer	100/720 Winter	2/30 Winter
S10.000	SW14	720 Winter	2	+40%	30/120 Winter	100/600 Winter	
S11.000	SW15 (dummy1)	15 Winter	2	+40%	30/15 Summer		
S11.001	SW15 (dummy2)	720 Winter	2	+40%	100/600 Winter		
S10.001	SW15	720 Winter	2	+40%	30/180 Winter		
S12.000	FD03	720 Winter	2	+40%	2/120 Winter		
S1.014	South East Swale	720 Winter	2	+40%	2/120 Winter		
S13.000	RWP 46-48	15 Winter	2	+40%			
S13.001	West Swale	120 Winter	2	+40%			
S13.002	Null	15 Winter	2	+40%	2/15 Winter	2/15 Winter	
S14.000	SW16 (RWP 38 - 45)	30 Winter	2	+40%	2/15 Summer	100/15 Summer	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	RWP 1-3		43.736	-0.132	0.000	0.30			14.3
S1.001	SW01		43.727	-0.115	0.000	0.69			37.4
S2.000	RWP4-9		43.775	0.000	0.000	2.47			45.2
S1.002	A2		43.609	-0.191	0.000	0.27		218	7.5
S1.003	SW02		43.549	-0.227	0.000	0.13			7.5
S1.004	SW03		43.469	-0.245	0.000	0.08			7.5
S3.000	RWP 10-11		43.563	-0.112	0.000	0.49			14.6
S1.005	SW04		43.420	-0.149	0.000	0.25			16.7
S1.006	SW05		43.404	-0.082	0.000	0.86			25.3
S4.000	RWP 12-17		43.525	0.000	0.000	1.29			49.1
S5.000	RWP 18-19		43.473	-0.130	0.000	0.24			7.3
S4.001	SW06		43.467	-0.060	0.000	0.99			63.9
S1.007	A1		43.297	-0.003	0.000	0.66		261	12.0
S1.008	SW07		43.277	0.127	0.000	0.73			13.0
S6.000	SW07a		43.257	0.032	0.000	0.06			2.1
S1.009	North Swale		43.256	-0.014	0.000	0.11			6.2
S1.010	SW08		43.248	-0.002	0.000	0.05			6.2
S7.000	RWP 20-21		43.403	-0.122	0.000	0.43			15.9
S1.011	SW09		43.236	0.021	0.000	0.05			6.2
S1.012	SW10		43.153	0.060	0.000	0.06			11.5
S8.000	East Detention Pond		42.867	-0.383	0.000	0.05			6.7
S8.001	sw11		42.826	-0.099	0.000	0.13			4.2
S9.000	RWP 25-26		43.150	0.000	0.000	0.35			6.2
S1.013	SW12	69	43.149	0.299	0.000	0.05	3.6		6.8
S10.000	SW14		42.788	-0.012	0.000	0.02			0.7
S11.000	SW15 (dummy1)		42.847	-0.053	0.000	0.72			17.1
S11.001	SW15 (dummy2)		42.781	-0.276	0.000	0.01			1.5
S10.001	SW15		42.791	-0.099	0.000	0.01			2.2
S12.000	FD03		42.790	0.240	0.000	0.06			0.6
S1.014	South East Swale		42.792	0.242	0.000	0.10			15.0
S13.000	RWP 46-48		44.123	-0.027	0.000	1.00			23.2
S13.001	West Swale		43.724	-0.126	0.000	0.03			5.1
S13.002	Null		43.748	0.000	0.201	0.06			9.4
S14.000	SW16 (RWP 38 - 45)		43.873	0.258	0.000	0.55			41.0

PN	US/MH Name	Status	Level Exceeded
S1.000	RWP 1-3	FLOOD RISK*	
S1.001	SW01	OK	
S2.000	RWP4-9	SURCHARGED*	
S1.002	A2	OK	
S1.003	SW02	OK	
S1.004	SW03	OK	
S3.000	RWP 10-11	OK*	
S1.005	SW04	OK	
S1.006	SW05	OK	
S4.000	RWP 12-17	SURCHARGED*	
S5.000	RWP 18-19	OK*	
S4.001	SW06	OK	
S1.007	A1	OK	44
S1.008	SW07	SURCHARGED	43
S6.000	SW07a	SURCHARGED	
S1.009	North Swale	OK	
S1.010	SW08	OK	
S7.000	RWP 20-21	OK*	
S1.011	SW09	SURCHARGED	
S1.012	SW10	SURCHARGED	
S8.000	East Detention Pond	OK	

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

PN	US/MH Name	Status	Level Exceeded
S8.001	sw11	OK	11
S9.000	RWP 25-26	SURCHARGED*	
S1.013	SW12	SURCHARGED	3
S10.000	SW14	FLOOD RISK	4
S11.000	SW15 (dummy1)	OK	
S11.001	SW15 (dummy2)	OK	
S10.001	SW15	OK	
S12.000	FD03	SURCHARGED	
S1.014	South East Swale	SURCHARGED	
S13.000	RWP 46-48	FLOOD RISK*	
S13.001	West Swale	FLOOD RISK	
S13.002	Null	FLOOD	50
S14.000	SW16 (RWP 38 - 45)	FLOOD RISK	4

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S13.003	South Swale	15 Winter	2	+40%	2/15 Summer			
S15.000	RWP 36-37	15 Summer	2	+40%				
S13.004	SW17	30 Winter	2	+40%	2/15 Summer	2/15 Summer		
S16.000	SW13a (RWP 27-32)	15 Winter	2	+40%	30/15 Summer	100/15 Summer		
S16.001	SW13	15 Winter	2	+40%	30/15 Summer	100/15 Summer		
S16.002	MH13B	720 Winter	2	+40%	30/15 Summer			
S16.003	SW13c	720 Winter	2	+40%	2/15 Winter	30/1440 Winter		
S13.005	New Swale	720 Winter	2	+40%	2/15 Summer	30/360 Winter		
S1.015	SW19	720 Winter	2	+40%	2/15 Summer	30/360 Winter		
S1.016	SW20	60 Winter	2	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S13.003	South Swale	43.777	0.318	0.000	0.53			27.0	FLOOD RISK
S15.000	RWP 36-37	43.175	0.000	0.000	0.06			11.0	SURCHARGED*
S13.004	SW17	43.755	1.055	4.928	0.08			6.0	FLOOD
S16.000	SW13a (RWP 27-32)	43.336	-0.089	0.000	0.66			55.1	OK
S16.001	SW13	42.780	-0.130	0.000	0.60			58.2	OK
S16.002	MH13B	42.656	-0.064	0.000	0.07			5.2	OK
S16.003	SW13c	42.656	0.136	0.000	0.10			6.2	FLOOD RISK
S13.005	New Swale	42.656	0.281	0.000	0.44			8.1	FLOOD RISK
S1.015	SW19	42.950	0.621	0.000	0.27			8.5	FLOOD RISK
S1.016	SW20	42.079	-0.146	0.000	0.27			8.5	OK

PN	US/MH Name	Level Exceeded
S13.003	South Swale	
S15.000	RWP 36-37	
S13.004	SW17	53
S16.000	SW13a (RWP 27-32)	3
S16.001	SW13	4
S16.002	MH13B	
S16.003	SW13c	12
S13.005	New Swale	24
S1.015	SW19	24
S1.016	SW20	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 40, 40, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
S1.000	RWP 1-3	15 Summer	30	+40%			
S1.001	SW01	15 Winter	30	+40%	30/15 Summer		
S2.000	RWP4-9	15 Summer	30	+40%			
S1.002	A2	120 Winter	30	+40%	100/60 Winter		
S1.003	SW02	120 Winter	30	+40%	30/60 Winter		
S1.004	SW03	240 Winter	30	+40%	30/30 Winter		
S3.000	RWP 10-11	600 Winter	30	+40%			
S1.005	SW04	360 Summer	30	+40%	30/15 Summer		
S1.006	SW05	120 Summer	30	+40%	30/15 Summer		
S4.000	RWP 12-17	15 Summer	30	+40%			
S5.000	RWP 18-19	15 Summer	30	+40%			
S4.001	SW06	60 Winter	30	+40%	30/15 Summer		
S1.007	A1	60 Winter	30	+40%	30/30 Summer	30/30 Winter	
S1.008	SW07	180 Summer	30	+40%	2/60 Summer	30/30 Winter	
S6.000	SW07a	480 Winter	30	+40%	2/180 Winter		
S1.009	North Swale	480 Winter	30	+40%	30/60 Summer		
S1.010	SW08	480 Winter	30	+40%	30/60 Summer		
S7.000	RWP 20-21	720 Winter	30	+40%			
S1.011	SW09	480 Winter	30	+40%	2/180 Winter		
S1.012	SW10	30 Summer	30	+40%	2/30 Summer		
S8.000	East Detention Pond	1440 Winter	30	+40%	30/360 Winter		
S8.001	sw11	1440 Winter	30	+40%	30/120 Summer	100/360 Winter	
S9.000	RWP 25-26	15 Summer	30	+40%			
S1.013	SW12	1440 Winter	30	+40%	2/15 Summer	100/720 Winter	2/30 Winter
S10.000	SW14	1440 Winter	30	+40%	30/120 Winter	100/600 Winter	
S11.000	SW15 (dummy1)	1440 Winter	30	+40%	30/15 Summer		
S11.001	SW15 (dummy2)	1440 Winter	30	+40%	100/600 Winter		
S10.001	SW15	1440 Winter	30	+40%	30/180 Winter		
S12.000	FD03	1440 Winter	30	+40%	2/120 Winter		
S1.014	South East Swale	1440 Winter	30	+40%	2/120 Winter		
S13.000	RWP 46-48	15 Summer	30	+40%			

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	RWP 1-3		43.868	0.000	0.000	0.54			26.3
S1.001	SW01		43.907	0.065	0.000	1.48			80.0
S2.000	RWP4-9		43.775	0.000	0.000	4.14			75.9
S1.002	A2		43.736	-0.064	0.000	0.77		111	21.1
S1.003	SW02		43.813	0.037	0.000	0.39			21.6
S1.004	SW03		43.894	0.180	0.000	0.22			21.1
S3.000	RWP 10-11		43.675	0.000	0.000	0.14			4.3
S1.005	SW04		43.895	0.326	0.000	0.31			20.6
S1.006	SW05		43.934	0.448	0.000	0.95			27.9
S4.000	RWP 12-17		43.525	0.000	0.000	2.32			88.3
S5.000	RWP 18-19		43.603	0.000	0.000	0.44			13.1
S4.001	SW06		43.982	0.455	0.000	1.00			64.4
S1.007	A1		43.901	0.601	1.302	2.77			50.3
S1.008	SW07		43.901	0.751	1.317	1.99			35.4
S6.000	SW07a		43.541	0.316	0.000	0.11			3.7
S1.009	North Swale		43.539	0.269	0.000	0.25			13.8
S1.010	SW08		43.545	0.295	0.000	0.10			12.3
S7.000	RWP 20-21		43.525	0.000	0.000	0.08			3.0
S1.011	SW09		43.544	0.329	0.000	0.09			12.1
S1.012	SW10		43.432	0.339	0.000	0.21			39.6
S8.000	East Detention Pond		43.341	0.091	0.000	0.00			0.6
S8.001	sw11		43.341	0.416	0.000	0.11			3.6
S9.000	RWP 25-26		43.150	0.000	0.000	1.12			20.1
S1.013	SW12	69	43.341	0.491	0.000	0.04	9.3		5.8
S10.000	SW14		43.060	0.260	0.000	0.02			0.7
S11.000	SW15 (dummy1)		43.056	0.156	0.000	0.07			1.6
S11.001	SW15 (dummy2)		43.056	-0.001	0.000	0.01			1.7
S10.001	SW15		43.061	0.171	0.000	0.01			2.6
S12.000	FD03		43.060	0.510	0.000	0.06			0.7
S1.014	South East Swale		43.061	0.511	0.000	0.10			15.0
S13.000	RWP 46-48		44.150	0.000	0.000	1.44			33.5

PN	US/MH Name	Status	Level Exceeded
S1.000	RWP 1-3	FLOOD RISK*	
S1.001	SW01	FLOOD RISK	
S2.000	RWP4-9	SURCHARGED*	
S1.002	A2	OK	
S1.003	SW02	FLOOD RISK	
S1.004	SW03	FLOOD RISK	
S3.000	RWP 10-11	SURCHARGED*	
S1.005	SW04	FLOOD RISK	
S1.006	SW05	FLOOD RISK	
S4.000	RWP 12-17	SURCHARGED*	
S5.000	RWP 18-19	SURCHARGED*	
S4.001	SW06	FLOOD RISK	
S1.007	A1	FLOOD	44
S1.008	SW07	FLOOD	43
S6.000	SW07a	SURCHARGED	
S1.009	North Swale	SURCHARGED	
S1.010	SW08	SURCHARGED	
S7.000	RWP 20-21	SURCHARGED*	
S1.011	SW09	SURCHARGED	
S1.012	SW10	SURCHARGED	
S8.000	East Detention Pond	SURCHARGED	
S8.001	sw11	FLOOD RISK	11
S9.000	RWP 25-26	SURCHARGED*	
S1.013	SW12	FLOOD RISK	3

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

PN	US/MH Name	Status	Level Exceeded
S10.000	SW14	FLOOD RISK	4
S11.000	SW15 (dummy1)	FLOOD RISK	
S11.001	SW15 (dummy2)	FLOOD RISK	
S10.001	SW15	FLOOD RISK	
S12.000	FD03	FLOOD RISK	
S1.014	South East Swale	SURCHARGED	
S13.000	RWP 46-48	FLOOD RISK*	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S13.001	West Swale	180 Winter	30	+40%				
S13.002	Null	180 Winter	30	+40%	2/15 Winter	2/15 Winter		
S14.000	SW16 (RWP 38 - 45)	15 Winter	30	+40%	2/15 Summer	100/15 Summer		
S13.003	South Swale	15 Summer	30	+40%	2/15 Summer			
S15.000	RWP 36-37	15 Summer	30	+40%				
S13.004	SW17	180 Winter	30	+40%	2/15 Summer	2/15 Summer		
S16.000	SW13a (RWP 27-32)	15 Winter	30	+40%	30/15 Summer	100/15 Summer		
S16.001	SW13	15 Winter	30	+40%	30/15 Summer	100/15 Summer		
S16.002	MH13B	15 Winter	30	+40%	30/15 Summer			
S16.003	SW13c	1440 Winter	30	+40%	2/15 Winter	30/1440 Winter		
S13.005	New Swale	1440 Winter	30	+40%	2/15 Summer	30/360 Winter		
S1.015	SW19	960 Winter	30	+40%	2/15 Summer	30/360 Winter		
S1.016	SW20	240 Summer	30	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S13.001	West Swale	43.794	-0.056	0.000	0.02		4.3	FLOOD RISK
S13.002	Null	43.793	0.045	45.387	0.02		4.0	FLOOD
S14.000	SW16 (RWP 38 - 45)	44.049	0.434	0.000	1.34		99.1	FLOOD RISK
S13.003	South Swale	43.834	0.375	0.000	0.67		34.3	FLOOD RISK
S15.000	RWP 36-37	43.175	0.000	0.000	0.16		26.9	SURCHARGED*
S13.004	SW17	43.785	1.085	34.996	0.08		5.8	FLOOD
S16.000	SW13a (RWP 27-32)	43.848	0.423	0.000	1.07		89.0	FLOOD RISK
S16.001	SW13	43.163	0.253	0.000	0.97		94.2	FLOOD RISK
S16.002	MH13B	42.985	0.265	0.000	1.25		95.1	FLOOD RISK
S16.003	SW13c	42.952	0.432	9.796	0.11		6.7	FLOOD
S13.005	New Swale	42.954	0.579	56.466	0.44		8.1	FLOOD
S1.015	SW19	43.150	0.821	0.128	0.27		8.5	FLOOD
S1.016	SW20	42.079	-0.146	0.000	0.27		8.5	OK

PN	US/MH Name	Level Exceeded
S13.001	West Swale	
S13.002	Null	50
S14.000	SW16 (RWP 38 - 45)	4
S13.003	South Swale	
S15.000	RWP 36-37	
S13.004	SW17	53
S16.000	SW13a (RWP 27-32)	3
S16.001	SW13	4
S16.002	MH13B	
S16.003	SW13c	12
S13.005	New Swale	24
S1.015	SW19	24
S1.016	SW20	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
 Number of Online Controls 6 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 40, 40, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
S1.000	RWP 1-3	15 Summer	100	+40%			
S1.001	SW01	15 Winter	100	+40%	30/15 Summer		
S2.000	RWP4-9	15 Summer	100	+40%			
S1.002	A2	180 Winter	100	+40%	100/60 Winter		
S1.003	SW02	180 Winter	100	+40%	30/60 Winter		
S1.004	SW03	60 Summer	100	+40%	30/30 Winter		
S3.000	RWP 10-11	15 Summer	100	+40%			
S1.005	SW04	30 Winter	100	+40%	30/15 Summer		
S1.006	SW05	180 Summer	100	+40%	30/15 Summer		
S4.000	RWP 12-17	15 Summer	100	+40%			
S5.000	RWP 18-19	15 Summer	100	+40%			
S4.001	SW06	60 Winter	100	+40%	30/15 Summer		
S1.007	A1	60 Winter	100	+40%	30/30 Summer	30/30 Winter	
S1.008	SW07	1440 Winter	100	+40%	2/60 Summer	30/30 Winter	
S6.000	SW07a	600 Winter	100	+40%	2/180 Winter		
S1.009	North Swale	600 Winter	100	+40%	30/60 Summer		
S1.010	SW08	600 Winter	100	+40%	30/60 Summer		
S7.000	RWP 20-21	1440 Summer	100	+40%			
S1.011	SW09	600 Winter	100	+40%	2/180 Winter		
S1.012	SW10	15 Winter	100	+40%	2/30 Summer		
S8.000	East Detention Pond	1440 Winter	100	+40%	30/360 Winter		
S8.001	sw11	1440 Winter	100	+40%	30/120 Summer	100/360 Winter	
S9.000	RWP 25-26	15 Summer	100	+40%			
S1.013	SW12	1440 Winter	100	+40%	2/15 Summer	100/720 Winter	2/30 Winter
S10.000	SW14	1440 Winter	100	+40%	30/120 Winter	100/600 Winter	
S11.000	SW15 (dummy1)	15 Winter	100	+40%	30/15 Summer		
S11.001	SW15 (dummy2)	1440 Winter	100	+40%	100/600 Winter		
S10.001	SW15	1440 Winter	100	+40%	30/180 Winter		
S12.000	FD03	1440 Winter	100	+40%	2/120 Winter		
S1.014	South East Swale	1440 Winter	100	+40%	2/120 Winter		
S13.000	RWP 46-48	15 Summer	100	+40%			

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	RWP 1-3		43.868	0.000	0.000	0.74			35.8
S1.001	SW01		43.986	0.144	0.000	1.92			103.6
S2.000	RWP4-9		43.775	0.000	0.000	5.05			92.4
S1.002	A2		43.881	0.081	0.000	0.56			15.4
S1.003	SW02		43.882	0.106	0.000	0.28			15.5
S1.004	SW03		43.906	0.192	0.000	0.26			25.2
S3.000	RWP 10-11		43.675	0.000	0.000	1.12			33.6
S1.005	SW04		43.921	0.352	0.000	0.45			29.7
S1.006	SW05		43.940	0.454	0.000	0.93			27.5
S4.000	RWP 12-17		43.525	0.000	0.000	2.93			111.5
S5.000	RWP 18-19		43.603	0.000	0.000	0.55			16.6
S4.001	SW06		44.035	0.508	0.000	1.33			85.5
S1.007	A1		43.922	0.622	22.443	2.72			49.4
S1.008	SW07		43.901	0.751	1.206	1.82			32.3
S6.000	SW07a		43.643	0.418	0.000	0.12			4.0
S1.009	North Swale		43.641	0.371	0.000	0.23			12.7
S1.010	SW08		43.646	0.396	0.000	0.10			12.7
S7.000	RWP 20-21		43.525	0.000	0.000	0.09			3.2
S1.011	SW09		43.645	0.430	0.000	0.10			13.4
S1.012	SW10		43.511	0.419	0.000	0.35			64.2
S8.000	East Detention Pond		43.471	0.221	0.000	0.01			0.8
S8.001	sw11		43.471	0.546	66.263	0.05			1.7
S9.000	RWP 25-26		43.150	0.000	0.000	1.37			24.5
S1.013	SW12	69	43.471	0.621	21.384	0.04	12.5		5.7
S10.000	SW14		43.099	0.299	18.986	0.03			1.0
S11.000	SW15 (dummy1)		43.161	0.261	0.000	1.63			38.6
S11.001	SW15 (dummy2)		43.092	0.035	0.000	0.01			2.1
S10.001	SW15		43.102	0.212	0.000	0.02			2.9
S12.000	FD03		43.102	0.552	0.000	0.08			0.8
S1.014	South East Swale		43.103	0.553	0.000	0.09			12.9
S13.000	RWP 46-48		44.150	0.000	0.000	1.73			40.1

PN	US/MH Name	Status	Level Exceeded
S1.000	RWP 1-3	FLOOD RISK*	
S1.001	SW01	FLOOD RISK	
S2.000	RWP4-9	SURCHARGED*	
S1.002	A2	FLOOD RISK	
S1.003	SW02	FLOOD RISK	
S1.004	SW03	FLOOD RISK	
S3.000	RWP 10-11	SURCHARGED*	
S1.005	SW04	FLOOD RISK	
S1.006	SW05	FLOOD RISK	
S4.000	RWP 12-17	SURCHARGED*	
S5.000	RWP 18-19	SURCHARGED*	
S4.001	SW06	FLOOD RISK	
S1.007	A1	FLOOD	44
S1.008	SW07	FLOOD	43
S6.000	SW07a	SURCHARGED	
S1.009	North Swale	FLOOD RISK	
S1.010	SW08	FLOOD RISK	
S7.000	RWP 20-21	SURCHARGED*	
S1.011	SW09	SURCHARGED	
S1.012	SW10	SURCHARGED	
S8.000	East Detention Pond	SURCHARGED	
S8.001	sw11	FLOOD	11
S9.000	RWP 25-26	SURCHARGED*	
S1.013	SW12	FLOOD	3

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

PN	US/MH Name	Status	Level Exceeded
S10.000	SW14	FLOOD	4
S11.000	SW15 (dummy1)	FLOOD RISK	
S11.001	SW15 (dummy2)	FLOOD RISK	
S10.001	SW15	FLOOD RISK	
S12.000	FD03	FLOOD RISK	
S1.014	South East Swale	SURCHARGED	
S13.000	RWP 46-48	FLOOD RISK*	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S13.001	West Swale	240 Winter	100	+40%				
S13.002	Null	240 Winter	100	+40%	2/15 Winter	2/15 Winter		
S14.000	SW16 (RWP 38 - 45)	15 Winter	100	+40%	2/15 Summer	100/15 Summer		
S13.003	South Swale	30 Winter	100	+40%	2/15 Summer			
S15.000	RWP 36-37	15 Summer	100	+40%				
S13.004	SW17	240 Winter	100	+40%	2/15 Summer	2/15 Summer		
S16.000	SW13a (RWP 27-32)	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S16.001	SW13	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S16.002	MH13B	1440 Winter	100	+40%	30/15 Summer			
S16.003	SW13c	1440 Winter	100	+40%	2/15 Winter	30/1440 Winter		
S13.005	New Swale	1440 Winter	100	+40%	2/15 Summer	30/360 Winter		
S1.015	SW19	1440 Winter	100	+40%	2/15 Summer	30/360 Winter		
S1.016	SW20	240 Summer	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S13.001	West Swale	43.826	-0.024	0.000	0.03		5.3	FLOOD RISK
S13.002	Null	43.825	0.077	77.568	0.02		3.8	FLOOD
S14.000	SW16 (RWP 38 - 45)	44.060	0.445	9.829	1.35		100.2	FLOOD
S13.003	South Swale	43.846	0.387	0.000	0.70		35.7	FLOOD RISK
S15.000	RWP 36-37	43.175	0.000	0.000	0.20		34.5	SURCHARGED*
S13.004	SW17	43.817	1.117	67.429	0.08		5.8	FLOOD
S16.000	SW13a (RWP 27-32)	44.103	0.678	2.746	1.25		104.3	FLOOD
S16.001	SW13	43.185	0.275	4.633	1.01		98.1	FLOOD
S16.002	MH13B	43.037	0.317	0.000	0.09		7.0	FLOOD RISK
S16.003	SW13c	43.037	0.517	94.207	0.14		8.6	FLOOD
S13.005	New Swale	43.038	0.663	94.464	0.46		8.5	FLOOD
S1.015	SW19	43.150	0.821	0.162	0.27		8.5	FLOOD
S1.016	SW20	42.079	-0.146	0.000	0.27		8.5	OK

PN	US/MH Name	Level Exceeded
S13.001	West Swale	
S13.002	Null	50
S14.000	SW16 (RWP 38 - 45)	4
S13.003	South Swale	
S15.000	RWP 36-37	
S13.004	SW17	53
S16.000	SW13a (RWP 27-32)	3
S16.001	SW13	4
S16.002	MH13B	
S16.003	SW13c	12
S13.005	New Swale	24
S1.015	SW19	24
S1.016	SW20	