Cascade Model Details for Catchment A7 basin design.SRCX

Storage is Online Cover Level (m) 32.000

Tank or Pond Structure

Invert Level (m) 30.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1700.0	1.600	2580.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0291-5000-1300-5000
Design Head (m)	1.300
Design Flow (l/s)	50.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	291
Invert Level (m)	30.400
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	49.9
Flush-Flo™	0.478	49.9
Kick-Flo®	0.957	43.1
Mean Flow over Head Range	-	41.6

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	9.0	1.200	48.0	3.000	74.8	7.000	113.0
0.200	30.0	1.400	51.7	3.500	80.6	7.500	116.9
0.300	48.0	1.600	55.2	4.000	86.0	8.000	120.6
0.400	49.6	1.800	58.4	4.500	91.1	8.500	124.2
0.500	49.9	2.000	61.5	5.000	95.9	9.000	127.8
0.600	49.4	2.200	64.4	5.500	100.5	9.500	131.2
0.800	47.4	2.400	67.1	6.000	104.8		
1.000	44.0	2.600	69.8	6.500	109.0		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 6.000 Invert Level (m) 31.650

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Cascade Summary of Results for Catchment A8 basin design.SRCX

Upstream Structures	Outflow To	Overflow To
Catchment A7 basin design.SRCX	(None)	(None)
Catchment A6 basin design.SRCX		
Catchment A5 basin design.SRCX		
Catchment A3 basin design.SRCX		
Catchment A4 basin design.SRCX		
Catchment A2 basin design.SRCX		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	25.247	0.247	47.7	153.8	O K
30 min Summer	25.253	0.253	49.3	157.2	O K
60 min Summer	25.255	0.255	49.9	158.6	O K
120 min Summer	25.255	0.255	49.9	158.6	O K
180 min Summer	25.255	0.255	49.9	158.6	O K
240 min Summer	25.255	0.255	49.9	158.6	O K
360 min Summer	25.255	0.255	49.9	158.5	O K
480 min Summer	25.346	0.346	67.4	221.4	O K
600 min Summer	25.583	0.583	69.5	397.6	O K
720 min Summer	25.740	0.740	69.5	526.0	O K
960 min Summer	25.949	0.949	69.5	712.1	O K
1440 min Summer	25.992	0.992	69.5	752.9	O K
2160 min Summer	25.890	0.890	69.5	657.8	O K
2880 min Summer	25.756	0.756	69.5	539.3	O K
4320 min Summer	25.580	0.580	69.5	395.0	O K
5760 min Summer	25.577	0.577	69.5	392.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	2218.7	360
30 min Summer	76.349	0.0	3098.9	397
60 min Summer	51.945	0.0	4596.5	324
120 min Summer	31.389	0.0	5538.6	1190
180 min Summer	23.519	0.0	6227.1	1738
240 min Summer	19.191	0.0	6749.2	2242
360 min Summer	14.401	0.0	7461.7	2604
480 min Summer	11.730	0.0	7815.0	512
600 min Summer	9.999	0.0	8031.2	624
720 min Summer	8.774	0.0	8171.2	736
960 min Summer	7.140	0.0	8333.8	972
1440 min Summer	5.307	0.0	8380.4	1250
2160 min Summer	3.957	0.0	12841.4	1636
2880 min Summer	3.233	0.0	13958.9	2000
4320 min Summer	2.467	0.0	14832.8	2792
5760 min Summer	2.064	0.0	17957.8	3600

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Cascade Summary of Results for Catchment A8 basin design.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
7200 min Summer	25.590	0.590	69.5	403.2	O K
8640 min Summer	25.608	0.608	69.5	417.2	O K
10080 min Summer	25.633	0.633	69.5	437.2	O K
15 min Winter	25.247	0.247	47.7	153.8	O K
30 min Winter	25.253	0.253	49.3	157.2	O K
60 min Winter	25.255	0.255	49.9	158.6	O K
120 min Winter	25.255	0.255	49.9	158.6	O K
180 min Winter	25.255	0.255	49.9	158.6	O K
240 min Winter	25.255	0.255	49.9	158.6	O K
360 min Winter	25.255	0.255	49.9	158.5	O K
480 min Winter	25.351	0.351	67.5	224.6	O K
600 min Winter	25.623	0.623	69.5	428.8	O K
720 min Winter	25.802	0.802	69.5	579.6	O K
960 min Winter	26.028	1.028	69.5	787.1	O K
1440 min Winter	26.032	1.032	69.5	791.7	O K
2160 min Winter	25.847	0.847	69.5	619.3	O K
2880 min Winter	25.615	0.615	69.5	422.7	O K
4320 min Winter	25.507	0.507	69.5	338.1	O K
5760 min Winter	25.431	0.431	69.0	281.6	O K
7200 min Winter	25.450	0.450	69.2	295.9	O K
8640 min Winter	25.447	0.447	69.2	293.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.820	0.0	19784.0	4400
8640 min Summer	1.655	0.0	21576.4	5192
10080 min Summer	1.538	0.0	23334.5	5968
15 min Winter	107.336	0.0	2218.8	360
30 min Winter	76.349	0.0	3099.6	562
60 min Winter	51.945	0.0	4592.4	308
120 min Winter	31.389	0.0	5538.3	1180
180 min Winter	23.519	0.0	6229.2	1752
240 min Winter	19.191	0.0	6753.8	2254
360 min Winter	14.401	0.0	7467.4	2598
480 min Winter	11.730	0.0	7834.9	506
600 min Winter	9.999	0.0	8059.9	616
720 min Winter	8.774	0.0	8202.4	730
960 min Winter	7.140	0.0	8367.4	950
1440 min Winter	5.307	0.0	8394.7	1342
2160 min Winter	3.957	0.0	12841.2	1692
2880 min Winter	3.233	0.0	13957.3	2100
4320 min Winter	2.467	0.0	14926.5	2948
5760 min Winter	2.064	0.0	17958.1	3728
7200 min Winter	1.820	0.0	19784.5	4576
8640 min Winter	1.655	0.0	21577.0	5408

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Cascade Summary of Results for Catchment A8 basin design.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	25.438	0.438	69.1	287.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.538	0.0	23334.8	6192

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Cascade Rainfall Details for Catchment A8 basin design.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.001

Time (mins) From:	To:	Area (ha)
0	4	0.001

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Cascade Model Details for Catchment A8 basin design.SRCX

Storage is Online Cover Level (m) 26.500

Tank or Pond Structure

Invert Level (m) 25.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	580.0	1.500	1180.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0336-6970-1200-6970
Design Head (m)	1.200
Design Flow (l/s)	69.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	336
Invert Level (m)	25.000
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	69.7
Flush-Flo™	0.515	69.5
Kick-Flo®	0.926	61.5
Mean Flow over Head Range	-	56.3

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	9.9	1.200	69.7	3.000	108.7	7.000	164.4
0.200	34.2	1.400	75.1	3.500	117.1	7.500	170.0
0.300	61.7	1.600	80.1	4.000	125.0	8.000	175.5
0.400	68.6	1.800	84.8	4.500	132.4	8.500	180.8
0.500	69.5	2.000	89.2	5.000	139.4	9.000	185.9
0.600	69.1	2.200	93.4	5.500	146.1	9.500	190.9
0.800	66.1	2.400	97.5	6.000	152.4		
1.000	63.8	2.600	101.4	6.500	158.5		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	22.470	0.220	2.8	131.9	O K
30 min Summer	22.562	0.312	2.8	186.9	O K
60 min Summer	22.670	0.420	2.8	252.1	O K
120 min Summer	22.749	0.499	2.8	299.2	O K
180 min Summer	22.802	0.552	2.8	330.9	O K
240 min Summer	22.842	0.592	2.8	355.0	O K
360 min Summer	22.899	0.649	2.8	389.6	O K
480 min Summer	22.937	0.687	2.8	412.5	O K
600 min Summer	22.964	0.714	2.8	428.4	O K
720 min Summer	22.983	0.733	2.8	439.9	O K
960 min Summer	23.007	0.757	2.8	454.4	O K
1440 min Summer	23.017	0.767	2.8	460.4	O K
2160 min Summer	23.014	0.764	2.8	458.5	O K
2880 min Summer	23.009	0.759	2.8	455.6	O K
4320 min Summer	23.002	0.752	2.8	451.2	O K
5760 min Summer	22.998	0.748	2.8	448.7	O K
7200 min Summer	23.000	0.750	2.8	449.9	O K
8640 min Summer	23.005	0.755	2.8	453.2	O K
10080 min Summer	23.014	0.764	2.8	458.1	O K
15 min Winter	22.470	0.220	2.8	132.0	O K
30 min Winter	22.562	0.312	2.8	186.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	121.9	23
30 min Summer	76.349	0.0	172.7	37
60 min Summer	51.945	0.0	252.4	68
120 min Summer	31.389	0.0	304.6	126
180 min Summer	23.519	0.0	341.2	186
240 min Summer	19.191	0.0	369.3	246
360 min Summer	14.401	0.0	407.7	366
480 min Summer	11.730	0.0	425.7	484
600 min Summer	9.999	0.0	426.6	604
720 min Summer	8.774	0.0	422.5	724
960 min Summer	7.140	0.0	411.6	962
1440 min Summer	5.307	0.0	390.7	1400
2160 min Summer	3.957	0.0	701.5	1736
2880 min Summer	3.233	0.0	755.2	2136
4320 min Summer	2.467	0.0	735.8	2980
5760 min Summer	2.064	0.0	987.9	3808
7200 min Summer	1.820	0.0	1088.0	4680
8640 min Summer	1.655	0.0	1185.8	5528
10080 min Summer	1.538	0.0	1279.4	6352
15 min Winter	107.336	0.0	121.9	22
30 min Winter	76.349	0.0	172.7	37

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	22.670	0.420	2.8	252.2	O K
120 min Winter	22.749	0.499	2.8	299.2	O K
180 min Winter	22.802	0.552	2.8	331.0	O K
240 min Winter	22.842	0.592	2.8	355.1	O K
360 min Winter	22.899	0.649	2.8	389.6	O K
480 min Winter	22.938	0.688	2.8	412.5	O K
600 min Winter	22.964	0.714	2.8	428.6	O K
720 min Winter	22.984	0.734	2.8	440.4	O K
960 min Winter	23.009	0.759	2.8	455.5	O K
1440 min Winter	23.022	0.772	2.8	463.1	O K
2160 min Winter	23.010	0.760	2.8	455.7	O K
2880 min Winter	22.998	0.748	2.8	449.0	O K
4320 min Winter	22.970	0.720	2.8	432.2	O K
5760 min Winter	22.942	0.692	2.8	415.0	O K
7200 min Winter	22.918	0.668	2.8	401.0	O K
8640 min Winter	22.897	0.647	2.8	388.4	O K
10080 min Winter	22.878	0.628	2.8	376.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	51.945	0.0	252.4	66
120 min Winter	31.389	0.0	304.6	124
180 min Winter	23.519	0.0	341.2	182
240 min Winter	19.191	0.0	369.3	242
360 min Winter	14.401	0.0	407.9	360
480 min Winter	11.730	0.0	426.3	476
600 min Winter	9.999	0.0	427.6	592
720 min Winter	8.774	0.0	423.5	706
960 min Winter	7.140	0.0	412.9	934
1440 min Winter	5.307	0.0	392.6	1374
2160 min Winter	3.957	0.0	701.7	1796
2880 min Winter	3.233	0.0	756.3	2224
4320 min Winter	2.467	0.0	748.1	3160
5760 min Winter	2.064	0.0	988.0	4096
7200 min Winter	1.820	0.0	1088.2	5040
8640 min Winter	1.655	0.0	1186.5	5968
10080 min Winter	1.538	0.0	1282.4	6864

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.500

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.250	4	8	0.250

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Model Details

Storage is Online Cover Level (m) 23.750

Tank or Pond Structure

Invert Level (m) 22.250

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	1.500	600.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0080-2800-1000-2800
Design Head (m)	1.000
Design Flow (l/s)	2.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	80
Invert Level (m)	22.250
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.8
Flush-Flo™	0.299	2.8
Kick-Flo®	0.623	2.3
Mean Flow over Head Range	-	2.5

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	2.3	1.200	3.0	3.000	4.7	7.000	6.9
0.200	2.7	1.400	3.3	3.500	5.0	7.500	7.2
0.300	2.8	1.600	3.5	4.000	5.3	8.000	7.4
0.400	2.8	1.800	3.7	4.500	5.6	8.500	7.6
0.500	2.6	2.000	3.9	5.000	5.9	9.000	7.8
0.600	2.4	2.200	4.0	5.500	6.2	9.500	8.0
0.800	2.5	2.400	4.2	6.000	6.4		
1.000	2.8	2.600	4.4	6.500	6.7		

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 271172 196525 SS 71172 96525	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
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)	Time (mins)	Area (ha)
0-4	4.593	8-12	0.120	16-20	1.618	24-28	6.763	32-36	1.942
4-8	4.049	12-16	0.145	20-24	4.159	28-32	3.800	36-40	0.094

Total Area Contributing (ha) = 27.281

Total Pipe Volume (m^3) = 8454.176

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

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Network Design Table for Storm

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)

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.000	2.000	20.0	0.294	5.00	0.0	0.600		o	300	Pipe/Conduit	
1.001	12.000	1.000	12.0	0.248	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.002	12.000	1.000	12.0	0.220	0.00	0.0		0.045	3 \=/	500	1:3 Swale	
1.003	33.000	1.500	22.0	0.491	0.00	0.0		0.045	3 \=/	500	1:3 Swale	
1.004	50.000	1.500	33.3	0.059	0.00	0.0		0.045	3 \=/	500	1:3 Swale	
1.005	19.000	3.000	6.3	0.689	0.00	0.0		0.045	3 \=/	500	1:3 Swale	
1.006	19.000	0.040	475.0	0.020	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.007	50.000	0.960	52.1	0.221	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.008	50.000	0.100	500.0	0.221	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.009	50.000	0.100	500.0	0.302	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.010	7.000	0.014	500.0	0.272	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.011	50.000	1.786	28.0	0.088	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.012	30.000	2.000	15.0	0.137	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.013	31.000	2.000	15.5	0.108	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.014	24.000	1.000	24.0	0.104	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.015	20.000	1.000	20.0	0.091	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.016	18.000	1.450	12.4	0.098	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.017	20.000	0.040	500.0	0.094	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.018	5.000	0.490	10.2	0.296	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.019	20.000	0.600	33.3	0.076	0.00	0.0	0.600		o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.19	77.575	0.294	0.0	0.0	0.0	3.53	249.6	39.8
1.001	50.00	5.23	75.575	0.542	0.0	0.0	0.0	4.56	322.5	73.4
1.002	50.00	5.38	74.575	0.762	0.0	0.0	0.0	1.37	194.8	103.2
1.003	50.00	5.92	73.500	1.253	0.0	0.0	0.0	1.01	143.9«	169.7
1.004	47.27	6.94	71.925	1.312	0.0	0.0	0.0	0.82	116.9«	169.7
1.005	46.81	7.11	70.425	2.001	0.0	0.0	0.0	1.88	268.1	253.7
1.006	46.11	7.37	67.200	2.021	0.0	0.0	0.0	1.20	427.9	253.7
1.007	45.52	7.60	67.160	2.242	0.0	0.0	0.0	3.64	1301.5	276.4
1.008	43.77	8.32	66.125	2.463	0.0	0.0	0.0	1.17	417.0	292.0
1.009	42.17	9.03	66.025	2.765	0.0	0.0	0.0	1.17	417.0	315.8
1.010	41.96	9.13	65.925	3.037	0.0	0.0	0.0	1.17	417.0	345.1
1.011	41.61	9.30	65.911	3.125	0.0	0.0	0.0	4.97	1776.9	352.1
1.012	40.85	9.68	64.500	3.262	0.0	0.0	0.0	1.33	289.3«	360.8
1.013	40.08	10.07	62.500	3.370	0.0	0.0	0.0	1.31	284.6«	365.8
1.014	39.37	10.45	61.500	3.474	0.0	0.0	0.0	1.05	228.7«	370.4
1.015	38.86	10.74	60.500	3.565	0.0	0.0	0.0	1.15	250.5«	375.1
1.016	38.50	10.95	59.500	3.663	0.0	0.0	0.0	1.46	318.0«	381.9
1.017	38.04	11.21	58.050	3.757	0.0	0.0	0.0	1.24	549.9	387.1
1.018	38.03	11.22	57.560	4.053	0.0	0.0	0.0	8.79	3883.0	417.4
1.019	37.91	11.29	57.500	4.129	0.0	0.0	0.0	4.86	2145.8	424.0

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.020	50.000	1.950	25.6	0.247	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.021	50.000	4.500	11.1	0.208	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.022	40.000	5.500	7.3	0.162	0.00	0.0	0.600		o	750	Pipe/Conduit	
2.000	50.000	1.650	30.3	0.047	5.00	0.0	0.600		o	150	Pipe/Conduit	
2.001	50.000	1.500	33.3	0.202	0.00	0.0	0.600		o	300	Pipe/Conduit	
2.002	40.000	2.575	15.5	0.156	0.00	0.0	0.600		o	300	Pipe/Conduit	
2.003	50.000	2.500	20.0	0.065	0.00	0.0	0.600		o	375	Pipe/Conduit	
2.004	20.000	1.000	20.0	0.059	0.00	0.0	0.600		o	375	Pipe/Conduit	
2.005	50.000	4.075	12.3	0.078	0.00	0.0	0.600		o	375	Pipe/Conduit	
2.006	50.000	3.075	16.3	0.215	0.00	0.0	0.600		o	450	Pipe/Conduit	
2.007	25.000	2.000	12.5	0.293	0.00	0.0	0.600		o	525	Pipe/Conduit	
2.008	30.000	2.575	11.7	0.254	0.00	0.0	0.600		o	525	Pipe/Conduit	
2.009	30.000	0.575	52.2	0.077	0.00	0.0	0.600		o	600	Pipe/Conduit	
2.010	10.000	0.500	20.0	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
1.023	35.000	1.500	23.3	0.098	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.024	10.000	0.050	200.0	0.118	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.025	40.000	1.500	26.7	0.218	0.00	0.0	0.045	3	\=/	1000	1:3 Swale	
1.026	40.000	1.000	40.0	0.150	0.00	0.0	0.045	3	\=/	1000	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.020	37.67	11.44	56.050	4.376	0.0	0.0	0.0	5.54	2447.4	446.4
1.021	37.51	11.54	54.550	4.584	0.0	0.0	0.0	8.42	3720.9	465.6
1.022	37.40	11.61	50.050	4.746	0.0	0.0	0.0	10.41	4600.5	480.8
2.000	50.00	5.45	66.650	0.047	0.0	0.0	0.0	1.84	32.4	6.4
2.001	50.00	5.76	65.000	0.249	0.0	0.0	0.0	2.73	193.2	33.7
2.002	50.00	5.93	63.500	0.405	0.0	0.0	0.0	4.01	283.4	54.8
2.003	49.59	6.13	60.925	0.470	0.0	0.0	0.0	4.07	449.2	63.1
2.004	49.35	6.21	58.425	0.529	0.0	0.0	0.0	4.07	449.2	70.7
2.005	48.88	6.37	57.425	0.607	0.0	0.0	0.0	5.20	574.0	80.3
2.006	48.40	6.54	53.350	0.822	0.0	0.0	0.0	5.06	804.9	107.7
2.007	48.21	6.60	50.275	1.115	0.0	0.0	0.0	6.36	1376.7	145.6
2.008	48.00	6.68	48.275	1.369	0.0	0.0	0.0	6.59	1426.1	177.9
2.009	47.58	6.83	45.700	1.446	0.0	0.0	0.0	3.38	954.7	186.3
2.010	47.50	6.85	45.125	1.446	0.0	0.0	0.0	5.88	2103.1	186.3
1.023	37.24	11.71	44.550	6.290	0.0	0.0	0.0	5.81	2565.8	634.4
1.024	37.11	11.79	43.050	6.408	0.0	0.0	0.0	1.98	872.6	644.0
1.025	36.09	12.46	43.000	6.626	0.0	0.0	0.0	1.00	217.0«	647.7
1.026	34.94	13.28	40.500	6.776	0.0	0.0	0.0	0.81	177.2«	647.7

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.027	45.000	0.900	50.0	0.072	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.028	20.000	1.000	20.0	0.072	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.029	24.000	1.000	24.0	0.078	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.030	22.000	1.000	22.0	0.059	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.031	25.000	0.500	50.0	0.085	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
1.032	36.000	7.500	4.8	0.104	0.00	0.0	0.600		o	900	Pipe/Conduit	
3.000	50.000	1.075	46.5	0.429	5.00	0.0	0.600		o	375	Pipe/Conduit	
3.001	50.000	2.150	23.3	0.423	0.00	0.0	0.600		o	375	Pipe/Conduit	
3.002	50.000	1.075	46.5	0.074	0.00	0.0	0.600		o	450	Pipe/Conduit	
3.003	11.000	0.027	407.4	0.282	0.00	0.0	0.600		o	450	Pipe/Conduit	
3.004	50.000	3.323	15.0	0.236	0.00	0.0	0.600		o	525	Pipe/Conduit	
3.005	50.000	1.000	50.0	0.293	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
3.006	44.000	1.725	25.5	0.419	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
4.000	50.000	0.500	100.0	0.176	5.00	0.0	0.600		o	300	Pipe/Conduit	
4.001	50.000	1.150	43.5	0.202	0.00	0.0	0.600		o	300	Pipe/Conduit	
4.002	50.000	2.000	25.0	0.358	0.00	0.0	0.600		o	450	Pipe/Conduit	
4.003	30.000	0.500	60.0	0.143	0.00	0.0	0.600		o	450	Pipe/Conduit	
4.004	50.000	0.950	52.6	0.098	0.00	0.0	0.600		o	900	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.027	33.61	14.31	39.500	6.848	0.0	0.0	0.0	0.73	158.5«	647.7
1.028	33.26	14.60	38.600	6.920	0.0	0.0	0.0	1.15	250.5«	647.7
1.029	32.82	14.98	38.500	6.998	0.0	0.0	0.0	1.05	228.7«	647.7
1.030	32.44	15.31	37.500	7.057	0.0	0.0	0.0	1.10	238.9«	647.7
1.031	31.81	15.88	36.500	7.142	0.0	0.0	0.0	0.73	158.5«	647.7
1.032	31.76	15.92	36.000	7.246	0.0	0.0	0.0	14.35	9128.9	647.7
3.000	50.00	5.31	63.650	0.429	0.0	0.0	0.0	2.66	294.1	58.1
3.001	50.00	5.53	62.575	0.852	0.0	0.0	0.0	3.77	416.5	115.4
3.002	50.00	5.81	60.425	0.926	0.0	0.0	0.0	2.99	475.1	125.4
3.003	49.99	6.00	59.350	1.208	0.0	0.0	0.0	1.00	159.2«	163.6
3.004	49.56	6.14	59.323	1.444	0.0	0.0	0.0	5.80	1254.5	193.8
3.005	46.34	7.28	56.000	1.737	0.0	0.0	0.0	0.73	158.5«	218.0
3.006	44.52	8.00	55.000	2.156	0.0	0.0	0.0	1.02	221.8«	260.0
4.000	50.00	5.53	58.000	0.176	0.0	0.0	0.0	1.57	111.1	23.8
4.001	50.00	5.88	57.500	0.378	0.0	0.0	0.0	2.39	169.0	51.2
4.002	49.73	6.08	56.350	0.736	0.0	0.0	0.0	4.08	648.8	99.1
4.003	49.17	6.27	54.350	0.879	0.0	0.0	0.0	2.63	418.0	117.0
4.004	48.60	6.47	53.400	0.977	0.0	0.0	0.0	4.32	2751.0	128.6

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
3.007	11.000	0.344	32.0	0.085	0.00	0.0	0.600		o	525	Pipe/Conduit	
3.008	50.000	4.775	10.5	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
5.000	50.000	2.300	21.7	0.078	5.00	0.0	0.600		o	375	Pipe/Conduit	
5.001	47.000	6.700	7.0	0.078	0.00	0.0	0.600		o	450	Pipe/Conduit	
5.002	20.000	3.450	5.8	0.098	0.00	0.0	0.600		o	525	Pipe/Conduit	
5.003	22.000	0.045	488.9	0.065	0.00	0.0	0.600		o	675	Pipe/Conduit	
5.004	20.000	0.205	97.6	0.335	0.00	0.0	0.600		o	675	Pipe/Conduit	
5.005	40.000	0.500	80.0	0.063	0.00	0.0	0.600		o	675	Pipe/Conduit	
5.006	40.000	0.250	160.0	0.074	0.00	0.0	0.600		o	675	Pipe/Conduit	
5.007	20.000	3.500	5.7	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
3.009	28.000	1.000	28.0	0.182	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
3.010	31.000	5.600	5.5	0.273	0.00	0.0		0.045	3 \=/	1000	1:3 Swale	
3.011	5.000	0.535	9.3	1.072	0.00	0.0	0.600		o	750	Pipe/Conduit	
3.012	40.000	2.465	16.2	0.169	0.00	0.0	0.600		o	750	Pipe/Conduit	
3.013	5.000	3.525	1.4	1.830	0.00	0.0	0.600		o	750	Pipe/Conduit	
3.014	50.000	3.000	16.7	0.080	0.00	0.0	0.600		o	750	Pipe/Conduit	
3.015	50.000	2.000	25.0	0.116	0.00	0.0	0.600		o	750	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)
3.007	44.41	8.05	53.619	3.218	0.0	0.0	0.0	3.97	859.7	387.0
3.008	44.12	8.17	53.275	3.218	0.0	0.0	0.0	6.95	1504.4	387.0
5.000	50.00	5.21	63.725	0.078	0.0	0.0	0.0	3.90	430.8	10.6
5.001	50.00	5.32	61.100	0.156	0.0	0.0	0.0	7.71	1226.6	21.1
5.002	50.00	5.35	54.575	0.254	0.0	0.0	0.0	9.34	2022.9	34.4
5.003	50.00	5.66	51.125	0.319	0.0	0.0	0.0	1.18	421.7	43.2
5.004	50.00	5.79	51.080	0.654	0.0	0.0	0.0	2.65	949.7	88.6
5.005	49.94	6.01	50.875	0.717	0.0	0.0	0.0	2.93	1049.2	97.0
5.006	48.98	6.34	50.375	0.791	0.0	0.0	0.0	2.07	740.6	104.9
5.007	48.89	6.37	50.125	0.791	0.0	0.0	0.0	11.01	3938.7	104.9
3.009	43.02	8.65	48.500	4.191	0.0	0.0	0.0	0.97	211.7«	488.2
3.010	42.49	8.88	47.500	4.464	0.0	0.0	0.0	2.19	476.2«	513.7
3.011	42.47	8.89	41.900	5.536	0.0	0.0	0.0	9.18	4057.6	636.8
3.012	42.27	8.99	41.365	5.705	0.0	0.0	0.0	6.97	3077.9	653.1
3.013	42.26	8.99	38.900	7.535	0.0	0.0	0.0	23.60	10424.6	862.4
3.014	42.00	9.11	35.375	7.615	0.0	0.0	0.0	6.87	3037.0	866.2
3.015	41.69	9.26	32.900	7.731	0.0	0.0	0.0	5.61	2478.6	872.8

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
3.016	45.000	3.900	11.5	0.120	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.033	27.000	1.500	18.0	0.050	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.034	36.000	1.500	24.0	0.050	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.035	50.000	1.500	33.3	0.100	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.036	41.000	0.100	410.0	0.080	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
6.000	30.000	1.075	27.9	0.055	5.00	0.0	0.600		o	150	Pipe/Conduit	
6.001	22.000	1.575	14.0	0.085	0.00	0.0	0.600		o	225	Pipe/Conduit	
6.002	15.000	0.100	150.0	0.267	0.00	0.0	0.600		o	375	Pipe/Conduit	
6.003	30.000	1.550	19.4	0.293	0.00	0.0	0.600		o	375	Pipe/Conduit	
6.004	21.000	1.000	21.0	0.098	0.00	0.0	0.600		o	450	Pipe/Conduit	
6.005	32.000	0.100	320.0	0.052	0.00	0.0	0.600		o	450	Pipe/Conduit	
6.006	25.000	0.100	250.0	0.039	0.00	0.0	0.600		o	525	Pipe/Conduit	
6.007	44.000	0.150	293.3	0.325	0.00	0.0	0.600		o	525	Pipe/Conduit	
6.008	50.000	2.160	23.1	0.975	0.00	0.0	0.600		o	525	Pipe/Conduit	
6.009	31.000	20.050	1.5	0.715	0.00	0.0	0.600		o	525	Pipe/Conduit	
1.037	43.000	0.100	430.0	0.050	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.038	44.000	0.100	440.0	0.070	0.00	0.0		0.045	3 \=/	1800	1:3 Swale	

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)
3.016	41.50	9.35	30.900	7.851	0.0	0.0	0.0	8.26	3651.2	882.4
1.033	31.40	16.27	29.000	15.147	0.0	0.0	0.0	1.31	480.3«	1288.2
1.034	30.87	16.80	27.500	15.197	0.0	0.0	0.0	1.13	415.9«	1288.2
1.035	30.04	17.67	26.000	15.297	0.0	0.0	0.0	0.96	352.9«	1288.2
1.036	27.94	20.16	25.900	15.377	0.0	0.0	0.0	0.27	100.6«	1288.2
6.000	50.00	5.26	44.650	0.055	0.0	0.0	0.0	1.91	33.8	7.4
6.001	50.00	5.37	43.575	0.140	0.0	0.0	0.0	3.52	139.9	19.0
6.002	50.00	5.53	42.000	0.407	0.0	0.0	0.0	1.48	163.1	55.1
6.003	50.00	5.66	41.900	0.700	0.0	0.0	0.0	4.13	456.7	94.8
6.004	50.00	5.73	40.350	0.798	0.0	0.0	0.0	4.45	708.1	108.1
6.005	49.37	6.21	39.350	0.850	0.0	0.0	0.0	1.13	179.9	113.6
6.006	48.50	6.50	38.250	0.889	0.0	0.0	0.0	1.41	305.7	116.8
6.007	46.93	7.06	38.150	1.214	0.0	0.0	0.0	1.30	282.0	154.3
6.008	46.45	7.24	38.000	2.189	0.0	0.0	0.0	4.67	1010.9	275.4
6.009	46.37	7.27	35.840	2.904	0.0	0.0	0.0	18.11	3919.7	364.7
1.037	26.06	22.84	25.800	18.331	0.0	0.0	0.0	0.27	98.3«	1293.6
1.038	24.41	25.64	25.700	18.401	0.0	0.0	0.0	0.26	88.3«	1293.6

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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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.039	50.000	0.200	250.0	0.100	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.040	50.000	0.100	500.0	0.080	0.00	0.0		0.045	3 \=/	2000	1:3 Swale	
1.041	50.000	0.100	500.0	0.120	0.00	0.0		0.045	3 \=/	1800	1:3 Swale	
1.042	50.000	1.300	38.5	0.080	0.00	0.0		0.045	3 \=/	1500	1:3 Swale	
1.043	14.000	0.228	61.4	1.500	0.00	0.0	0.600		o	1200	Pipe/Conduit	
1.044	5.000	1.428	3.5	0.000	0.00	0.0	0.600		o	1200	Pipe/Conduit	
1.045	48.000	0.096	500.0	0.000	0.00	0.0	0.600		o	1200	Pipe/Conduit	
1.046	50.000	0.100	500.0	0.000	0.00	0.0	0.600		o	1200	Pipe/Conduit	
1.047	50.000	5.866	8.5	0.000	0.00	0.0	0.600		o	1200	Pipe/Conduit	
7.000	50.000	1.000	50.0	7.000	5.00	0.0	0.600		o	600	Pipe/Conduit	
7.001	50.000	4.000	12.5	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
7.002	50.000	1.000	50.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	
7.003	50.000	1.000	50.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	
7.004	50.000	5.000	10.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	
1.048	40.000	1.167	34.3	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	
1.049	5.000	0.010	500.0	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	
1.050	24.000	0.048	500.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.039	23.20	28.02	25.500	18.501	0.0	0.0	0.0	0.35	128.9«	1293.6
1.040	22.31	30.00	25.400	18.581	0.0	0.0	0.0	0.25	91.1«	1293.6
1.041	22.31	30.00	25.300	18.701	0.0	0.0	0.0	0.25	82.9«	1293.6
1.042	22.31	30.00	25.200	18.781	0.0	0.0	0.0	0.87	254.2«	1293.6
1.043	22.31	30.00	23.900	20.281	0.0	0.0	0.0	4.78	5404.4	1293.6
1.044	22.31	30.00	23.675	20.281	0.0	0.0	0.0	20.05	22679.6	1293.6
1.045	22.31	30.00	23.662	20.281	0.0	0.0	0.0	1.67	1884.5	1293.6
1.046	22.31	30.00	23.566	20.281	0.0	0.0	0.0	1.67	1884.5	1293.6
1.047	22.31	30.00	23.466	20.281	0.0	0.0	0.0	12.85	14530.5	1293.6
7.000	50.00	5.24	30.200	7.000	0.0	0.0	0.0	3.45	975.3	947.9
7.001	50.00	5.36	29.200	7.000	0.0	0.0	0.0	6.91	1954.4	947.9
7.002	50.00	5.57	25.200	7.000	0.0	0.0	0.0	3.96	1751.0	947.9
7.003	50.00	5.78	24.200	7.000	0.0	0.0	0.0	3.96	1751.0	947.9
7.004	50.00	5.88	23.200	7.000	0.0	0.0	0.0	8.88	3922.4	947.9
1.048	22.31	30.00	17.600	27.281	0.0	0.0	0.0	5.36	3410.9	1648.2
1.049	22.31	30.00	16.358	27.281	0.0	0.0	0.0	1.39	887.1«	1648.2
1.050	22.31	30.00	16.348	27.281	0.0	0.0	0.0	1.24	549.9«	1648.2

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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)
1.050		17.300	16.300	16.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	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)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	9	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Weir Manhole: 4, DS/PN: 1.003, Volume (m³): 75.2

Discharge Coef 0.544 Width (m) 1.200 Invert Level (m) 74.500

Weir Manhole: 5, DS/PN: 1.004, Volume (m³): 240.3

Discharge Coef 0.544 Width (m) 1.200 Invert Level (m) 73.000

Weir Manhole: 6, DS/PN: 1.005, Volume (m³): 403.1

Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 71.500

Complex Manhole: 19, DS/PN: 1.018, Volume (m³): 13.1

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0223-2680-1200-2680
Design Head (m)	1.200
Design Flow (l/s)	26.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	223
Invert Level (m)	58.010
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	26.8	Kick-Flo®	0.850	22.7
Flush-Flo™	0.395	26.8	Mean Flow over Head Range	-	22.7

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	7.5	0.600	26.1	1.600	30.7	2.600	38.8
0.200	22.1	0.800	24.0	1.800	32.5	3.000	41.6
0.300	26.4	1.000	24.6	2.000	34.2	3.500	44.8
0.400	26.8	1.200	26.8	2.200	35.8	4.000	47.8
0.500	26.5	1.400	28.8	2.400	37.4	4.500	50.6

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Hydro-Brake® Optimum

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
5.000	53.3	6.500	60.5	8.000	66.9	9.500	72.8
5.500	55.8	7.000	62.7	8.500	68.9		
6.000	58.2	7.500	64.8	9.000	70.9		

Weir

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 59.110

Complex Manhole: 70, DS/PN: 3.012, Volume (m³): 4.9

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0303-5430-1200-5430
Design Head (m)	1.200
Design Flow (l/s)	54.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	303
Invert Level (m)	41.365
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	54.3	Kick-Flo®	0.908	47.5
Flush-Flo™	0.478	54.3	Mean Flow over Head Range	-	44.6

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	9.2	1.200	54.3	3.000	84.6	7.000	127.8
0.200	31.1	1.400	58.5	3.500	91.2	7.500	132.2
0.300	52.2	1.600	62.4	4.000	97.3	8.000	136.5
0.400	53.9	1.800	66.0	4.500	103.0	8.500	140.6
0.500	54.3	2.000	69.5	5.000	108.5	9.000	144.6
0.600	53.7	2.200	72.8	5.500	113.6	9.500	148.4
0.800	51.0	2.400	75.9	6.000	118.6		
1.000	49.7	2.600	78.9	6.500	123.3		

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Weir

Discharge Coef 0.544 Width (m) 20.000 Invert Level (m) 42.465

Complex Manhole: 72, DS/PN: 3.014, Volume (m³): 6.8

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0336-6940-1200-6940
Design Head (m)	1.200
Design Flow (l/s)	69.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	336
Invert Level (m)	35.375
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	69.4	Kick-Flo®	0.931	61.3
Flush-Flo™	0.516	69.4	Mean Flow over Head Range	-	56.2

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	9.9	1.200	69.4	3.000	108.2	7.000	163.7
0.200	34.2	1.400	74.7	3.500	116.6	7.500	169.3
0.300	61.6	1.600	79.7	4.000	124.5	8.000	174.7
0.400	68.5	1.800	84.4	4.500	131.9	8.500	180.0
0.500	69.4	2.000	88.8	5.000	138.8	9.000	185.1
0.600	69.1	2.200	93.1	5.500	145.4	9.500	190.1
0.800	66.1	2.400	97.1	6.000	151.8		
1.000	63.5	2.600	100.9	6.500	157.8		

Weir

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 36.475

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Complex Manhole: 96, DS/PN: 1.044, Volume (m³): 21.6

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0517-2000-1700-2000
Design Head (m)	1.700
Design Flow (l/s)	200.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	517
Invert Level (m)	23.675
Minimum Outlet Pipe Diameter (mm)	Site Specific Design (Contact Hydro International)
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	200.0	Kick-Flo®	1.333	177.6
Flush-Flo™	0.769	199.8	Mean Flow over Head Range	-	160.0

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	12.8	1.200	187.9	3.000	264.0	7.000	400.2
0.200	47.4	1.400	181.9	3.500	284.7	7.500	414.0
0.300	96.8	1.600	194.1	4.000	304.0	8.000	427.4
0.400	151.7	1.800	205.6	4.500	322.1	8.500	440.3
0.500	192.3	2.000	216.5	5.000	339.2	9.000	452.9
0.600	197.1	2.200	226.8	5.500	355.4	9.500	465.1
0.800	199.7	2.400	236.7	6.000	371.0		
1.000	196.3	2.600	246.1	6.500	385.8		

Weir

Discharge Coef 0.544 Width (m) 30.000 Invert Level (m) 25.375

Complex Manhole: 101, DS/PN: 7.001, Volume (m³): 16.4

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0524-2000-1200-2000
Design Head (m)	1.200

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Hydro-Brake® Optimum

Design Flow (l/s)	200.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	524
Invert Level (m)	29.200
Minimum Outlet Pipe Diameter (mm)	Site Specific Design (Contact Hydro International)
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	200.0	Kick-Flo®	1.039	186.4
Flush-Flo™	0.708	199.1	Mean Flow over Head Range	-	148.1

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	12.9	1.200	200.0	3.000	313.1	7.000	475.0
0.200	47.9	1.400	215.6	3.500	337.8	7.500	491.4
0.300	97.8	1.600	230.1	4.000	360.7	8.000	507.3
0.400	153.8	1.800	243.8	4.500	382.2	8.500	522.7
0.500	192.8	2.000	256.7	5.000	402.5	9.000	537.6
0.600	197.5	2.200	269.0	5.500	421.8	9.500	552.2
0.800	198.1	2.400	280.7	6.000	440.3		
1.000	189.3	2.600	291.9	6.500	458.0		

Weir

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 30.200

Hydro-Brake® Optimum Manhole: 107, DS/PN: 1.050, Volume (m³): 7.0

Unit Reference	MD-SHE-0536-2137-1400-2137
Design Head (m)	1.400
Design Flow (l/s)	213.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	536
Invert Level (m)	16.348
Minimum Outlet Pipe Diameter (mm)	Site Specific Design (Contact Hydro International)
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

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Hydro-Brake® Optimum Manhole: 107, DS/PN: 1.050, Volume (m³): 7.0

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	213.5	Kick-Flo®	1.177	196.2
Flush-Flo™	0.755	213.6	Mean Flow over Head Range	-	163.9

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	13.1	1.200	198.0	3.000	310.0	7.000	470.2
0.200	48.6	1.400	213.5	3.500	334.4	7.500	486.5
0.300	99.7	1.600	227.9	4.000	357.1	8.000	502.2
0.400	157.4	1.800	241.4	4.500	378.3	8.500	517.4
0.500	205.1	2.000	254.2	5.000	398.5	9.000	532.2
0.600	210.7	2.200	266.3	5.500	417.6	9.500	546.6
0.800	213.4	2.400	277.9	6.000	435.9		
1.000	208.0	2.600	289.0	6.500	453.4		

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Storage Structures for Storm

Tank or Pond Manhole: 19, DS/PN: 1.018

Invert Level (m) 58.010

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2180.0	1.500	3520.0

Tank or Pond Manhole: 70, DS/PN: 3.012

Invert Level (m) 41.965

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	770.0	1.500	4600.0

Tank or Pond Manhole: 72, DS/PN: 3.014

Invert Level (m) 35.975

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	390.0	1.500	1106.0

Tank or Pond Manhole: 96, DS/PN: 1.044

Invert Level (m) 23.675

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4013.0	2.000	6894.0

Tank or Pond Manhole: 101, DS/PN: 7.001

Invert Level (m) 29.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	602.0	1.500	1447.0

Tank or Pond Manhole: 107, DS/PN: 1.050

Invert Level (m) 16.348

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Tank or Pond Manhole: 107, DS/PN: 1.050

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3767.0	0.500	4516.0	0.510	4648.0	1.700	5923.0

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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 Coeffiecient	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	0	Number of Time/Area Diagrams	0
Number of Online Controls	9	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%					77.746
1.001	2	15 Winter	100	+40%	100/15 Summer				76.069
1.002	3	15 Winter	100	+40%					74.962
1.003	4	15 Winter	100	+40%					74.950
1.004	5	15 Winter	100	+40%					73.437
1.005	6	30 Summer	100	+40%					71.943
1.006	7	30 Winter	100	+40%	100/15 Summer				68.689
1.007	8	30 Winter	100	+40%	100/15 Winter				68.404
1.008	9	30 Winter	100	+40%	100/15 Summer				67.999
1.009	10	30 Winter	100	+40%	100/15 Summer				67.536
1.010	11	30 Winter	100	+40%	100/15 Summer				67.014
1.011	12	30 Winter	100	+40%					66.278

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.129	0.000	0.61		141.7	OK	
1.001	2	0.194	0.000	1.04		259.8	SURCHARGED	
1.002	3	-1.038	0.000	0.02		364.2	OK	
1.003	4	-0.050	0.000	0.02		602.5	FLOOD RISK	
1.004	5	-0.063	0.000	0.02		588.0	FLOOD RISK	
1.005	6	-0.057	0.000	0.01		746.6	FLOOD RISK	
1.006	7	0.814	0.000	2.49		687.3	SURCHARGED	
1.007	8	0.569	0.000	0.65		727.6	SURCHARGED	
1.008	9	1.199	0.000	2.13		763.0	FLOOD RISK	
1.009	10	0.836	0.000	2.26		810.0	SURCHARGED	
1.010	11	0.414	0.000	3.48		855.3	SURCHARGED	
1.011	12	-0.308	0.000	0.57		870.5	OK	

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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) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.012	13	30 Winter	100	+40%					64.769
1.013	14	30 Winter	100	+40%					62.771
1.014	15	30 Winter	100	+40%					61.809
1.015	16	30 Winter	100	+40%					60.799
1.016	17	30 Winter	100	+40%					59.762
1.017	18	30 Winter	100	+40%	100/15 Summer				59.112
1.018	19	960 Winter	100	+40%	100/15 Winter				59.046
1.019	20	60 Winter	100	+40%					57.593
1.020	21	15 Winter	100	+40%					56.192
1.021	22	15 Winter	100	+40%					54.699
1.022	23	15 Summer	100	+40%					50.207
2.000	24	15 Winter	100	+40%					66.745
2.001	25	15 Winter	100	+40%					65.185
2.002	26	15 Winter	100	+40%					63.702
2.003	27	15 Winter	100	+40%					61.130
2.004	28	15 Winter	100	+40%					58.661
2.005	29	15 Winter	100	+40%					57.631
2.006	30	15 Winter	100	+40%					53.595
2.007	31	15 Winter	100	+40%					50.546
2.008	32	15 Winter	100	+40%					48.565
2.009	33	15 Winter	100	+40%					46.171
2.010	34	15 Winter	100	+40%					45.593
1.023	35	15 Winter	100	+40%					44.967
1.024	36	15 Winter	100	+40%	100/15 Summer				44.291
1.025	37	15 Winter	100	+40%					43.369
1.026	38	15 Winter	100	+40%					40.914
1.027	39	15 Winter	100	+40%					39.946
1.028	40	15 Winter	100	+40%					38.957
1.029	41	15 Winter	100	+40%					38.876
1.030	42	15 Winter	100	+40%					37.870
1.031	43	15 Winter	100	+40%					36.959
1.032	44	15 Winter	100	+40%					36.301
3.000	45	15 Winter	100	+40%					63.959
3.001	46	15 Winter	100	+40%	100/15 Summer				63.439
3.002	47	15 Winter	100	+40%	100/15 Summer				61.495
3.003	48	15 Winter	100	+40%	100/15 Summer				60.600
3.004	49	15 Winter	100	+40%					59.607
3.005	50	15 Winter	100	+40%					56.338
3.006	51	15 Winter	100	+40%					55.320
4.000	52	15 Winter	100	+40%					58.233
4.001	53	15 Winter	100	+40%	100/15 Summer				57.937
4.002	54	15 Winter	100	+40%					56.601
4.003	55	15 Winter	100	+40%	100/15 Summer				55.855

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.012	13	-1.231	0.000	0.03		894.6	OK	
1.013	14	-1.229	0.000	0.02		913.9	OK	
1.014	15	-1.191	0.000	0.03		933.3	OK	
1.015	16	-1.201	0.000	0.03		949.3	OK	
1.016	17	-1.238	0.000	0.03		966.4	OK	
1.017	18	0.312	0.000	2.80		974.0	SURCHARGED	
1.018	19	0.736	0.000	0.02		25.7	SURCHARGED	
1.019	20	-0.657	0.000	0.04		45.1	OK	
1.020	21	-0.608	0.000	0.08		167.5	OK	
1.021	22	-0.601	0.000	0.09		275.0	OK	
1.022	23	-0.593	0.000	0.10		358.5	OK	
2.000	24	-0.055	0.000	0.70		22.2	OK	
2.001	25	-0.115	0.000	0.69		125.5	OK	
2.002	26	-0.098	0.000	0.78		205.4	OK	
2.003	27	-0.170	0.000	0.57		238.1	OK	
2.004	28	-0.139	0.000	0.71		267.3	OK	
2.005	29	-0.169	0.000	0.58		305.5	OK	
2.006	30	-0.205	0.000	0.57		413.3	OK	
2.007	31	-0.254	0.000	0.52		560.0	OK	
2.008	32	-0.235	0.000	0.57		685.5	OK	
2.009	33	-0.129	0.000	0.95		718.1	OK	
2.010	34	-0.207	0.000	0.81		722.3	OK	
1.023	35	-0.333	0.000	0.58		1111.3	OK	
1.024	36	0.491	0.000	2.35		1180.1	SURCHARGED	
1.025	37	-1.131	0.000	0.05		1278.5	OK	
1.026	38	-1.086	0.000	0.05		1341.0	OK	
1.027	39	-1.054	0.000	0.06		1358.9	OK	
1.028	40	-1.043	0.000	0.05		1386.9	OK	
1.029	41	-1.124	0.000	0.05		1428.9	OK	
1.030	42	-1.130	0.000	0.05		1447.7	OK	
1.031	43	-1.041	0.000	0.07		1470.0	OK	
1.032	44	-0.599	0.000	0.24		1485.5	OK	
3.000	45	-0.066	0.000	0.75		203.0	OK	
3.001	46	0.489	0.000	0.95		364.1	SURCHARGED	
3.002	47	0.620	0.000	0.92		396.5	SURCHARGED	
3.003	48	0.800	0.000	5.29		515.4	SURCHARGED	
3.004	49	-0.241	0.000	0.56		622.1	OK	
3.005	50	-1.162	0.000	0.04		759.3	OK	
3.006	51	-1.180	0.000	0.03		955.6	OK	
4.000	52	-0.067	0.000	0.78		81.6	OK	
4.001	53	0.137	0.000	1.06		168.4	SURCHARGED	
4.002	54	-0.199	0.000	0.59		346.4	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.003	55	1.055	0.000	1.08		389.1	FLOOD RISK	

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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) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
4.004	56	30 Winter	100	+40%	100/15 Summer	100/30 Winter			55.500
3.007	57	30 Winter	100	+40%	100/15 Summer				55.196
3.008	58	30 Winter	100	+40%					53.594
5.000	59	15 Winter	100	+40%					63.800
5.001	60	15 Winter	100	+40%					61.174
5.002	61	15 Winter	100	+40%					54.681
5.003	62	15 Winter	100	+40%					51.508
5.004	63	15 Winter	100	+40%					51.450
5.005	64	15 Winter	100	+40%					51.178
5.006	65	15 Winter	100	+40%					50.771
5.007	66	15 Winter	100	+40%					50.308
3.009	67	15 Winter	100	+40%					48.877
3.010	68	15 Winter	100	+40%					47.757
3.011	69	30 Winter	100	+40%	100/15 Summer				43.445
3.012	70	60 Winter	100	+40%	100/15 Summer				42.579
3.013	71	60 Winter	100	+40%					39.318
3.014	72	60 Winter	100	+40%	100/15 Summer				36.687
3.015	73	60 Winter	100	+40%					33.428
3.016	74	60 Winter	100	+40%					31.313
1.033	75	60 Winter	100	+40%					29.383
1.034	76	60 Winter	100	+40%					27.912
1.035	77	120 Summer	100	+40%					27.000
1.036	78	60 Winter	100	+40%					26.842
6.000	79	15 Winter	100	+40%					44.754
6.001	80	15 Winter	100	+40%					43.695
6.002	81	15 Winter	100	+40%	100/15 Summer				42.540
6.003	82	15 Winter	100	+40%					42.175
6.004	83	15 Winter	100	+40%	100/15 Summer				40.933
6.005	84	15 Winter	100	+40%	100/15 Summer				40.418
6.006	85	15 Winter	100	+40%	100/15 Summer				39.563
6.007	86	15 Winter	100	+40%	100/15 Summer				39.260
6.008	87	15 Winter	100	+40%					38.457
6.009	88	15 Winter	100	+40%					36.058
1.037	89	60 Winter	100	+40%					26.759
1.038	90	60 Winter	100	+40%					26.632
1.039	91	60 Winter	100	+40%					26.465
1.040	92	60 Winter	100	+40%					26.355
1.041	93	60 Winter	100	+40%					26.226
1.042	94	60 Winter	100	+40%					25.728
1.043	95	60 Winter	100	+40%	100/60 Summer				25.332
1.044	96	960 Winter	100	+40%	100/240 Winter				25.298
1.045	97	480 Summer	100	+40%					23.982
1.046	98	360 Summer	100	+40%					23.862

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.004	56	1.200	0.334	0.17		377.5	FLOOD	1
3.007	57	1.052	0.000	2.03		914.6	SURCHARGED	
3.008	58	-0.206	0.000	0.68		913.6	OK	
5.000	59	-0.300	0.000	0.09		37.7	OK*	
5.001	60	-0.376	0.000	0.06		77.6	OK*	
5.002	61	-0.419	0.000	0.09		127.8	OK	
5.003	62	-0.292	0.000	0.53		158.5	OK	
5.004	63	-0.305	0.000	0.57		327.9	OK	
5.005	64	-0.372	0.000	0.41		356.1	OK	
5.006	65	-0.279	0.000	0.64		393.5	OK	
5.007	66	-0.492	0.000	0.17		393.7	OK	
3.009	67	-1.123	0.000	0.05		1288.4	OK	
3.010	68	-1.243	0.000	0.02		1379.9	OK	
3.011	69	0.795	0.000	1.32		1516.7	SURCHARGED	
3.012	70	0.464	0.000	0.55		1361.4	SURCHARGED	
3.013	71	-0.332	0.000	0.59		1736.2	OK	
3.014	72	0.562	0.000	0.68		1738.4	SURCHARGED	
3.015	73	-0.222	0.000	0.84		1757.6	OK	
3.016	74	-0.337	0.000	0.59		1776.8	OK	
1.033	75	-0.617	0.000	0.15		2561.4	OK	
1.034	76	-0.588	0.000	0.17		2569.5	OK	
1.035	77	0.000	0.000	0.17		2139.8	FLOOD RISK	
1.036	78	-0.158	0.000	0.58		2555.6	FLOOD RISK	
6.000	79	-0.046	0.000	0.81		26.3	OK	
6.001	80	-0.105	0.000	0.55		69.8	OK	
6.002	81	0.165	0.000	1.67		207.0	SURCHARGED	
6.003	82	-0.100	0.000	0.89		357.1	OK	
6.004	83	0.133	0.000	0.70		393.9	SURCHARGED	
6.005	84	0.618	0.000	2.68		418.0	SURCHARGED	
6.006	85	0.788	0.000	1.74		431.4	SURCHARGED	
6.007	86	0.585	0.000	2.19		544.0	SURCHARGED	
6.008	87	-0.068	0.000	1.00		901.2	OK	
6.009	88	-0.307	0.000	0.36		1184.0	OK	
1.037	89	-0.241	0.000	0.59		3080.0	FLOOD RISK	
1.038	90	-0.368	0.000	0.48		3063.3	OK	
1.039	91	-0.035	0.000	0.59		2933.3	FLOOD RISK*	
1.040	92	-0.145	0.000	0.66		2856.8	FLOOD RISK*	
1.041	93	-0.274	0.000	0.56		2825.8	FLOOD RISK*	
1.042	94	-0.772	0.000	0.14		2824.7	OK	
1.043	95	0.232	0.000	1.47		2890.3	SURCHARGED*	
1.044	96	0.423	0.000	0.04		199.8	SURCHARGED	
1.045	97	-0.880	0.000	0.14		199.8	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.046	98	-0.904	0.000	0.14		199.8	OK	

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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) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.047	99	480 Summer	100	+40%					23.583
7.000	100	120 Winter	100	+40%	100/15 Summer				32.000
7.001	101	30 Winter	100	+40%	100/15 Summer				30.399
7.002	102	30 Winter	100	+40%	100/30 Winter				26.538
7.003	103	30 Winter	100	+40%	100/30 Winter				25.229
7.004	104	30 Winter	100	+40%					23.580
1.048	105	30 Winter	100	+40%					18.329
1.049	106	30 Winter	100	+40%	100/15 Winter				17.767
1.050	107	1440 Winter	100	+40%	100/120 Winter				17.638

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.047	99	-1.083	0.000	0.02		199.8	OK	
7.000	100	1.200	0.000	1.41		1207.2	FLOOD RISK*	
7.001	101	0.599	0.000	1.00		1705.4	SURCHARGED	
7.002	102	0.588	0.000	1.15		1700.1	SURCHARGED	
7.003	103	0.279	0.000	1.14		1692.2	SURCHARGED	
7.004	104	-0.370	0.000	0.51		1692.4	OK	
1.048	105	-0.171	0.000	0.69		1684.4	OK	
1.049	106	0.509	0.000	3.31		1688.1	SURCHARGED	
1.050	107	0.540	0.000	0.54		213.1	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.702	4-8	0.208

Total Area Contributing (ha) = 0.910

Total Pipe Volume (m³) = 3.181

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
1.000	10.000	5.000	2.0	0.910	5.00	0.0	0.600	o	450	Pipe/Conduit	
1.001	10.000	0.039	256.4	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)
1.000	50.00	5.01	98.000	0.910	0.0	0.0	0.0	14.46	2299.1	123.2
1.001	50.00	5.14	93.000	0.910	0.0	0.0	0.0	1.26	201.2	123.2

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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)
1.001		97.000	92.961	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	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)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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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 Coeffiecient	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 Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 271172 196525 SS 71172 96525
C (1km)	0.000
D1 (1km)	0.000
D2 (1km)	0.000
D3 (1km)	0.000
E (1km)	0.000
F (1km)	0.000
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%					98.039
1.001	2	15 Winter	100	+40%					93.122

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.411	0.000	0.02		22.5	OK	
1.001	2	-0.328	0.000	0.16		22.8	OK	

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	40.870	0.370	23.1	376.7	O K
30 min Summer	40.995	0.495	23.1	529.8	O K
60 min Summer	41.125	0.625	23.1	704.0	O K
120 min Summer	41.196	0.696	23.1	806.5	O K
180 min Summer	41.234	0.734	23.1	863.1	O K
240 min Summer	41.256	0.756	23.1	896.5	O K
360 min Summer	41.273	0.773	23.1	923.8	O K
480 min Summer	41.278	0.778	23.1	931.2	O K
600 min Summer	41.277	0.777	23.1	929.6	O K
720 min Summer	41.273	0.773	23.1	922.7	O K
960 min Summer	41.258	0.758	23.1	899.9	O K
1440 min Summer	41.211	0.711	23.1	829.0	O K
2160 min Summer	41.136	0.636	23.1	720.5	O K
2880 min Summer	41.067	0.567	23.1	624.2	O K
4320 min Summer	40.950	0.450	23.1	472.3	O K
5760 min Summer	40.863	0.363	23.1	368.6	O K
7200 min Summer	40.806	0.306	22.9	302.7	O K
8640 min Summer	40.766	0.266	22.6	258.8	O K
10080 min Summer	40.739	0.239	22.2	230.0	O K
15 min Winter	40.870	0.370	23.1	376.8	O K
30 min Winter	40.995	0.495	23.1	530.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	382.4	22
30 min Summer	76.349	0.0	547.8	36
60 min Summer	51.945	0.0	757.3	66
120 min Summer	31.389	0.0	916.2	124
180 min Summer	23.519	0.0	1030.2	182
240 min Summer	19.191	0.0	1121.2	242
360 min Summer	14.401	0.0	1262.4	340
480 min Summer	11.730	0.0	1371.2	398
600 min Summer	9.999	0.0	1461.2	464
720 min Summer	8.774	0.0	1538.5	526
960 min Summer	7.140	0.0	1669.1	662
1440 min Summer	5.307	0.0	1859.8	930
2160 min Summer	3.957	0.0	2089.9	1328
2880 min Summer	3.233	0.0	2276.6	1708
4320 min Summer	2.467	0.0	2602.3	2428
5760 min Summer	2.064	0.0	2910.4	3168
7200 min Summer	1.820	0.0	3207.0	3824
8640 min Summer	1.655	0.0	3499.0	4504
10080 min Summer	1.538	0.0	3788.3	5240
15 min Winter	107.336	0.0	382.4	22
30 min Winter	76.349	0.0	547.8	36

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	41.125	0.625	23.1	704.0	O K
120 min Winter	41.196	0.696	23.1	806.7	O K
180 min Winter	41.234	0.734	23.1	863.6	O K
240 min Winter	41.256	0.756	23.1	897.4	O K
360 min Winter	41.274	0.774	23.1	925.1	O K
480 min Winter	41.273	0.773	23.1	922.6	O K
600 min Winter	41.267	0.767	23.1	914.3	O K
720 min Winter	41.258	0.758	23.1	899.6	O K
960 min Winter	41.230	0.730	23.1	857.0	O K
1440 min Winter	41.150	0.650	23.1	740.2	O K
2160 min Winter	41.025	0.525	23.1	568.9	O K
2880 min Winter	40.914	0.414	23.1	429.0	O K
4320 min Winter	40.763	0.263	22.5	255.6	O K
5760 min Winter	40.706	0.206	20.7	195.4	O K
7200 min Winter	40.685	0.185	18.5	174.4	O K
8640 min Winter	40.672	0.172	16.9	161.3	O K
10080 min Winter	40.663	0.163	15.8	152.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	51.945	0.0	757.3	64
120 min Winter	31.389	0.0	916.2	122
180 min Winter	23.519	0.0	1030.2	178
240 min Winter	19.191	0.0	1121.2	236
360 min Winter	14.401	0.0	1262.4	344
480 min Winter	11.730	0.0	1371.3	440
600 min Winter	9.999	0.0	1461.2	474
720 min Winter	8.774	0.0	1538.6	550
960 min Winter	7.140	0.0	1669.2	704
1440 min Winter	5.307	0.0	1860.2	994
2160 min Winter	3.957	0.0	2090.0	1388
2880 min Winter	3.233	0.0	2276.6	1760
4320 min Winter	2.467	0.0	2602.7	2420
5760 min Winter	2.064	0.0	2910.5	3000
7200 min Winter	1.820	0.0	3207.0	3744
8640 min Winter	1.655	0.0	3499.2	4416
10080 min Winter	1.538	0.0	3789.1	5144

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.470

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.735	4	8	0.735

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Model Details

Storage is Online Cover Level (m) 42.000

Tank or Pond Structure

Invert Level (m) 40.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	870.0	1.500	2370.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0209-2310-1200-2310
Design Head (m)	1.200
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	209
Invert Level (m)	40.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	23.1
Flush-Flo™	0.383	23.1
Kick-Flo®	0.836	19.5
Mean Flow over Head Range	-	19.6

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	7.1	1.200	23.1	3.000	35.8	7.000	54.0
0.200	20.1	1.400	24.9	3.500	38.6	7.500	55.8
0.300	22.8	1.600	26.5	4.000	41.2	8.000	57.6
0.400	23.1	1.800	28.0	4.500	43.6	8.500	59.3
0.500	22.8	2.000	29.5	5.000	45.9	9.000	61.0
0.600	22.4	2.200	30.9	5.500	48.0	9.500	62.6
0.800	20.3	2.400	32.2	6.000	50.1		
1.000	21.2	2.600	33.5	6.500	52.1		

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Cascade Summary of Results for F1A.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	F2.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	46.531	0.631	314.2	338.9	O K
30 min Summer	46.644	0.744	397.6	411.7	O K
60 min Summer	46.698	0.798	421.1	448.0	O K
120 min Summer	46.623	0.723	381.8	397.4	O K
180 min Summer	46.559	0.659	334.5	356.1	O K
240 min Summer	46.509	0.609	297.7	324.9	O K
360 min Summer	46.438	0.538	245.9	281.5	O K
480 min Summer	46.388	0.488	210.4	251.9	O K
600 min Summer	46.351	0.451	184.4	230.5	O K
720 min Summer	46.322	0.422	163.7	213.6	O K
960 min Summer	46.272	0.372	137.2	186.0	O K
1440 min Summer	46.212	0.312	106.7	153.4	O K
2160 min Summer	46.173	0.273	80.9	132.9	O K
2880 min Summer	46.152	0.252	66.3	121.8	O K
4320 min Summer	46.119	0.219	50.6	104.9	O K
5760 min Summer	46.098	0.198	42.4	94.4	O K
7200 min Summer	46.086	0.186	37.5	88.1	O K
8640 min Summer	46.077	0.177	34.1	83.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	506.6	20
30 min Summer	76.349	0.0	720.9	28
60 min Summer	51.945	0.0	981.5	44
120 min Summer	31.389	0.0	1186.3	74
180 min Summer	23.519	0.0	1333.3	104
240 min Summer	19.191	0.0	1450.6	136
360 min Summer	14.401	0.0	1632.8	196
480 min Summer	11.730	0.0	1773.4	256
600 min Summer	9.999	0.0	1889.6	316
720 min Summer	8.774	0.0	1989.7	378
960 min Summer	7.140	0.0	2158.8	498
1440 min Summer	5.307	0.0	2406.8	738
2160 min Summer	3.957	0.0	2692.3	1100
2880 min Summer	3.233	0.0	2933.4	1468
4320 min Summer	2.467	0.0	3357.2	2204
5760 min Summer	2.064	0.0	3744.9	2936
7200 min Summer	1.820	0.0	4127.2	3656
8640 min Summer	1.655	0.0	4504.6	4400

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Cascade Summary of Results for F1A.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	46.071	0.171	31.7	80.8	O K
15 min Winter	46.527	0.627	310.9	335.8	O K
30 min Winter	46.630	0.730	387.3	402.6	O K
60 min Winter	46.654	0.754	403.2	418.2	O K
120 min Winter	46.546	0.646	325.3	348.1	O K
180 min Winter	46.470	0.570	269.2	300.6	O K
240 min Winter	46.416	0.516	230.2	268.5	O K
360 min Winter	46.345	0.445	179.9	226.8	O K
480 min Winter	46.294	0.394	148.5	198.0	O K
600 min Winter	46.255	0.355	128.5	176.5	O K
720 min Winter	46.226	0.326	113.9	161.1	O K
960 min Winter	46.192	0.292	93.8	143.0	O K
1440 min Winter	46.158	0.258	70.3	124.7	O K
2160 min Winter	46.123	0.223	52.4	107.0	O K
2880 min Winter	46.099	0.199	42.8	94.9	O K
4320 min Winter	46.074	0.174	32.7	82.2	O K
5760 min Winter	46.061	0.161	27.5	75.6	O K
7200 min Winter	46.049	0.149	24.2	70.0	O K
8640 min Winter	46.041	0.141	22.0	66.2	O K
10080 min Winter	46.036	0.136	20.4	63.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	4881.5	5088
15 min Winter	107.336	0.0	506.6	20
30 min Winter	76.349	0.0	720.9	28
60 min Winter	51.945	0.0	981.5	44
120 min Winter	31.389	0.0	1186.3	76
180 min Winter	23.519	0.0	1333.3	108
240 min Winter	19.191	0.0	1450.6	138
360 min Winter	14.401	0.0	1632.8	198
480 min Winter	11.730	0.0	1773.4	260
600 min Winter	9.999	0.0	1889.6	320
720 min Winter	8.774	0.0	1989.7	380
960 min Winter	7.140	0.0	2158.8	498
1440 min Winter	5.307	0.0	2406.8	736
2160 min Winter	3.957	0.0	2692.0	1104
2880 min Winter	3.233	0.0	2933.2	1472
4320 min Winter	2.467	0.0	3357.3	2204
5760 min Winter	2.064	0.0	3744.9	2928
7200 min Winter	1.820	0.0	4127.2	3672
8640 min Winter	1.655	0.0	4504.6	4400
10080 min Winter	1.538	0.0	4881.6	5136

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Cascade Rainfall Details for F1A.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.890

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.630	4	8	0.630	8	12	0.630

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Cascade Model Details for F1A.SRCX

Storage is Online Cover Level (m) 47.000

Tank or Pond Structure

Invert Level (m) 45.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	450.0	1.100	780.0

Orifice Outflow Control

Diameter (m) 0.525 Discharge Coefficient 0.600 Invert Level (m) 45.900

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Cascade Summary of Results for F2.SRCX

Upstream Structures	Outflow To	Overflow To
F1A.SRCX	F4.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.483	0.583	315.0	69.4	O K
30 min Summer	38.595	0.695	414.8	99.4	O K
60 min Summer	38.646	0.746	461.1	115.4	O K
120 min Summer	38.612	0.712	430.0	104.4	O K
180 min Summer	38.562	0.662	385.4	89.8	O K
240 min Summer	38.520	0.620	347.9	78.5	O K
360 min Summer	38.454	0.554	290.6	62.8	O K
480 min Summer	38.407	0.507	249.9	52.7	O K
600 min Summer	38.368	0.468	218.8	45.4	O K
720 min Summer	38.330	0.430	195.0	38.8	O K
960 min Summer	38.282	0.382	164.6	31.2	O K
1440 min Summer	38.231	0.331	128.3	24.3	O K
2160 min Summer	38.194	0.294	97.5	19.9	O K
2880 min Summer	38.169	0.269	79.9	17.3	O K
4320 min Summer	38.130	0.230	61.0	13.5	O K
5760 min Summer	38.110	0.210	51.1	11.8	O K
7200 min Summer	38.098	0.198	45.3	10.7	O K
8640 min Summer	38.089	0.189	41.1	10.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	609.6	21
30 min Summer	76.349	0.0	867.4	30
60 min Summer	51.945	0.0	1181.0	46
120 min Summer	31.389	0.0	1427.3	76
180 min Summer	23.519	0.0	1604.2	106
240 min Summer	19.191	0.0	1745.4	138
360 min Summer	14.401	0.0	1964.6	198
480 min Summer	11.730	0.0	2133.7	258
600 min Summer	9.999	0.0	2273.6	318
720 min Summer	8.774	0.0	2394.0	380
960 min Summer	7.140	0.0	2597.4	498
1440 min Summer	5.307	0.0	2895.9	736
2160 min Summer	3.957	0.0	3239.3	1100
2880 min Summer	3.233	0.0	3529.4	1464
4320 min Summer	2.467	0.0	4039.4	2204
5760 min Summer	2.064	0.0	4505.8	2912
7200 min Summer	1.820	0.0	4965.8	3616
8640 min Summer	1.655	0.0	5419.9	4352

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Cascade Summary of Results for F2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	38.083	0.183	38.2	9.6	O K
15 min Winter	38.482	0.582	314.6	69.2	O K
30 min Winter	38.592	0.692	412.1	98.4	O K
60 min Winter	38.633	0.733	449.4	111.3	O K
120 min Winter	38.555	0.655	379.1	87.8	O K
180 min Winter	38.487	0.587	318.5	70.3	O K
240 min Winter	38.435	0.535	274.3	58.6	O K
360 min Winter	38.362	0.462	215.1	44.3	O K
480 min Winter	38.304	0.404	178.4	34.5	O K
600 min Winter	38.266	0.366	154.6	28.9	O K
720 min Winter	38.241	0.341	137.0	25.7	O K
960 min Winter	38.212	0.312	112.9	22.1	O K
1440 min Winter	38.178	0.278	84.7	18.2	O K
2160 min Winter	38.134	0.234	63.0	13.9	O K
2880 min Winter	38.111	0.211	51.6	11.8	O K
4320 min Winter	38.086	0.186	39.5	9.8	O K
5760 min Winter	38.068	0.168	33.0	8.5	O K
7200 min Winter	38.057	0.157	29.2	7.7	O K
8640 min Winter	38.049	0.149	26.5	7.2	O K
10080 min Winter	38.044	0.144	24.5	6.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	5873.4	5056
15 min Winter	107.336	0.0	609.6	21
30 min Winter	76.349	0.0	867.4	30
60 min Winter	51.945	0.0	1181.0	46
120 min Winter	31.389	0.0	1427.3	78
180 min Winter	23.519	0.0	1604.2	108
240 min Winter	19.191	0.0	1745.4	140
360 min Winter	14.401	0.0	1964.6	200
480 min Winter	11.730	0.0	2133.7	262
600 min Winter	9.999	0.0	2273.6	320
720 min Winter	8.774	0.0	2394.0	378
960 min Winter	7.140	0.0	2597.4	494
1440 min Winter	5.307	0.0	2895.9	740
2160 min Winter	3.957	0.0	3239.0	1104
2880 min Winter	3.233	0.0	3529.1	1460
4320 min Winter	2.467	0.0	4039.4	2172
5760 min Winter	2.064	0.0	4505.8	2936
7200 min Winter	1.820	0.0	4965.8	3600
8640 min Winter	1.655	0.0	5419.8	4336
10080 min Winter	1.538	0.0	5873.4	5152

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Cascade Rainfall Details for F2.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.384

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.192	4	8	0.192

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Cascade Model Details for F2.SRCX

Storage is Online Cover Level (m) 39.000

Tank or Pond Structure

Invert Level (m) 37.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	32.0	1.100	580.0

Orifice Outflow Control

Diameter (m) 0.600 Discharge Coefficient 0.600 Invert Level (m) 37.900

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Cascade Summary of Results for F3.SRCX

Upstream Structures	Outflow To	Overflow To
F4.SRCX	(None)	(None)
F2.SRCX		
F1A.SRCX		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	33.617	0.617	49.9	550.6	O K
30 min Summer	33.911	0.911	49.9	887.6	O K
60 min Summer	34.231	1.231	49.9	1305.9	O K
120 min Summer	34.419	1.419	49.9	1577.7	O K
180 min Summer	34.516	1.516	49.9	1725.5	O K
240 min Summer	34.570	1.570	49.9	1810.7	O K
360 min Summer	34.612	1.612	49.9	1878.0	O K
480 min Summer	34.617	1.617	49.9	1885.9	O K
600 min Summer	34.611	1.611	49.9	1876.8	O K
720 min Summer	34.599	1.599	49.9	1858.1	O K
960 min Summer	34.568	1.568	49.9	1808.4	O K
1440 min Summer	34.481	1.481	49.9	1672.0	O K
2160 min Summer	34.342	1.342	49.9	1464.9	O K
2880 min Summer	34.199	1.199	49.9	1261.3	O K
4320 min Summer	33.892	0.892	49.9	865.3	O K
5760 min Summer	33.676	0.676	49.9	613.9	O K
7200 min Summer	33.529	0.529	49.9	457.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	849.0	72
30 min Summer	76.349	0.0	1211.8	88
60 min Summer	51.945	0.0	1660.0	114
120 min Summer	31.389	0.0	2006.9	158
180 min Summer	23.519	0.0	2255.9	206
240 min Summer	19.191	0.0	2454.6	256
360 min Summer	14.401	0.0	2763.2	360
480 min Summer	11.730	0.0	3001.1	422
600 min Summer	9.999	0.0	3197.8	488
720 min Summer	8.774	0.0	3367.1	554
960 min Summer	7.140	0.0	3652.8	692
1440 min Summer	5.307	0.0	4070.5	968
2160 min Summer	3.957	0.0	4561.1	1380
2880 min Summer	3.233	0.0	4969.0	1788
4320 min Summer	2.467	0.0	5682.8	2496
5760 min Summer	2.064	0.0	6347.0	3184
7200 min Summer	1.820	0.0	6994.5	3856

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Cascade Summary of Results for F3.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Summer	33.432	0.432	49.5	359.5	O K
10080 min Summer	33.367	0.367	48.7	298.3	O K
15 min Winter	33.617	0.617	49.9	550.6	O K
30 min Winter	33.911	0.911	49.9	887.4	O K
60 min Winter	34.229	1.229	49.9	1304.1	O K
120 min Winter	34.415	1.415	49.9	1572.7	O K
180 min Winter	34.513	1.513	49.9	1721.4	O K
240 min Winter	34.568	1.568	49.9	1808.7	O K
360 min Winter	34.614	1.614	49.9	1881.4	O K
480 min Winter	34.613	1.613	49.9	1880.2	O K
600 min Winter	34.600	1.600	49.9	1858.3	O K
720 min Winter	34.579	1.579	49.9	1826.2	O K
960 min Winter	34.525	1.525	49.9	1740.2	O K
1440 min Winter	34.375	1.375	49.9	1513.3	O K
2160 min Winter	34.090	1.090	49.9	1115.1	O K
2880 min Winter	33.806	0.806	49.9	762.0	O K
4320 min Winter	33.425	0.425	49.5	352.5	O K
5760 min Winter	33.283	0.283	45.9	222.6	O K
7200 min Winter	33.254	0.254	40.7	196.7	O K
8640 min Winter	33.235	0.235	37.2	181.1	O K
10080 min Winter	33.223	0.223	34.5	170.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.655	0.0	7632.9	4536
10080 min Summer	1.538	0.0	8267.1	5248
15 min Winter	107.336	0.0	849.0	72
30 min Winter	76.349	0.0	1211.8	88
60 min Winter	51.945	0.0	1660.0	114
120 min Winter	31.389	0.0	2006.9	158
180 min Winter	23.519	0.0	2255.9	206
240 min Winter	19.191	0.0	2454.6	256
360 min Winter	14.401	0.0	2763.2	358
480 min Winter	11.730	0.0	3001.1	448
600 min Winter	9.999	0.0	3197.9	506
720 min Winter	8.774	0.0	3367.1	582
960 min Winter	7.140	0.0	3652.9	734
1440 min Winter	5.307	0.0	4070.8	1036
2160 min Winter	3.957	0.0	4561.0	1456
2880 min Winter	3.233	0.0	4968.9	1800
4320 min Winter	2.467	0.0	5683.3	2428
5760 min Winter	2.064	0.0	6347.1	3000
7200 min Winter	1.820	0.0	6994.5	3704
8640 min Winter	1.655	0.0	7633.1	4416
10080 min Winter	1.538	0.0	8268.0	5144

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Cascade Rainfall Details for F3.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.288

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.144	4	8	0.144

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Cascade Model Details for F3.SRCX

Storage is Online Cover Level (m) 35.000

Tank or Pond Structure

Invert Level (m) 33.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.0	0.500	1020.0	2.000	1850.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0286-5000-1700-5000
Design Head (m)	1.700
Design Flow (l/s)	50.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	286
Invert Level (m)	33.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	50.0
Flush-Flo™	0.539	49.9
Kick-Flo®	1.172	41.8
Mean Flow over Head Range	-	42.6

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	8.9	1.200	42.3	3.000	65.8	7.000	99.3
0.200	29.4	1.400	45.5	3.500	70.9	7.500	102.7
0.300	47.2	1.600	48.6	4.000	75.6	8.000	106.0
0.400	49.2	1.800	51.4	4.500	80.1	8.500	109.2
0.500	49.9	2.000	54.1	5.000	84.3	9.000	112.2
0.600	49.8	2.200	56.6	5.500	88.3	9.500	115.3
0.800	48.8	2.400	59.0	6.000	92.1		
1.000	46.6	2.600	61.4	6.500	95.8		

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Cascade Summary of Results for F4.SRCX

Upstream Structures	Outflow To	Overflow To
F2.SRCX F1A.SRCX	F3.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	34.483	0.483	292.9	226.7	O K
30 min Summer	34.609	0.609	407.5	307.2	O K
60 min Summer	34.676	0.676	487.8	353.8	O K
120 min Summer	34.667	0.667	477.0	347.3	O K
180 min Summer	34.639	0.639	442.8	327.2	O K
240 min Summer	34.607	0.607	405.1	305.5	O K
360 min Summer	34.545	0.545	347.2	265.0	O K
480 min Summer	34.496	0.496	304.3	234.7	O K
600 min Summer	34.458	0.458	271.0	212.1	O K
720 min Summer	34.432	0.432	245.3	196.8	O K
960 min Summer	34.400	0.400	208.8	178.9	O K
1440 min Summer	34.361	0.361	162.9	157.5	O K
2160 min Summer	34.313	0.313	123.5	132.7	O K
2880 min Summer	34.281	0.281	101.8	116.9	O K
4320 min Summer	34.246	0.246	78.1	100.1	O K
5760 min Summer	34.227	0.227	65.6	91.3	O K
7200 min Summer	34.211	0.211	57.9	84.1	O K
8640 min Summer	34.200	0.200	52.6	79.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	781.3	25
30 min Summer	76.349	0.0	1112.0	35
60 min Summer	51.945	0.0	1514.3	50
120 min Summer	31.389	0.0	1830.2	80
180 min Summer	23.519	0.0	2057.0	112
240 min Summer	19.191	0.0	2238.0	144
360 min Summer	14.401	0.0	2519.1	204
480 min Summer	11.730	0.0	2736.0	264
600 min Summer	9.999	0.0	2915.3	324
720 min Summer	8.774	0.0	3069.8	382
960 min Summer	7.140	0.0	3330.7	502
1440 min Summer	5.307	0.0	3713.1	740
2160 min Summer	3.957	0.0	4153.6	1104
2880 min Summer	3.233	0.0	4525.6	1472
4320 min Summer	2.467	0.0	5179.5	2200
5760 min Summer	2.064	0.0	5777.8	2936
7200 min Summer	1.820	0.0	6367.6	3672
8640 min Summer	1.655	0.0	6949.9	4384

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Cascade Summary of Results for F4.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	34.192	0.192	49.0	75.8	O K
15 min Winter	34.483	0.483	292.9	226.6	O K
30 min Winter	34.609	0.609	406.9	306.8	O K
60 min Winter	34.673	0.673	483.6	351.0	O K
120 min Winter	34.636	0.636	439.2	325.0	O K
180 min Winter	34.583	0.583	380.1	289.2	O K
240 min Winter	34.531	0.531	334.9	256.2	O K
360 min Winter	34.457	0.457	269.6	211.0	O K
480 min Winter	34.416	0.416	226.7	187.6	O K
600 min Winter	34.390	0.390	197.2	173.4	O K
720 min Winter	34.371	0.371	175.1	163.2	O K
960 min Winter	34.343	0.343	143.9	148.0	O K
1440 min Winter	34.290	0.290	107.9	121.3	O K
2160 min Winter	34.249	0.249	80.5	101.9	O K
2880 min Winter	34.228	0.228	66.1	91.8	O K
4320 min Winter	34.196	0.196	50.6	77.3	O K
5760 min Winter	34.178	0.178	42.2	69.8	O K
7200 min Winter	34.168	0.168	37.4	65.4	O K
8640 min Winter	34.161	0.161	34.0	62.4	O K
10080 min Winter	34.155	0.155	31.6	59.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	7531.3	5096
15 min Winter	107.336	0.0	781.3	25
30 min Winter	76.349	0.0	1112.0	35
60 min Winter	51.945	0.0	1514.3	50
120 min Winter	31.389	0.0	1830.2	84
180 min Winter	23.519	0.0	2057.0	116
240 min Winter	19.191	0.0	2238.0	146
360 min Winter	14.401	0.0	2519.1	206
480 min Winter	11.730	0.0	2736.0	264
600 min Winter	9.999	0.0	2915.3	324
720 min Winter	8.774	0.0	3069.8	382
960 min Winter	7.140	0.0	3330.7	508
1440 min Winter	5.307	0.0	3713.2	744
2160 min Winter	3.957	0.0	4153.4	1108
2880 min Winter	3.233	0.0	4525.4	1476
4320 min Winter	2.467	0.0	5179.6	2200
5760 min Winter	2.064	0.0	5777.8	2944
7200 min Winter	1.820	0.0	6367.6	3632
8640 min Winter	1.655	0.0	6949.9	4408
10080 min Winter	1.538	0.0	7531.5	5040

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Cascade Rainfall Details for F4.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.642

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.321	4	8	0.321

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Cascade Model Details for F4.SRCX

Storage is Online Cover Level (m) 35.000

Tank or Pond Structure

Invert Level (m) 34.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	350.0	1.000	940.0

Orifice Outflow Control

Diameter (m) 0.750 Discharge Coefficient 0.600 Invert Level (m) 34.000

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Cascade Summary of Results for F5.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	F6.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	41.516	0.516	113.6	212.0	O K
30 min Summer	41.621	0.621	128.9	269.5	O K
60 min Summer	41.692	0.692	138.3	311.3	O K
120 min Summer	41.656	0.656	133.6	289.6	O K
180 min Summer	41.610	0.610	127.4	263.5	O K
240 min Summer	41.568	0.568	121.4	239.8	O K
360 min Summer	41.496	0.496	110.5	202.0	O K
480 min Summer	41.444	0.444	101.8	175.6	O K
600 min Summer	41.408	0.408	92.7	158.7	O K
720 min Summer	41.382	0.382	84.3	146.2	O K
960 min Summer	41.342	0.342	71.6	128.2	O K
1440 min Summer	41.291	0.291	55.6	106.2	O K
2160 min Summer	41.248	0.248	42.5	88.3	O K
2880 min Summer	41.218	0.218	35.1	76.2	O K
4320 min Summer	41.182	0.182	27.2	62.6	O K
5760 min Summer	41.166	0.166	22.8	56.6	O K
7200 min Summer	41.157	0.157	20.1	53.1	O K
8640 min Summer	41.151	0.151	18.4	50.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	271.8	17
30 min Summer	76.349	0.0	387.0	27
60 min Summer	51.945	0.0	527.6	44
120 min Summer	31.389	0.0	637.7	76
180 min Summer	23.519	0.0	716.7	110
240 min Summer	19.191	0.0	779.8	140
360 min Summer	14.401	0.0	877.7	200
480 min Summer	11.730	0.0	953.2	260
600 min Summer	9.999	0.0	1015.7	318
720 min Summer	8.774	0.0	1069.5	380
960 min Summer	7.140	0.0	1160.3	500
1440 min Summer	5.307	0.0	1293.3	740
2160 min Summer	3.957	0.0	1447.1	1104
2880 min Summer	3.233	0.0	1576.7	1472
4320 min Summer	2.467	0.0	1804.3	2200
5760 min Summer	2.064	0.0	2013.1	2936
7200 min Summer	1.820	0.0	2218.6	3672
8640 min Summer	1.655	0.0	2421.5	4384

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Cascade Summary of Results for F5.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	41.146	0.146	17.1	49.2	O K
15 min Winter	41.515	0.515	113.5	211.5	O K
30 min Winter	41.617	0.617	128.3	267.1	O K
60 min Winter	41.672	0.672	135.7	299.3	O K
120 min Winter	41.605	0.605	126.7	260.3	O K
180 min Winter	41.537	0.537	116.9	223.5	O K
240 min Winter	41.481	0.481	108.0	194.1	O K
360 min Winter	41.406	0.406	92.1	157.7	O K
480 min Winter	41.362	0.362	77.9	137.2	O K
600 min Winter	41.330	0.330	67.9	123.0	O K
720 min Winter	41.306	0.306	60.4	112.6	O K
960 min Winter	41.272	0.272	49.7	98.1	O K
1440 min Winter	41.227	0.227	37.2	80.2	O K
2160 min Winter	41.186	0.186	28.1	64.1	O K
2880 min Winter	41.167	0.167	23.1	56.7	O K
4320 min Winter	41.148	0.148	17.6	49.9	O K
5760 min Winter	41.138	0.138	14.8	46.3	O K
7200 min Winter	41.128	0.128	13.0	42.7	O K
8640 min Winter	41.121	0.121	11.8	40.2	O K
10080 min Winter	41.116	0.116	11.0	38.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	2623.7	5040
15 min Winter	107.336	0.0	271.8	18
30 min Winter	76.349	0.0	387.0	28
60 min Winter	51.945	0.0	527.6	46
120 min Winter	31.389	0.0	637.7	80
180 min Winter	23.519	0.0	716.7	114
240 min Winter	19.191	0.0	779.8	144
360 min Winter	14.401	0.0	877.7	202
480 min Winter	11.730	0.0	953.3	264
600 min Winter	9.999	0.0	1015.7	324
720 min Winter	8.774	0.0	1069.5	384
960 min Winter	7.140	0.0	1160.3	504
1440 min Winter	5.307	0.0	1293.4	752
2160 min Winter	3.957	0.0	1447.1	1104
2880 min Winter	3.233	0.0	1576.7	1468
4320 min Winter	2.467	0.0	1804.3	2196
5760 min Winter	2.064	0.0	2013.1	2928
7200 min Winter	1.820	0.0	2218.6	3640
8640 min Winter	1.655	0.0	2421.5	4328
10080 min Winter	1.538	0.0	2623.8	5112

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Cascade Rainfall Details for F5.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.016

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.508	4	8	0.508

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Cascade Model Details for F5.SRCX

Storage is Online Cover Level (m) 42.000

Tank or Pond Structure

Invert Level (m) 41.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	310.0	1.000	770.0

Orifice Outflow Control

Diameter (m) 0.300 Discharge Coefficient 0.600 Invert Level (m) 41.000

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Cascade Summary of Results for F6.SRCX

Upstream Structures	Outflow To	Overflow To
F5.SRCX	F8.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	36.922	0.422	27.7	311.7	O K
30 min Summer	37.091	0.591	33.7	459.0	O K
60 min Summer	37.277	0.777	39.4	637.5	O K
120 min Summer	37.401	0.901	42.7	765.5	O K
180 min Summer	37.458	0.958	44.1	827.4	O K
240 min Summer	37.480	0.980	44.7	850.9	O K
360 min Summer	37.499	0.999	45.1	872.2	O K
480 min Summer	37.501	1.001	45.2	874.7	O K
600 min Summer	37.494	0.994	45.0	866.7	O K
720 min Summer	37.481	0.981	44.7	852.6	O K
960 min Summer	37.448	0.948	43.9	816.8	O K
1440 min Summer	37.369	0.869	41.9	732.1	O K
2160 min Summer	37.264	0.764	39.0	624.0	O K
2880 min Summer	37.179	0.679	36.5	541.8	O K
4320 min Summer	37.059	0.559	32.7	430.4	O K
5760 min Summer	36.980	0.480	29.9	360.8	O K
7200 min Summer	36.926	0.426	27.8	315.1	O K
8640 min Summer	36.888	0.388	26.3	284.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	433.2	58
30 min Summer	76.349	0.0	620.2	73
60 min Summer	51.945	0.0	855.2	96
120 min Summer	31.389	0.0	1034.4	136
180 min Summer	23.519	0.0	1163.1	184
240 min Summer	19.191	0.0	1265.8	222
360 min Summer	14.401	0.0	1425.1	284
480 min Summer	11.730	0.0	1548.0	348
600 min Summer	9.999	0.0	1649.6	416
720 min Summer	8.774	0.0	1737.0	482
960 min Summer	7.140	0.0	1884.4	616
1440 min Summer	5.307	0.0	2099.5	880
2160 min Summer	3.957	0.0	2355.5	1260
2880 min Summer	3.233	0.0	2565.9	1624
4320 min Summer	2.467	0.0	2933.1	2344
5760 min Summer	2.064	0.0	3279.5	3064
7200 min Summer	1.820	0.0	3613.6	3784
8640 min Summer	1.655	0.0	3942.9	4504

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Cascade Summary of Results for F6.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	36.859	0.359	25.0	260.8	O K
15 min Winter	36.922	0.422	27.7	311.7	O K
30 min Winter	37.091	0.591	33.7	459.0	O K
60 min Winter	37.277	0.777	39.3	637.2	O K
120 min Winter	37.400	0.900	42.7	764.7	O K
180 min Winter	37.459	0.959	44.2	827.8	O K
240 min Winter	37.479	0.979	44.6	850.1	O K
360 min Winter	37.488	0.988	44.9	859.8	O K
480 min Winter	37.479	0.979	44.7	850.8	O K
600 min Winter	37.461	0.961	44.2	830.0	O K
720 min Winter	37.436	0.936	43.6	803.3	O K
960 min Winter	37.381	0.881	42.2	744.3	O K
1440 min Winter	37.264	0.764	39.0	624.6	O K
2160 min Winter	37.120	0.620	34.7	486.1	O K
2880 min Winter	37.016	0.516	31.2	392.4	O K
4320 min Winter	36.885	0.385	26.1	281.4	O K
5760 min Winter	36.810	0.310	22.8	221.9	O K
7200 min Winter	36.766	0.266	20.5	187.3	O K
8640 min Winter	36.737	0.237	18.9	165.4	O K
10080 min Winter	36.717	0.217	17.7	151.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	4269.0	5240
15 min Winter	107.336	0.0	433.2	58
30 min Winter	76.349	0.0	620.2	73
60 min Winter	51.945	0.0	855.2	96
120 min Winter	31.389	0.0	1034.4	134
180 min Winter	23.519	0.0	1163.1	182
240 min Winter	19.191	0.0	1265.8	230
360 min Winter	14.401	0.0	1425.2	292
480 min Winter	11.730	0.0	1548.1	366
600 min Winter	9.999	0.0	1649.6	440
720 min Winter	8.774	0.0	1737.0	512
960 min Winter	7.140	0.0	1884.4	652
1440 min Winter	5.307	0.0	2099.6	918
2160 min Winter	3.957	0.0	2355.6	1300
2880 min Winter	3.233	0.0	2565.9	1664
4320 min Winter	2.467	0.0	2933.5	2384
5760 min Winter	2.064	0.0	3279.5	3104
7200 min Winter	1.820	0.0	3613.7	3816
8640 min Winter	1.655	0.0	3943.1	4504
10080 min Winter	1.538	0.0	4269.9	5184

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Cascade Rainfall Details for F6.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.640

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.213	4	8	0.213	8	12	0.214

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Cascade Model Details for F6.SRCX

Storage is Online Cover Level (m) 38.000

Tank or Pond Structure

Invert Level (m) 36.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	650.0	1.500	1400.0

Orifice Outflow Control

Diameter (m) 0.150 Discharge Coefficient 0.600 Invert Level (m) 36.500

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Cascade Summary of Results for F7.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	F8.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.130	0.630	2.9	108.7	O K
30 min Summer	38.273	0.773	2.9	154.0	O K
60 min Summer	38.410	0.910	2.9	206.6	O K
120 min Summer	38.491	0.991	2.9	242.5	O K
180 min Summer	38.539	1.039	2.9	265.4	O K
240 min Summer	38.572	1.072	2.9	281.6	O K
360 min Summer	38.612	1.112	2.9	302.4	O K
480 min Summer	38.634	1.134	2.9	314.1	O K
600 min Summer	38.646	1.146	2.9	320.5	O K
720 min Summer	38.651	1.151	2.9	323.4	O K
960 min Summer	38.651	1.151	2.9	323.7	O K
1440 min Summer	38.639	1.139	2.9	317.1	O K
2160 min Summer	38.622	1.122	2.9	307.6	O K
2880 min Summer	38.608	1.108	2.9	300.1	O K
4320 min Summer	38.584	1.084	2.9	287.6	O K
5760 min Summer	38.564	1.064	2.9	277.4	O K
7200 min Summer	38.550	1.050	2.9	270.4	O K
8640 min Summer	38.539	1.039	2.9	265.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	111.4	22
30 min Summer	76.349	0.0	158.4	37
60 min Summer	51.945	0.0	216.0	66
120 min Summer	31.389	0.0	261.0	126
180 min Summer	23.519	0.0	293.3	186
240 min Summer	19.191	0.0	319.1	244
360 min Summer	14.401	0.0	359.1	364
480 min Summer	11.730	0.0	389.9	482
600 min Summer	9.999	0.0	415.3	602
720 min Summer	8.774	0.0	436.9	720
960 min Summer	7.140	0.0	462.8	896
1440 min Summer	5.307	0.0	451.5	1138
2160 min Summer	3.957	0.0	592.5	1536
2880 min Summer	3.233	0.0	645.5	1960
4320 min Summer	2.467	0.0	738.5	2772
5760 min Summer	2.064	0.0	824.3	3632
7200 min Summer	1.820	0.0	908.4	4464
8640 min Summer	1.655	0.0	991.5	5272

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Cascade Summary of Results for F7.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	38.532	1.032	2.9	261.9	O K
15 min Winter	38.130	0.630	2.9	108.7	O K
30 min Winter	38.273	0.773	2.9	154.1	O K
60 min Winter	38.410	0.910	2.9	206.9	O K
120 min Winter	38.492	0.992	2.9	243.1	O K
180 min Winter	38.541	1.041	2.9	266.3	O K
240 min Winter	38.575	1.075	2.9	282.9	O K
360 min Winter	38.616	1.116	2.9	304.5	O K
480 min Winter	38.639	1.139	2.9	316.9	O K
600 min Winter	38.652	1.152	2.9	324.0	O K
720 min Winter	38.659	1.159	2.9	327.8	O K
960 min Winter	38.661	1.161	2.9	329.2	O K
1440 min Winter	38.643	1.143	2.9	318.8	O K
2160 min Winter	38.615	1.115	2.9	304.1	O K
2880 min Winter	38.587	1.087	2.9	289.5	O K
4320 min Winter	38.532	1.032	2.9	261.9	O K
5760 min Winter	38.480	0.980	2.9	237.3	O K
7200 min Winter	38.434	0.934	2.9	217.1	O K
8640 min Winter	38.393	0.893	2.9	199.6	O K
10080 min Winter	38.355	0.855	2.9	184.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.538	0.0	1074.4	6056
15 min Winter	107.336	0.0	111.4	22
30 min Winter	76.349	0.0	158.4	37
60 min Winter	51.945	0.0	216.0	66
120 min Winter	31.389	0.0	261.0	124
180 min Winter	23.519	0.0	293.3	182
240 min Winter	19.191	0.0	319.1	240
360 min Winter	14.401	0.0	359.1	356
480 min Winter	11.730	0.0	389.9	472
600 min Winter	9.999	0.0	415.3	584
720 min Winter	8.774	0.0	436.8	696
960 min Winter	7.140	0.0	460.9	914
1440 min Winter	5.307	0.0	450.0	1158
2160 min Winter	3.957	0.0	592.5	1624
2880 min Winter	3.233	0.0	645.5	2080
4320 min Winter	2.467	0.0	738.6	2988
5760 min Winter	2.064	0.0	824.3	3864
7200 min Winter	1.820	0.0	908.4	4752
8640 min Winter	1.655	0.0	991.5	5616
10080 min Winter	1.538	0.0	1074.4	6456

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Cascade Rainfall Details for F7.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.416

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.208	4	8	0.208

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Cascade Model Details for F7.SRCX

Storage is Online Cover Level (m) 39.000

Tank or Pond Structure

Invert Level (m) 37.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.500	780.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0079-3000-1200-3000
Design Head (m)	1.200
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	37.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.0
Flush-Flo™	0.348	2.9
Kick-Flo®	0.707	2.4
Mean Flow over Head Range	-	2.6

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	2.3	1.200	3.0	3.000	4.6	7.000	6.8
0.200	2.8	1.400	3.2	3.500	4.9	7.500	7.0
0.300	2.9	1.600	3.4	4.000	5.2	8.000	7.3
0.400	2.9	1.800	3.6	4.500	5.5	8.500	7.5
0.500	2.8	2.000	3.8	5.000	5.8	9.000	7.7
0.600	2.7	2.200	4.0	5.500	6.1	9.500	7.9
0.800	2.5	2.400	4.1	6.000	6.3		
1.000	2.8	2.600	4.3	6.500	6.6		

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Cascade Summary of Results for F8.SRCX

Upstream Structures	Outflow To	Overflow To
F6.SRCX	F9.SRCX	(None)
F5.SRCX		
F7.SRCX		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	32.747	0.247	25.5	424.1	O K
30 min Summer	32.864	0.364	26.4	642.7	O K
60 min Summer	33.020	0.520	26.4	947.1	O K
120 min Summer	33.144	0.644	26.4	1204.7	O K
180 min Summer	33.232	0.732	26.4	1396.1	O K
240 min Summer	33.304	0.804	26.4	1555.5	O K
360 min Summer	33.410	0.910	26.4	1799.1	O K
480 min Summer	33.474	0.974	26.4	1952.3	O K
600 min Summer	33.522	1.022	26.4	2067.4	O K
720 min Summer	33.559	1.059	26.4	2158.3	O K
960 min Summer	33.612	1.112	26.4	2291.0	O K
1440 min Summer	33.655	1.155	26.4	2400.2	O K
2160 min Summer	33.638	1.138	26.4	2357.2	O K
2880 min Summer	33.620	1.120	26.4	2312.2	O K
4320 min Summer	33.589	1.089	26.4	2233.8	O K
5760 min Summer	33.560	1.060	26.4	2160.4	O K
7200 min Summer	33.537	1.037	26.4	2103.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	884.5	148
30 min Summer	76.349	0.0	1270.7	231
60 min Summer	51.945	0.0	1809.3	340
120 min Summer	31.389	0.0	2189.3	440
180 min Summer	23.519	0.0	2460.6	518
240 min Summer	19.191	0.0	2675.7	590
360 min Summer	14.401	0.0	3005.3	698
480 min Summer	11.730	0.0	3254.4	778
600 min Summer	9.999	0.0	3453.2	856
720 min Summer	8.774	0.0	3614.2	932
960 min Summer	7.140	0.0	3830.0	1082
1440 min Summer	5.307	0.0	3779.5	1444
2160 min Summer	3.957	0.0	5030.5	1824
2880 min Summer	3.233	0.0	5474.8	2188
4320 min Summer	2.467	0.0	6220.5	2948
5760 min Summer	2.064	0.0	7025.5	3736
7200 min Summer	1.820	0.0	7740.0	4536

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Cascade Summary of Results for F8.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Summer	33.517	1.017	26.4	2054.7	O K
10080 min Summer	33.502	1.002	26.4	2017.9	O K
15 min Winter	32.747	0.247	25.5	424.1	O K
30 min Winter	32.864	0.364	26.4	642.7	O K
60 min Winter	33.019	0.519	26.4	946.6	O K
120 min Winter	33.143	0.643	26.4	1202.7	O K
180 min Winter	33.231	0.731	26.4	1392.6	O K
240 min Winter	33.302	0.802	26.4	1550.3	O K
360 min Winter	33.407	0.907	26.4	1792.3	O K
480 min Winter	33.471	0.971	26.4	1944.1	O K
600 min Winter	33.518	1.018	26.4	2058.0	O K
720 min Winter	33.555	1.055	26.4	2147.8	O K
960 min Winter	33.607	1.107	26.4	2278.9	O K
1440 min Winter	33.650	1.150	26.4	2387.7	O K
2160 min Winter	33.622	1.122	26.4	2317.2	O K
2880 min Winter	33.587	1.087	26.4	2228.2	O K
4320 min Winter	33.504	1.004	26.4	2022.5	O K
5760 min Winter	33.413	0.913	26.4	1806.6	O K
7200 min Winter	33.312	0.812	26.4	1574.4	O K
8640 min Winter	33.219	0.719	26.4	1366.1	O K
10080 min Winter	33.143	0.643	26.4	1203.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.655	0.0	8441.3	5336
10080 min Summer	1.538	0.0	9128.2	6144
15 min Winter	107.336	0.0	884.5	148
30 min Winter	76.349	0.0	1270.7	230
60 min Winter	51.945	0.0	1809.3	340
120 min Winter	31.389	0.0	2189.3	438
180 min Winter	23.519	0.0	2460.6	516
240 min Winter	19.191	0.0	2675.8	588
360 min Winter	14.401	0.0	3005.3	696
480 min Winter	11.730	0.0	3254.5	776
600 min Winter	9.999	0.0	3453.5	854
720 min Winter	8.774	0.0	3614.8	930
960 min Winter	7.140	0.0	3833.5	1080
1440 min Winter	5.307	0.0	3800.9	1420
2160 min Winter	3.957	0.0	5030.8	1848
2880 min Winter	3.233	0.0	5475.6	2236
4320 min Winter	2.467	0.0	6227.9	3076
5760 min Winter	2.064	0.0	7025.7	3952
7200 min Winter	1.820	0.0	7740.5	4768
8640 min Winter	1.655	0.0	8442.4	5512
10080 min Winter	1.538	0.0	9132.4	6248

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Cascade Rainfall Details for F8.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.493	4	8	0.493	8	12	0.494

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Cascade Model Details for F8.SRCX

Storage is Online Cover Level (m) 34.000

Tank or Pond Structure

Invert Level (m) 32.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1630.0	1.500	2880.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0222-2650-1200-2650
Design Head (m)	1.200
Design Flow (l/s)	26.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	222
Invert Level (m)	32.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	26.5
Flush-Flo™	0.398	26.4
Kick-Flo®	0.852	22.5
Mean Flow over Head Range	-	22.4

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	7.5	1.200	26.5	3.000	41.1	7.000	61.9
0.200	22.0	1.400	28.5	3.500	44.2	7.500	64.0
0.300	26.1	1.600	30.4	4.000	47.2	8.000	66.1
0.400	26.4	1.800	32.1	4.500	50.0	8.500	68.0
0.500	26.2	2.000	33.8	5.000	52.6	9.000	70.0
0.600	25.8	2.200	35.4	5.500	55.1	9.500	71.8
0.800	23.7	2.400	36.9	6.000	57.4		
1.000	24.3	2.600	38.3	6.500	59.7		

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Cascade Summary of Results for F9.SRCX

Upstream Structures	Outflow To	Overflow To
F8.SRCX	(None)	(None)
F7.SRCX		
F6.SRCX		
F5.SRCX		

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	32.745	0.245	25.0	71.6	O K
30 min Summer	32.839	0.339	25.9	104.7	O K
60 min Summer	32.921	0.421	26.0	136.7	O K
120 min Summer	32.960	0.460	26.0	153.0	O K
180 min Summer	33.004	0.504	26.0	172.2	O K
240 min Summer	33.038	0.538	26.0	187.2	O K
360 min Summer	33.081	0.581	26.0	207.5	O K
480 min Summer	33.099	0.599	26.0	216.1	O K
600 min Summer	33.116	0.616	26.0	224.3	O K
720 min Summer	33.138	0.638	26.0	235.0	O K
960 min Summer	33.216	0.716	26.0	275.9	O K
1440 min Summer	33.533	1.033	26.0	471.7	O K
2160 min Summer	33.575	1.075	26.0	501.6	O K
2880 min Summer	33.581	1.081	26.0	505.7	O K
4320 min Summer	33.592	1.092	26.0	514.0	O K
5760 min Summer	33.623	1.123	26.0	537.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.336	0.0	939.3	267
30 min Summer	76.349	0.0	1350.0	472
60 min Summer	51.945	0.0	1928.9	796
120 min Summer	31.389	0.0	2334.0	172
180 min Summer	23.519	0.0	2623.3	192
240 min Summer	19.191	0.0	2852.4	250
360 min Summer	14.401	0.0	3202.8	366
480 min Summer	11.730	0.0	3467.2	448
600 min Summer	9.999	0.0	3677.5	604
720 min Summer	8.774	0.0	3846.4	728
960 min Summer	7.140	0.0	3927.5	1376
1440 min Summer	5.307	0.0	3613.4	2880
2160 min Summer	3.957	0.0	5368.1	3604
2880 min Summer	3.233	0.0	5841.7	4096
4320 min Summer	2.467	0.0	6632.2	5052
5760 min Summer	2.064	0.0	7499.2	5944

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Cascade Summary of Results for F9.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
7200 min Summer	33.635	1.135	26.0	546.3	O K
8640 min Summer	33.640	1.140	26.0	549.9	O K
10080 min Summer	33.645	1.145	26.0	553.8	O K
15 min Winter	32.745	0.245	25.0	71.6	O K
30 min Winter	32.839	0.339	25.9	104.7	O K
60 min Winter	32.921	0.421	26.0	136.7	O K
120 min Winter	32.960	0.460	26.0	153.0	O K
180 min Winter	33.004	0.504	26.0	172.2	O K
240 min Winter	33.038	0.538	26.0	187.3	O K
360 min Winter	33.082	0.582	26.0	208.1	O K
480 min Winter	33.103	0.603	26.0	218.1	O K
600 min Winter	33.120	0.620	26.0	226.3	O K
720 min Winter	33.142	0.642	26.0	237.1	O K
960 min Winter	33.229	0.729	26.0	282.7	O K
1440 min Winter	33.536	1.036	26.0	474.1	O K
2160 min Winter	33.573	1.073	26.0	500.4	O K
2880 min Winter	33.576	1.076	26.0	502.7	O K
4320 min Winter	33.585	1.085	26.0	508.8	O K
5760 min Winter	33.628	1.128	26.0	540.8	O K
7200 min Winter	33.664	1.164	26.0	568.0	O K
8640 min Winter	33.698	1.198	26.1	595.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.820	0.0	8261.8	6776
8640 min Summer	1.655	0.0	9009.9	7576
10080 min Summer	1.538	0.0	9741.9	8392
15 min Winter	107.336	0.0	939.3	267
30 min Winter	76.349	0.0	1350.0	472
60 min Winter	51.945	0.0	1928.9	796
120 min Winter	31.389	0.0	2334.0	172
180 min Winter	23.519	0.0	2623.3	190
240 min Winter	19.191	0.0	2852.4	248
360 min Winter	14.401	0.0	3203.0	358
480 min Winter	11.730	0.0	3467.4	462
600 min Winter	9.999	0.0	3677.9	588
720 min Winter	8.774	0.0	3847.1	714
960 min Winter	7.140	0.0	3933.2	2666
1440 min Winter	5.307	0.0	3632.4	2880
2160 min Winter	3.957	0.0	5368.4	3576
2880 min Winter	3.233	0.0	5842.6	4056
4320 min Winter	2.467	0.0	6641.6	4976
5760 min Winter	2.064	0.0	7499.5	5800
7200 min Winter	1.820	0.0	8262.3	6432
8640 min Winter	1.655	0.0	9011.2	7008

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Cascade Summary of Results for F9.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	33.722	1.222	26.3	614.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.538	0.0	9746.6	7664

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Cascade Rainfall Details for F9.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 271172 196525 SS 71172 96525
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.240

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.080	4	8	0.080	8	12	0.080

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Cascade Model Details for F9.SRCX

Storage is Online Cover Level (m) 34.000

Tank or Pond Structure

Invert Level (m) 32.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	1.500	980.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0220-2610-1200-2610
Design Head (m)	1.200
Design Flow (l/s)	26.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	220
Invert Level (m)	32.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	26.1
Flush-Flo™	0.397	26.0
Kick-Flo®	0.850	22.1
Mean Flow over Head Range	-	22.1

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	7.4	1.200	26.1	3.000	40.5	7.000	61.0
0.200	21.7	1.400	28.1	3.500	43.6	7.500	63.1
0.300	25.7	1.600	29.9	4.000	46.5	8.000	65.1
0.400	26.0	1.800	31.7	4.500	49.3	8.500	67.1
0.500	25.8	2.000	33.3	5.000	51.8	9.000	69.0
0.600	25.4	2.200	34.9	5.500	54.3	9.500	70.8
0.800	23.4	2.400	36.4	6.000	56.6		
1.000	23.9	2.600	37.8	6.500	58.9		

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Appendix K DCWW Consultation & Developer Enquiry

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Mrs Phoebe Ryding
PJA Civil Engineering Ltd
Seven House
High Street
Longbridge
Birmingham
B31 2UQ

Date: 18/08/2021
Our Ref: PPA0005951

Dear Mrs Ryding

Grid Ref: 271457 195972
Site Address: Llandary Urban Village
Development: Mixed-Use Development

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to a mixed-use development comprising "2,000 residential dwellings, a 2FE School, a 1.2ha extension to the existing commercial development and a local centre which includes retail units" on land adjacent Junction 43 of the M4 in Llandarcy, Neath. We acknowledge that the site comprises of the Llandary Urban Village allocation (Ref: SRA1) within the Local Development Plan (LDP) and parts of the site have been developed and/or benefit from extant planning permission. In reference to our representations during the LDP consultation process, we can confirm that an initial assessment would have been undertaken of the public sewerage and watermains systems in relation to this development which informs our appraisal as follows.

Please note, notwithstanding the following assessment, we would advise there is also a mandatory requirement to undertake pre-application consultation with all 'Specialist Consultees', including Dwr Cymru Welsh Water as the statutory water and sewerage undertaker, in accordance with Schedule 4 of Town & Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016. As a major development, you will be statutorily required to consult Welsh Water and a substantive response will be issued within 28 days from the date of the notice as per the requirements of Article 2E.

glas
Glas Cymru Cyfyngedig

Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dŵr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a mixed sewerage system, comprising combined, foul and surface water public sewers, which drains to Afan New Works Wastewater Treatment Works (WwTW). The site also lies in proximity to a public sewerage system that drains to Swansea Bay WwTW, located approximately 1.2km to the west.

This site is crossed by combined public sewers and an overflow system in the north-east corner of the site, with their approximate positions being marked on the attached Statutory Public Sewer Record, along with foul and surface water sewers in the south-eastern portion of the site. In accordance with the Water Industry Act 1991, Dwr Cymru Welsh Water requires access to its apparatus at all times in order to carry out maintenance and repairs. No part of any building will be permitted within the protection zone of the public sewers measured 3 metres either side of the centreline. Our strong recommendation is that your site layout takes into account the location of the assets crossing the site and should be referred to in any master-planning exercises or site layout plans submitted as part of any subsequent planning application. Further information regarding Asset Protection is provided in the attached Advice & Guidance note.

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

The submitted information refers to proposals to utilise swales and basins for surface water disposal whereas highway drainage will flow to a private *"sewer watercourse"* and therefore is recommended that the developer consult with Neath Port Talbot County Borough Council, as the Local Highways Authority and determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation.

In addition, with respect to the accompanying e-mail correspondence 2nd August, we are unaware of an arrangement whereby existing *"surface water is currently pumped from the reservoir, north of the Site, to the DCWW sewer east of the Site"*, which may refer to private systems. Furthermore, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system. Accordingly, for the purposes of this pre-application enquiry, please note the requirement to obtain SAB consent and there is no agreement to communicate flows to the public sewerage system. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development and concluded it is unlikely that sufficient capacity exists to accommodate your development without causing detriment to the existing services we provide to our customers, or in regard to the protection of the environment.

In light of the above, our recommendation is that you instruct us to undertake a Hydraulic Modelling Assessment (HMA) which is at the developer's expense and will examine the impact of the introduction of flows from your development upon the performance of the existing network and consider. Where required and appropriate, the HMA will then identify solutions and points of communication to ensure that your site can be accommodated within the system. For the developer to obtain a quotation for the HMA, we will require a fee of £250 + VAT. Please note that we will seek to control the outcomes of the HMA via appropriate planning conditions. However, in the absence of known solutions to accommodate your site we will not be able to support your development through the planning process. We therefore recommend that the HMA is undertaken in advance of a planning application being submitted, in order to avoid any subsequent delays. Further information on Hydraulic Modelling Assessments as well as any implications on the planning process is provided in the attached Advice & Guidance note.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com.

If the development will give rise to a new discharge (or alter an existing discharge) of trade effluent, directly or indirectly to the public sewerage system, then a Discharge Consent under Section 118 of the Water Industry Act 1991 is required from Dwr Cymru / Welsh Water. Please note that the issuing of a Discharge Consent is independent of the planning process and a consent may be refused although planning permission is granted.

Foul Water Drainage – Sewage Treatment

No problems are envisaged with the Wastewater Treatment Works for the treatment of domestic discharges from this site.

Potable Water Supply

In order to establish what would be required to serve the site with an adequate water supply, it will be necessary for the developer to fund the undertaking of a Hydraulic Modelling Assessment on the water supply network. For the developer to obtain a quotation for the Hydraulic Modelling Assessment, we will require a fee of £250 + VAT.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at **developer.services@dwrcymru.com**

Please quote our reference number in all communications and correspondence.

Yours faithfully,

Owain George
Planning Liaison Manager
Developer Services

***Please Note** that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.*

From:	Phoebe Ryding
To:	Sion Jones; Matthew Humphreys
Cc:	Alison Caldwell; Emma Wood; Mike Poland; Jonathan Hearing; Elise Coalter
Subject:	RE: [PJA: 05474] Coed Darcy - DCWW
Date:	12 November 2021 15:26:45
Attachments:	image002.png image008.png image013.png image016.png image017.png image018.png image023.png image026.png image027.png image030.png image031.png image033.png image035.png image036.png image037.png image038.png image531064.png

---

Hi Both,

Thanks for your time this afternoon.

Please find the following link to the PC22 document which outlines the previously agreed surface water discharge rate to the Bridge House Outfall and the previously agreed foul water discharge locations and areas: https://we.tl/t-ZqIJnLJbok

As discussed, we will provide commentary in relation to the need for a Hydraulic Modelling Assessment (HMA) within the reports submitted as part of a future planning application. We would also be grateful if you could also provide correspondence in relation to the need for HMAs clarifying your position.

If you have any questions or queries, please don't hesitate to contact me.

Hope you have a lovely weekend.

Kind regards,
Phoebe

PJA
transport • engineering • placemaking

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 387 7961 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 10 November 2021 14:49
To: Sion Jones <Sion.Jones@dwrcymru.com>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Siôn,

Thanks for confirming. We will circulate a meeting invite shortly.

Kind regards,

Phoebe

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 387 7961 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Sion Jones <Sion.Jones@dwrcymru.com>
Sent: 10 November 2021 10:20
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Phoebe,

Friday PM is okay for both of us as well (preferably not 3-3:30pm for me) if you're happy to send through a calendar invite to us.

Thanks,

Siôn

Siôn Jones
Lead Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com
T: 0800 917 2652 | M: 07770856624
A: PO Box 3146, Cardiff, CF30 0EH

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---

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 08 November 2021 15:37
To: Sion Jones <Sion.Jones@dwrcymru.com>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Siôn,

We are free this Friday (12th) afternoon for a call if you and Matthew are available, please let me know and we will set up a Teams meeting?

Thanks in advance,

Phoebe

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 387 7961 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Sion Jones <Sion.Jones@dwrcymru.com>
Sent: 08 November 2021 13:22
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>; Amanda Thompson <amanda.thompson@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Good Afternoon Phoebe,

Thanks for your e-mails and continued patience. Forgive me as I haven't had an opportunity to catchup with Matthew as yet, seeing as we were both on leave the prior week, but will endeavour to review at the earliest opportunity. In the meantime, looking at the suggested times/dates below, we would unable to do this Thursday (11th) or next Monday (15th) but it looks like we could make this Friday (12th) or otherwise 10-11am next Tuesday (16th) if you want to check with your team and likewise I'll liaise further with Matthew.

Regards,

Siôn

Siôn Jones
Lead Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com
T: 0800 917 2652 | M: 07770856624
A: PO Box 3146, Cardiff, CF30 0EH

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---

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 05 November 2021 11:18
To: Sion Jones <Sion.Jones@dwrcymru.com>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>; Amanda Thompson <amanda.thompson@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Sion,

We have received the PAC response from you and we would be grateful if you could confirm your

availability for a call with yourself and Matthew Humphreys at your earliest convenience.

The dates and times we are now available are:

- After 4pm on Thursday 11th November
- Friday 12th November (between 10am and 1pm or after 2pm)
- Monday 15th November (before 11am or after 3pm)
- Tuesday 16th November (AM)

Many thanks,
Phoebe

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 387 7961 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 01 November 2021 14:02
To: Sion Jones <Sion.Jones@dwrcymru.com>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>; Amanda Thompson <amanda.thompson@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Siôn,

Thanks for you email.

As discussed and outlined in previous agreements, DCWW have previously agreed to cover the costs of all the off-Site reinforcements, as such it was our understanding that HMAs would not be required.

In relation to the need for pumping, due to the topography of the Site there will be a need for foul water pumping however, surface water is not proposed to be pumped at this stage.

With regards to the discharge rate which has been previously agreed of 583l/s into the Bridge House Outfall, following our phone call we have reviewed this and reduced to a rate of 99.3l/s in the proposed surface water drainage strategy. Whilst this is greater than the greenfield runoff rate, this represents an 82% betterment, which is significantly lower than the previously agreed discharge rate.

We would welcome a phone call to discuss the queries below. Our current availability is:

- Monday 8th November (PM)
- Tuesday 9th November (All day)
- Wednesday 10th November (AM)
- Friday 12th November (All day)

Please let me know when works best for you and we will circulate a Teams meeting.

Kind regards,
Phoebe

Phoebe Ryding
Senior Flood Risk and Drainage Engineer

T. 0121 387 7961 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Sion Jones <Sion.Jones@dwrcymru.com>
Sent: 27 October 2021 09:19
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>; Amanda Thompson <amanda.thompson@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Good Morning Phoebe,

Thank you for your e-mail and continued patience. Quite timely, we've recently received a statutory pre-application consultation from the planning agent Savills for the development (https://sites.savills.com/Coed_Darcy/en/page_159110.php) and will be due to respond by 10th November (Ref: PPA0006151) although we will look to respond at the earliest possible opportunity.

Whilst DCWW would generally prefer gravity connections into the network, I haven't been privy to the original commercial agreement for this development site including business park SPS and any required off-site reinforcement works to the watermains network. Therefore, for the purposes of the current pre-application consultation (Ref: PPA0006151), we will look to replicate the same comments as our previous response to your pre-application enquiry (Ref: PPA0005951) with reference to the hydraulic modelling assessments (HMAs). Forgive me as I can't recall if a copy of the commercial agreement was shared during our meeting but, on his return from leave, I will liaise further with @Matthew Humphreys regarding the queries listed below and what (if any) assessments we will be considered necessary for the purposes of this development which may sit outside the scope of the original agreement.

With respect to your enquiry regarding the surface water drainage proposals, however, I'm unaware of any former agreement and therefore would be concerned at the substantial rate referenced below and within the link provided and likewise would advocate that flows shall be reduced and attenuated to the lowest possible rate. Ultimately, as discussed at the meeting, the development is now subject to Schedule 3 of the Flood and Water Management Act 2010 and therefore I would advocate for discussions with NPTCBC in respect of any forthcoming SAB application(s) which I would anticipate will enable a considerable reduction or, better yet, consideration of an alternative or hybrid solution for the surface water runoff destination.

For completeness, I've also copied in Amanda as I was mindful you had still not received a copy of the HMA quotations in the correct company name although, any decision whether HMAs will be required will depend on the aforementioned. Perhaps we could arrange another follow-up meeting in the next fortnight or so and this will give me and Matthew an opportunity to catchup in anticipation of any forthcoming planning application submission; if you would like to suggest any times/dates?

Regards,

Siôn

Siôn Jones
Lead Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com

T: 0800 917 2652 | M: 07770856624
A: PO Box 3146, Cardiff, CF30 0EH

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---

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 21 September 2021 10:55
To: Sion Jones <Sion.Jones@dwrcymru.com>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Both,

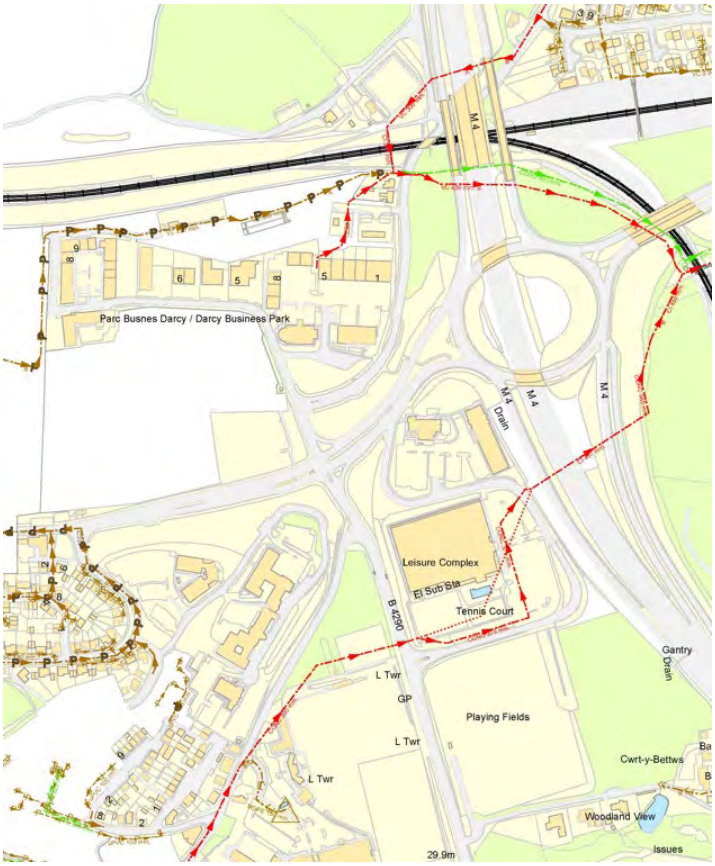
Thank you so much for your time this morning.

To summarise the key points that were discussed:

- The development no longer requires the Business Park Pumping Station on the construction of the 301st dwelling
- DCWW would prefer gravity network and gravity connections into the network, where possible
- Manholes agreed as part of PC20, produced by Atkins, with regards to the foul drainage strategy are still acceptable discharge locations
- There is no need to progress Hydraulic Modelling Assessments for either the potable or foul water drainage
- The agreed rate of surface water discharge (583l/s), as identified in the PC22 document (available at the following wetransfer link: https://we.tl/t-VhUOa8QZBX), via a connection to the surface water sewer at the Bridge House Outfall is still acceptable in principle. The discharge rate previously agreed should still be acceptable in principle, however should be reduced as far as reasonably practicable.
- All off-site upgrades will be covered by DCWW.

We would be grateful if you could also provide a cost for DCWW to upgrade the combined sewer over the railway within the Site.

In addition, if you have any manhole information (including cover level and invert level data) for the below area, it would be appreciated.



Please can you let me know if there is are any additional points raised in the meeting which have not been captured within this email?

If you have any queries or questions, please do not hesitate to contact me.

Many thanks,
Phoebe

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 475 0234 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Sion Jones <Sion.Jones@dwrcymru.com>
Sent: 21 September 2021 09:06
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>; Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Phoebe,

We're just trying to re-send the invite now.

Regards,

Siôn

Siôn Jones
Lead Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com
T: 0800 917 2652 | M: 07770856624
A: PO Box 3146, Cardiff, CF30 0EH

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---

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 21 September 2021 09:02
To: Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Sion Jones <Sion.Jones@dwrcymru.com>; Mike Poland <mike.poland@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Matthew,

We cant get into the Teams meeting. Please can you re-send the invite?

Many thanks,
Phoebe

PJA
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Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 475 0234 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Sent: 18 September 2021 08:59
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>; Sion Jones <Sion.Jones@dwrcymru.com>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Phoebe,

Can we go for 9am on Tuesday. I'll sent out an invite.

Regards,

Matthew.

Matthew Humphreys
Head of Infrastructure Delivery (Developer Services)
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com
T: 0800 917 2652 | M: 07917 777610 |
A: PO Box 3146, Cardiff, CF30 0EH

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 17 September 2021 07:47
To: Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Matthew,

Thanks for the response.

We are available either:

- Monday afternoon 1pm-3pm
- Tuesday morning 9am

Please let me know which of these suit you best and I will arrange a Teams call.

Kind regards,
Phoebe

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Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 475 0234 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Sent: 16 September 2021 13:29
To: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

Hi Phoebe,

Apologies for the delay in responding – I've been liaising with the planning team who provided the response to yourselves.

The strategy for Coed Darcy goes back a number of years and I've been involved over this time.

Tim and I have agreed a strategy for the foul flows and connection points and this has been documented and agreed. In terms of surface water this may change now with the SAB authority for Wales.

I would be available Monday PM (20th) or Tuesday AM (21st) to discuss.

Regards,

Matthew.

Matthew Humphreys
Head of Infrastructure Delivery (Developer Services)
Dŵr Cymru Welsh Water

W: dwrcymru.com
E: developer.services@dwrcymru.com
T: 0800 917 2652 | M: 07917 777610 |
A: PO Box 3146, Cardiff, CF30 0EH

From: Phoebe Ryding <Phoebe.ryding@pja.co.uk>
Sent: 14 September 2021 09:46
To: Matthew Humphreys <Matthew.Humphreys@dwrcymru.com>
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>
Subject: RE: [PJA: 05474] Coed Darcy - DCWW

******** External Mail ********
Hi Matthew,

I just wanted to follow up on the below email and wondered whether you had any availability to discuss the Coed Darcy Site and works that have been previously undertaken by DCWW on the Site?

Many thanks,
Phoebe

PJA
transport • engineering • placemaking

Phoebe Ryding
Senior Flood Risk and Drainage Engineer
T. 0121 475 0234 M. 07872 858452
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

From: Phoebe Ryding
Sent: 07 September 2021 08:20
To: matthew.humphreys@dwrcymru.com
Cc: Alison Caldwell <Alison.caldwell@pja.co.uk>; Emma Wood <emma.wood@pja.co.uk>
Subject: [PJA: 05474] Coed Darcy - DCWW

Hi Matthew,

We have recently received the attached pre-development enquiry for a proposed development at Coed Darcy. Since receiving we have been in discussions with Tim Budd with regards to previous works undertaken and he has advised we arrange a call with yourself to discuss.

I would be grateful if you could confirm a time that you are free week commencing 13th September so I can arrange a Teams call to understand works that have been previously undertaken by DCWW with regards to the Site?

If you have any questions or queries, don't hesitate to contact me.

Kind regards,
Phoebe

Phoebe Ryding

Senior Flood Risk and Drainage Engineer
T. 0121 475 0234
Seven House, High Street, Longbridge, Birmingham, B31 2UQ
www.pja.co.uk

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Appendix L Pre-Application Correspondence

From: Environmental Information Requests
To: Phoebe Ryding
Subject: Request for information
Date: 17 August 2021 09:23:54

Our Reference: EIR/858/2021

Dear Ms Ryding

Request for information

RE: [PJA: 05474] Historic Sewer Flood Request

We write further to your request for information dated 26th July 2021, which we have been considering under the Environmental Information Regulations 2004.

We can confirm that we have reviewed our flooding database and we have no flooding history or flood risk within the boundary requested in Llandarcy.

We hope that this response is clear. Should you have any questions, please contact us by email at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Linea, Fortran Road, St Mellons, Cardiff CF3 0LT

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

Yours sincerely,

R.Stevens

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