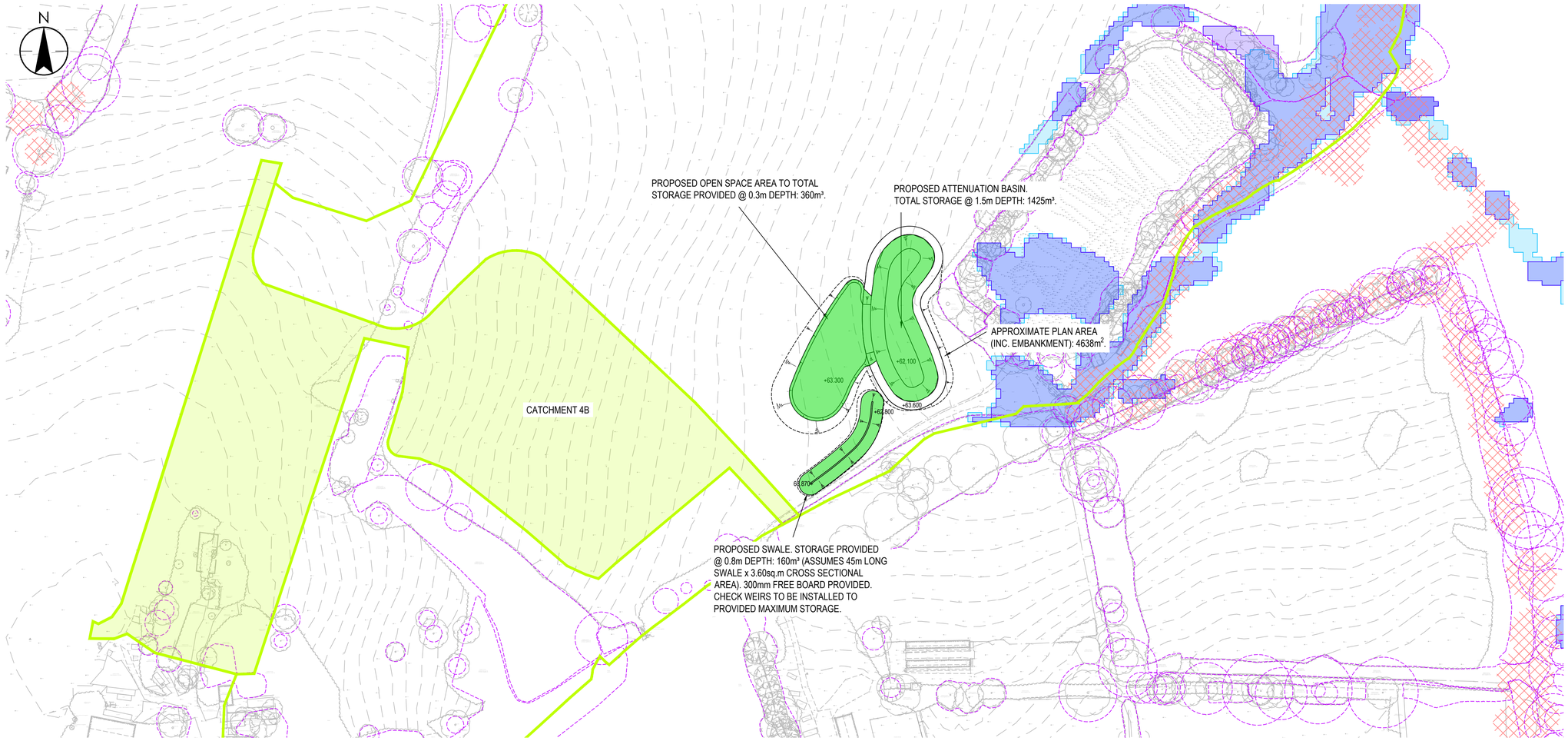
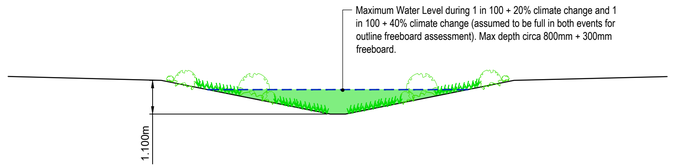
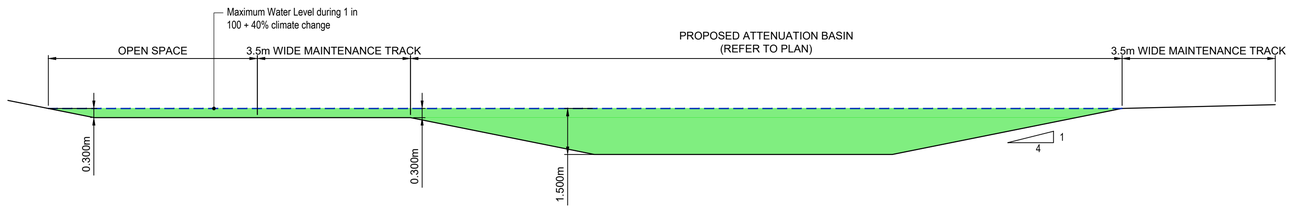




TYPICAL ATTENUATION SWALE CROSS SECTION

SCALE 1:100



TYPICAL SECTION THROUGH STRATEGIC ATTENUATION

SCALE 1:100

Stantec

Stantec UK Limited
CAMBRIDGE
50/60 Station Road, Cambridge, CB1 2JH
Tel: +44 1223 882 000
www.stantec.com/uk

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Notes

CATCHMENT 4B SUMMARY

ASSUMED IMPERMEABLE AREA: 1.38ha
PROPOSED DISCHARGE RATE: 1.9l/s
STORAGE REQUIRED UP TO 1:10 YEAR EVENT: 692m³
STORAGE REQUIRED UP TO 1:30 YEAR + 20%cc EVENT: 1139m³
STORAGE REQUIRED UP TO 1:100 YEAR +20%cc EVENT: 1540m³
STORAGE REQUIRED UP TO 1:100 YEAR +40%cc EVENT: 1831m³

- 1:30 YEAR FLOOD EXTENTS
- 1:100 YEAR FLOOD EXTENTS
- ROOT PROTECTION AREAS
- TREE PRESERVATION ORDER
- ATTENUATION PROVIDING STORAGE UP TO 1 IN 100 YR PLUS 40% CLIMATE CHANGE

Issued/Revision		By	Appd	YYYY.MM.DD
P06	MASTERPLAN UPDATED. CATCHMENT AREA REVISED ACCORDINGLY.	KB	SK	2022.07.22
P05	CATCHMENT AREA REVISED. CATCHMENT SUMMARY	HA	SK	2022.03.14
P04	CATCHMENT 4 REVISED. BASINS 4A AND 4B REVISED TO SUIT	KB	SK	2021.11.09
P03	REVISED TO SUIT LATEST MASTERPLAN	HA	SK	2021.05.23
P02	REVISED	HA	SK	2021.05.04
P01	REVISED	HA	SK	2021.04.08

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	HA	HA	SK	2021.03.20

Issue Status

PRELIMINARY

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this Land. A DEVELOPMENT BUSINESS

Client/Project

THIS LAND LTD.

HADLEIGH SITE CASTLE POINT

Title

CATCHMENTS 4B ATTENUATION

Project No. 47268

Scale 1:1000 & 1:100

Revision **P06**

Drawing No. **47268/2001/004**

Plotted: 26.08.2022 08:28, 3.28.1.0 PM By: Burnside, Kieron
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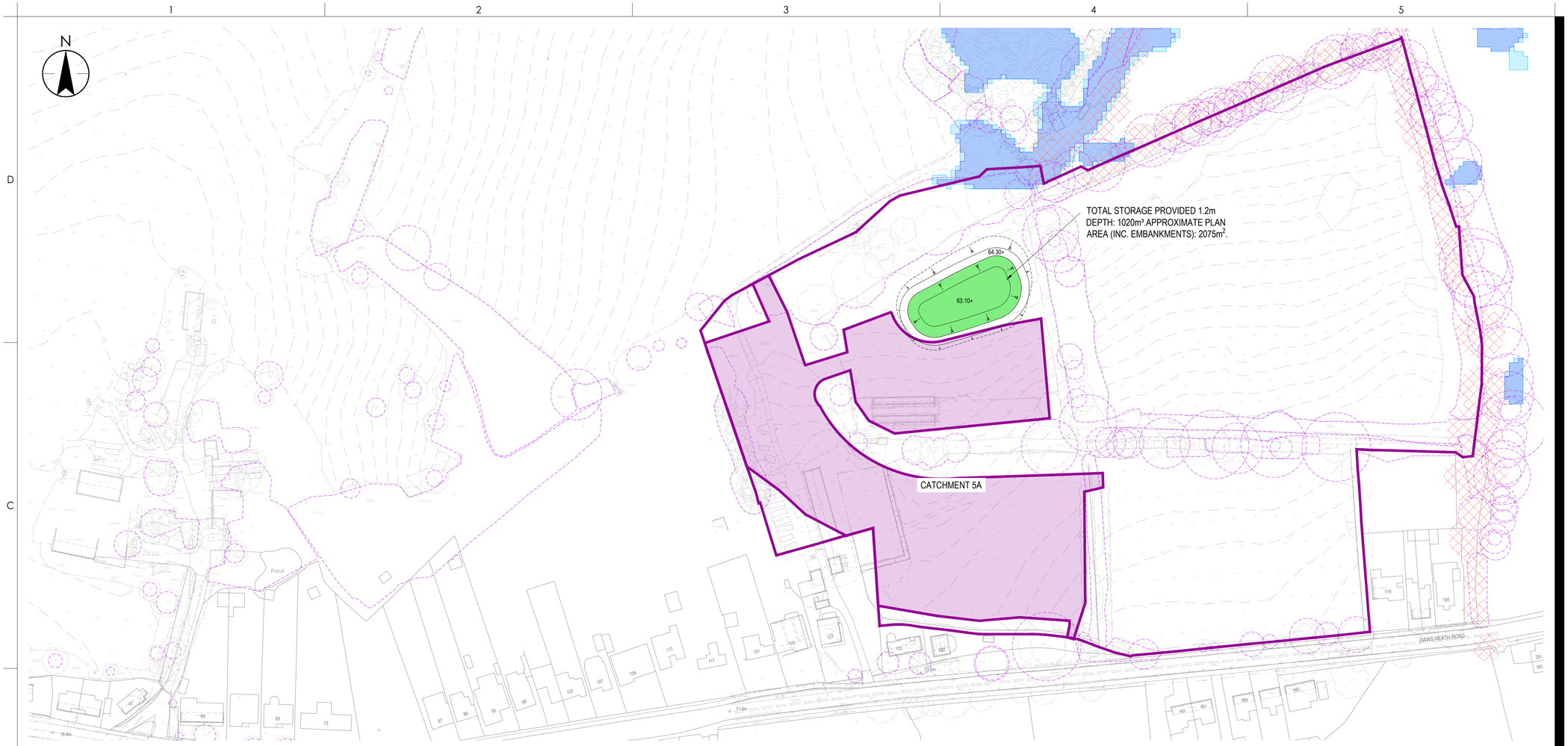

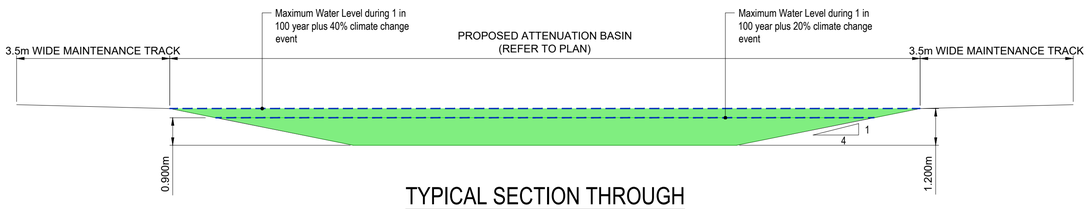

TYPICAL SECTION THROUGH STRATEGIC ATTENUATION

SCALE 1:100

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Notes

CATCHMENT 5A SUMMARY

ASSUMED IMPERMEABLE AREA: 0.74ha
PROPOSED DISCHARGE RATE: 1.0l/s
STORAGE REQUIRED UP TO 1: 10 YEAR EVENT: 382m³
STORAGE REQUIRED UP TO 1: 30 YEAR +20%cc EVENT: 626m³
STORAGE REQUIRED UP TO 1: 100 YEAR +20%cc EVENT: 833m³
STORAGE REQUIRED UP TO 1: 100 YEAR +40%cc EVENT: 999m³

- 1:30 YEAR FLOOD EXTENTS
- 1:100 YEAR FLOOD EXTENTS
- ROOT PROTECTION AREAS
- TREE PRESERVATION ORDER
- ATTENUATION PROVIDING STORAGE UP TO 1 IN 100 YR PLUS 40% CLIMATE CHANGE

Issued/Revision		By	Appd	YYYY.MM.DD
P07	AMENDED ACCORDING TO NEW SITE BOUNDARY	KB	SK	2022.11.28
P06	MASTERPLAN UPDATED. CATCHMENT AREA REVISED ACCORDINGLY	KB	SK	2022.07.22
P05	CATCHMENT SUMMARY	HA	SK	2022.03.14
P04	BASIN POSITION REVISED	HA	SK	2021.06.09
P03	REVISED TO SUIT LATEST MASTERPLAN	HA	SK	2021.05.21
P02	REVISED	HA	SK	2021.05.04
P01	NOTES	HA	SK	2021.04.08

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	ECR	ECR	-	2021.04.06

Issue Status

DRAFT

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Client/Project Logo

Client/Project

HADLEIGH SITE CASTLE POINT

Title

CATCHMENTS 5A ATTENUATION

Project No.
47268

Scale
1:1000 & 1:100

Revision
P07

Drawing No.
47268/2001/005

Plotted: 25/11/2022 11:29 12:06:21 PM By: Burnside, Kieron
Drawing name: 47268_2001_005.dwg Layout: P07 Xrefs: Hazardous Trees.dwg;Proposed Layout.dwg;Topo.dwg;Tree Survey.dwg;Tree Survey Plan.dwg;Tree Survey Plan Overlay.dwg;Tree Survey Plan Overlay Rev A.dwg;Tree Survey Plan Overlay Rev B.dwg;Tree Survey Plan Overlay Rev C.dwg;Tree Survey Plan Overlay Rev D.dwg;Tree Survey Plan Overlay Rev E.dwg;Tree Survey Plan Overlay Rev F.dwg;Tree Survey Plan Overlay Rev G.dwg;Tree Survey Plan Overlay Rev H.dwg;Tree Survey Plan Overlay Rev I.dwg;Tree Survey Plan Overlay Rev J.dwg;Tree Survey Plan Overlay Rev K.dwg;Tree Survey Plan Overlay Rev L.dwg;Tree Survey Plan Overlay Rev M.dwg;Tree Survey Plan Overlay Rev N.dwg;Tree Survey Plan Overlay Rev O.dwg;Tree Survey Plan Overlay Rev P.dwg;Tree Survey Plan Overlay Rev Q.dwg;Tree Survey Plan Overlay Rev R.dwg;Tree Survey Plan Overlay Rev S.dwg;Tree Survey Plan Overlay Rev T.dwg;Tree Survey Plan Overlay Rev U.dwg;Tree Survey Plan Overlay Rev V.dwg;Tree Survey Plan Overlay Rev W.dwg;Tree Survey Plan Overlay Rev 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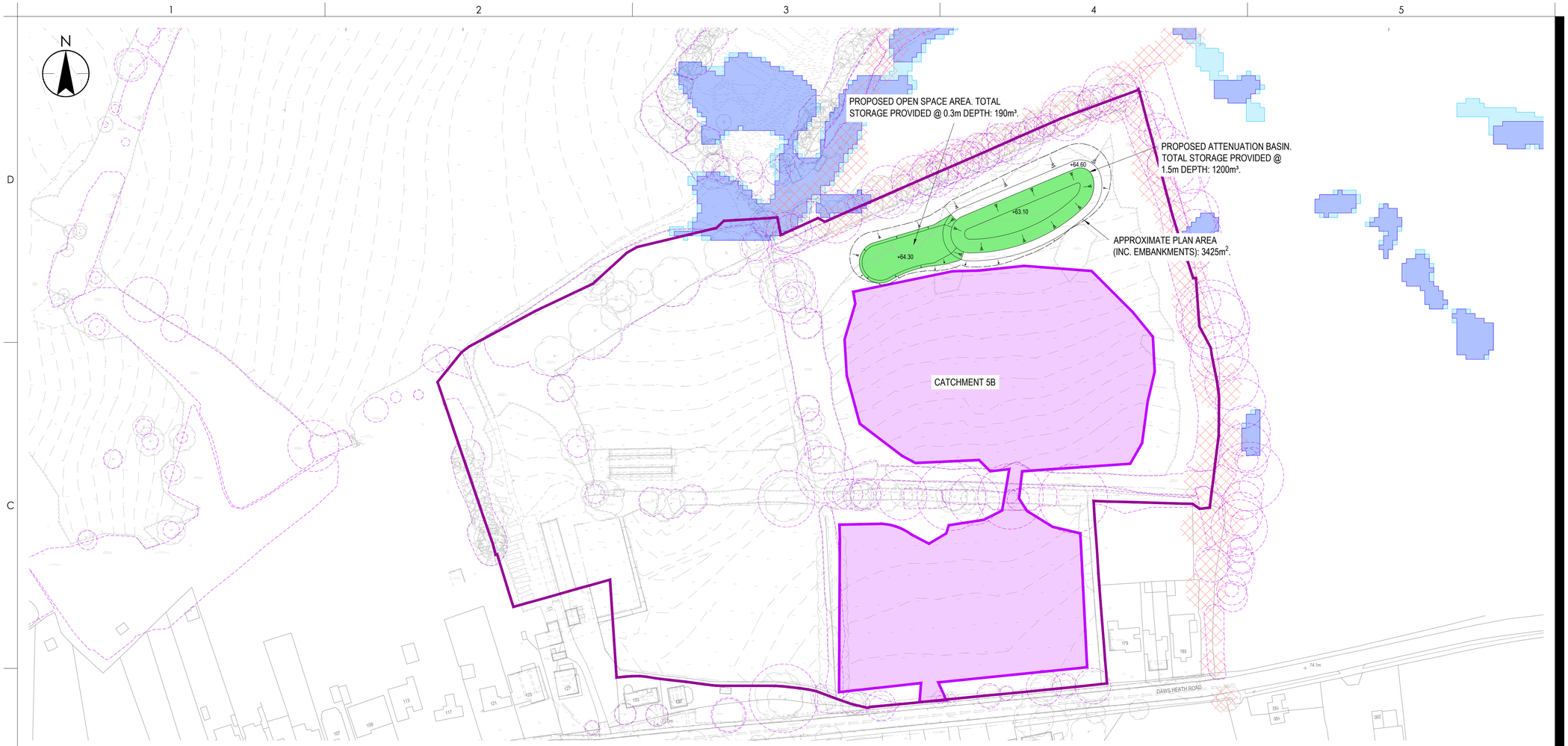

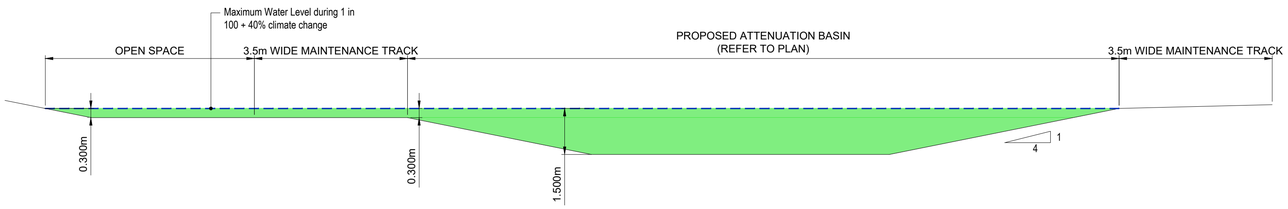

TYPICAL SECTION THROUGH STRATEGIC ATTENUATION

SCALE 1:100

Stantec

Stantec UK Limited
CAMBRIDGE
50/60 Station Road, Cambridge, CB1 2JH
Tel: +44 1223 882 000
www.stantec.com/uk

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Notes

CATCHMENT 5B SUMMARY

ASSUMED IMPERMEABLE AREA: 0.98ha
PROPOSED DISCHARGE RATE: 1.4l/s
STORAGE REQUIRED UP TO 1: 10 YEAR EVENT: 486m³
STORAGE REQUIRED UP TO 1: 30 YEAR + 20%cc EVENT: 800m³
STORAGE REQUIRED UP TO 1: 100 YEAR +20%cc EVENT: 1090m³
STORAGE REQUIRED UP TO 1: 100 YEAR +40%cc EVENT: 1294m³

- 1:30 YEAR FLOOD EXTENTS
- 1:100 YEAR FLOOD EXTENTS
- ROOT PROTECTION AREAS
- TREE PRESERVATION ORDER
- ATTENUATION PROVIDING STORAGE UP TO 1 IN 100 YR PLUS 40% CLIMATE CHANGE

Issued/Revision		By	Appd	YYYY.MM.DD
P06	AMENDED ACCORDING TO NEW SITE BOUNDARY	KB	SK	2022.11.28
P05	MASTERPLAN UPDATED. CATCHMENT AREA REVISED ACCORDINGLY	KB	SK	2022.07.22
P04	CATCHMENT AREA, BASIN AND SUMMARY	HA	SK	2022.03.14
P03	REVISED TO SUIT LATEST MASTERPLAN	HA	SK	2021.05.21
P02	REVISED	HA	SK	2021.05.04
P01	NOTES	HA	SK	2021.04.08

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	ECR	ECR	SK	2021.04.06

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HADLEIGH SITE CASTLE POINT

Title
CATCHMENTS 5B ATTENUATION

Project No.
47268

Scale
1:1000 & 1:100

Revision
P06

Drawing No.
47268/2001/006

Plotted: 29.11.2022 2022.11.29 12:23:54 PM By: Burnside, Kieron
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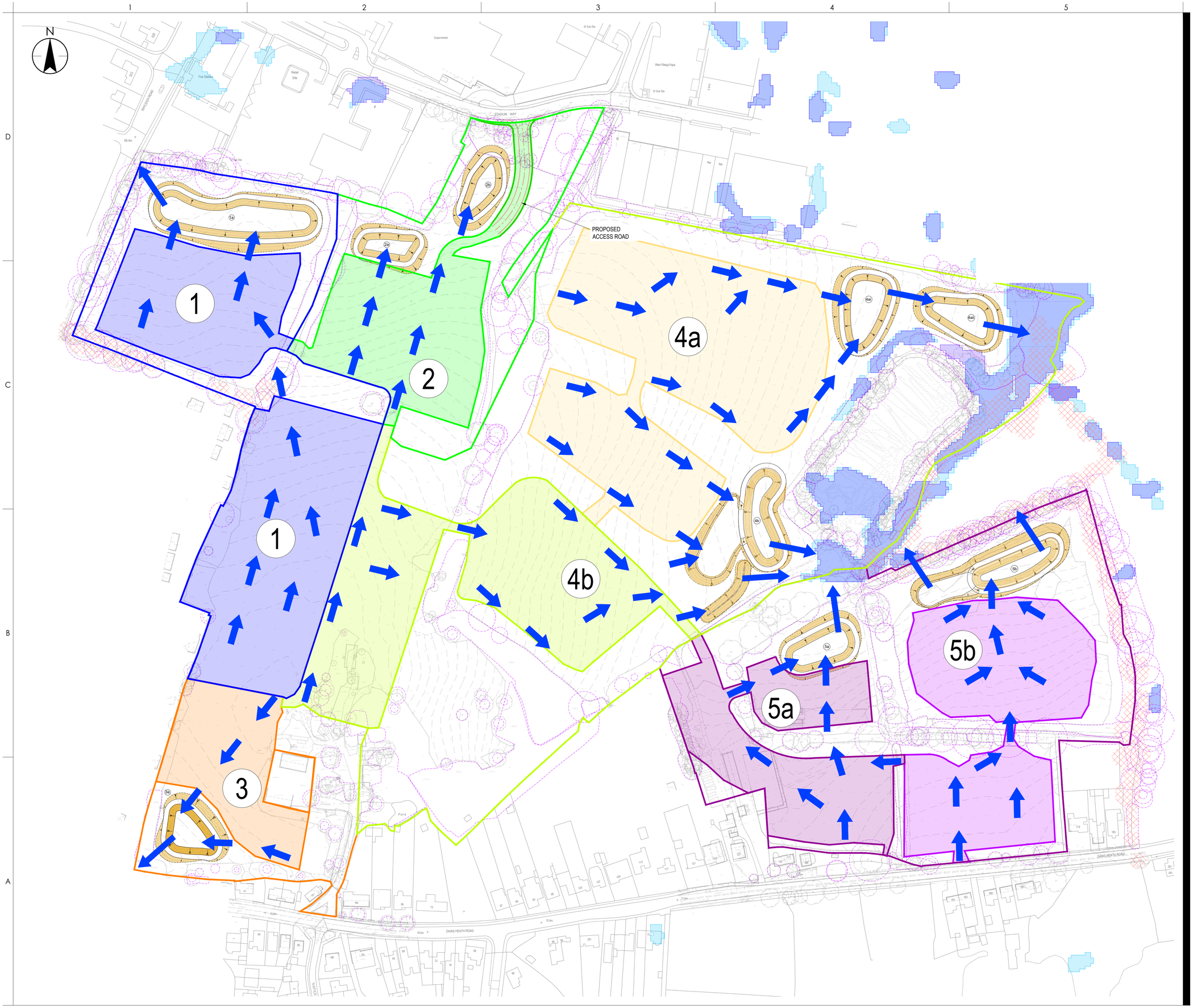

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Stantec UK Limited
CAMBRIDGE
50/60 Station Road, Cambridge, CB1 2JH
Tel: +44 1223 882 000
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LEGEND

- 1:30 YEAR FLOOD EXTENTS
- 1:100 YEAR FLOOD EXTENTS
- ROOT PROTECTION AREAS
- TREE PRESERVATION ORDER
- CATCHMENT 1 - 4.34ha
- CATCHMENT 1 (DRAINAGE CATCHMENT) - 2.93ha
- CATCHMENT 2 - 2.81ha
- CATCHMENT 2 (DRAINAGE CATCHMENT) - 1.29ha
- CATCHMENT 3 - 1.78ha
- CATCHMENT 3 (DRAINAGE CATCHMENT) - 0.81ha
- CATCHMENT 4 - 12.84ha
- CATCHMENT 4a (DRAINAGE CATCHMENT) - 2.86ha
- CATCHMENT 4b (DRAINAGE CATCHMENT) - 2.30ha
- CATCHMENT 5 - 6.21ha
- CATCHMENT 5a (DRAINAGE CATCHMENT) - 1.35ha
- CATCHMENT 5b (DRAINAGE CATCHMENT) - 1.77ha
- EXCEEDANCE FLOW ROUTES

Issued/Revision	By	Appd	YYYY.MM.DD
P01 AMENDED ACCORDING TO NEW SITE BOUNDARY	KB	SK	2022.11.29

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	KB	YR	SK	2022.11.29

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HADLEIGH SITE CASTLE POINT

Title
PROPOSED EXCEEDANCE FLOW ROUTES PLAN

Project No.	Scale
47268	1:1250

Revision	Drawing No.
P01	**47268/2001/015**

PlotTed: 29.11.2022 22:21 - ZK 41.023 PM By: Bartolde, Karon
CHADWICK, ROBERT - ROOM 1 - J:\47268\4 Drawings\Site\Drainage\Site\drainage\47268-2001-015-P01 proposed exceedance flow routes.pln

Appendix L Greenfield Runoff Rates

FEH Greenfield Runoff
Per Hectare

Using 2008 QMED Equation

Project Title	Hadleigh site Castle Point
Project No	47268

Methodology as set out in SuDS Manual 24.3.2 — SUDS Manual Chapter 24

1 Retrieve FEH Catchment Information

Export catchment data from FEH CDROM as .csv file and save in FEH data export

Catchment Descriptors	**BFIHOST**	0.490	*see note 1*
	SAAR	546.0	*see note 1*
	FARL	1.0	*see note 2*

2 Derive QBAR (mean annual flood)

Define area	**Site Area**	1.0	ha	
	Applied Area	50.0	ha	*see note 3*
FEH Index Flood (SuDS Manual Equation 24.2)	**QMED (Q_2)**	1.4	l/s	*see note 4*
Calculate QBAR by dividing QMED by 2yr growth factor	**QBAR**	1.6	l/s	*see note 5*

3 Select appropriate growth factors

FSR Hydrological Region		6	*(refer to FSR Hydrological Region tab)*
100yr Growth Curve Factor	**GQ_{100}**	3.19	
30yr Growth Curve Factor	**GQ_{30}**	2.40	
10yr Growth Curve Factor	**GQ_{10}**	1.62	
2yr Growth Curve Factor	**GQ_2**	0.88	
1yr Growth Curve Factor	**GQ_1**	0.85	

Figure 24.1 Hydrological areas

4 Derive Flood Frequency

Greenfield Runoff per 1ha

100yr Peak Runoff Rate	**Q_{100}**	5.2	l/s	**Q_{100}**	5.2	l/s/ha
30yr Peak Runoff Rate	**Q_{30}**	3.9	l/s	**Q_{30}**	3.9	l/s/ha
10yr Growth Curve Factor	**Q_{10}**	2.6	l/s	**Q_{10}**	2.6	l/s/ha
QBAR Peak Runoff Rate	**QBAR**	1.6	l/s	**Q_{BAR}**	1.6	l/s/ha
2yr Peak Runoff Rate	**Q_2**	1.4	l/s	**Q_2**	1.4	l/s/ha
1yr Peak Runoff Rate	**Q_1**	1.4	l/s	**Q_1**	1.4	l/s/ha

Location of FEH Data (as Hyperlink)

DOCUMENT ISSUE RECORD

Rev	Comments	Prepared	Date	Checked	Date
-	Initial Issue	MH	21.11.19	CW	21.11.19
A	Re-submission for outline planning	HA	02.03.21	SK	

Sheet created by Alex Bearne

Last updated 03.01.18 Recommended Review 01.07.18

Notes This spreadsheet has been created to allow derivation of greenfield runoff rates using the FEH statistical method applied in a manner consistent with the recommendations of the SuDS Manual. If you have recommendations to improve this spreadsheet please contact the owner.

Note 1 FEH Web version 3 allows extraction of BFIHOST and SAAR values for each square kilometre grid If you do not think the BFIHOST value is representative of your site then it is possible to derive it manually. This should only very occasionally be necessary. BFI can be derived manually using the the methodology set out in the Flood Estimation Handbook (see *Manual Derivation of BFIHOST tab).*

Note 2 FARL value is a measure of attenuation from reservoirs and lakes for the majority of studies this should be set to 1 (representing no attenuation). If your site includes a large water body with an attenuating affect on runoff please consult a hydrologist.
FARL is a measurement of studies water bodies in the catchment so that their attenuation effects so this term becomes 1.0 and therefore drops out. (see page 23 of the Preliminary rainfall runoff management for developments EA/Defra 2013)
Rainfall runoff management for developments.pdf

Note 3 If the site area is less than 50 hectare the spreadsheet will calculate QMED for 50ha and scale the results automatically to the defined Site Area

Note 4 QMED is calculated using the statistical equation as revised by Kjeldsen in 2008

$$Q_{MED} = 8.3062AREA^{0.8510} .0.1536^{(1000/SAAR)} .FARL^{3.4451} .0.0460^{BFIHOST^2}$$

Rainfall runoff management for developments.pdf
It is reproduced as Equation 24.2 in the SUDS Manual (pg 512)

Note 5 QBAR is calculated by dividing QMED by the growth factor for the 2 year event, as per the methodology set out in paragraph 6.2.2 of 'Rainfall runoff management for developments' . QBAR is then used as the index flood for the basis of applying the growth factors.

Checked by Natasha Vaughan, Clare Waller, David Collis

Appendix M MicroDrainage SuDS Calculation

47268 Hadleigh - 2022 Update Rev B

Existing Site Areas

Site Area in sq.m	**280444**	or	**28.04**	ha

Greenfield Runoff Rates

(Refer to FEH Calculation sheet)

1:1 Year	1.4	l/s per ha
1:2 Year	1.4	l/s per ha
QBAR	1.6	l/s per ha
1:10 Year	2.6	l/s per ha
1:30 Year	3.9	l/s per ha
1:100 Year	5.2	l/s per ha

Existing Catchment Areas

Catchment 1	**43405**	or	**4.34**	ha
Catchment 2	**28063**	or	**2.81**	ha
Catchment 3	**17827**	or	**1.78**	ha
Catchment 4	**128415**	or	**12.84**	ha
Catchment 5	**62131**	or	**6.21**	ha

Existing Runoff Rates (l/s)

	Catch.1	Catch. 2	Catch.3	Catch.4	Catch.5
1:1 Year	*6.1*	*3.9*	*2.5*	*18.0*	*8.7*
1:2 Year	*6.1*	*3.9*	*2.5*	*18.0*	*8.7*
QBAR	*6.9*	*4.5*	*2.9*	*20.5*	*9.9*
1:10 Year	*11.3*	*7.3*	*4.6*	*33.4*	*16.2*
1:30 Year	*16.9*	*10.9*	*7.0*	*50.1*	*24.2*
1:100 Year	*22.6*	*14.6*	*9.3*	*66.8*	*32.3*

Proposed Catchments & Impermeable Areas (exc basin)

	Prop. Catchment Area (sq.m & ha)		Drainage Area (sq.m & ha)		Impermable Area Assumed (sq.m & ha)		Percentage
Catchment 1	*43405*	*4.34*	*29251*	*2.93*	*19306*	*1.93*	66%
Catchment 2	*28063*	*2.81*	*12947*	*1.29*	*8545*	*0.85*	66%
Catchment 3*	*17827*	*1.78*	*8070*	*0.81*	*4842*	*0.48*	60%
Catchment 4a	*128415*	*12.84*	*28554*	*2.86*	*17132*	*1.71*	60%
Catchment 4b			*22981*	*2.30*	*13788*	*1.38*	60%
Catchment 5a	*62131*	*6.21*	*13539*	*1.35*	*7446*	*0.74*	55%
Catchment 5b			*17734*	*1.77*	*9753*	*0.98*	55%

Proposed Runoff Rates @ 1:1 Year and Discharge Locations

Catchment 1	2.7	l/s	Discharge: Public Sewer (Ref: 0354, CL & IL Unknown)
Catchment 2	1.2	l/s	Discharge: Public Sewer (Ref: 3351, CL & IL Unknown)
Catchment 3	0.7	l/s	Discharge: Public Sewer (Ref: 0853, CL & IL Unknown)
Catchment 4a	2.4	l/s	Discharge: Watercourse
Catchment 4b	1.9	l/s	Discharge: Watercourse
Catchment 5a	1.0	l/s	Discharge: Watercourse
Catchment 5b	1.4	l/s	Discharge: Watercourse

Storage Estimates Using Source Control

	1:10	1:30+20%	1:30+40%	1:100 + 20%	1:100 + 25%	1:100 + 40%	Discharge Rt.	Agreed with AW
Catchment 1	915	1552	1906	2140	2239	2539	2.7	2.7l/s
Catchment 2	370	609	724	877	917	1038	2.0	2.0l/s
Catchment 3	188	312	375	458	479	543	2.0	2.0l/s
Catchment 4a	814	1390	1700	1901	1989	2257	2.4	N/A
Catchment 4b	692	1139	1390	1540	1611	1831	1.9	N/A
Catchment 5a	382	626	762	833	873	999	1.0	N/A
Catchment 5b	486	800	977	1090	1140	1294	1.4	N/A

NB. As 4B and 5B have multi-use basins, the basins have been sized to show a 300mm freeboard in microdrainage, however the SWDS shows that the 300mm freeboard forms part of the multi-use element and cannot be true fre

Storage Requirement per 1ha of Imp. Area (Based on source control calculations above)

	1:10	1:30+20%	1:30+40%	1:100 + 20%	1:100 + 25%	1:100 + 40%
Catchment 1	474	804	987	1108	1160	1315
Catchment 2	433	713	847	1026	1073	1215
Catchment 3	388	644	774	946	989	1121
Catchment 4a	475	811	992	1110	1161	1317
Catchment 4b	502	826	1008	1117	1168	1328
Catchment 5a	513	841	1023	1119	1172	1342
Catchment 5b	498	820	1002	1118	1169	1327

	Catchment 1	Catchment 2	Catchment 3	Catchment 4a	Catchment 4b	Catchment 5a	Catchment 5b
Storage Required for 1:30+20% (m^3)	1552	609	312	1390	1139	626	800
Storage Provided (m^3) - assumes minimum	1552	609	312	1390	1139	626	800
Rate of drain down (l/s)	2.7	2.0	2.0	2.4	1.9	1.0	1.4
Half Drain down Volume (m^3)	776	304.5	156	695	569.5	313	400
Volume Drained per hour (m^3)	9.7	7.2	7.2	8.6	6.9	3.8	4.9
Half Drain down times (hours)	79.8	42.3	21.7	80.5	81.9	83.4	81.4
Half Drain Times Exceed 24hours	YES	YES	NO	YES	YES	YES	YES

Storage Volume for 1:10 storm (m^3)	915	370	188	814	692	382	486
Storage Volume for **1:30+20cc** storm (m^3)	1552	609	312	1390	1139	626	800
Storage Volume for **1:30+20cc** + 1:10 Storm (m	2467	979	500	2204	1831	1008	1286

Storage Volume for 1:10 storm (m^3)	915	370	188	814	692	382	486
Storage Volume for **1:30+40cc** storm (m^3)	1906	724	375	1700	1700	762	977
Storage Volume for **1:30+40cc** + 1:10 Storm (m	2821	1094	563	2514	2392	1144	1463

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Microdrainage Source Control

1 in 10 year return period

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.844	0.144	2.3	302.7	O K
30 min Summer	65.883	0.183	2.4	385.7	O K
60 min Summer	65.921	0.221	2.5	470.1	O K
120 min Summer	65.984	0.284	2.5	609.7	O K
180 min Summer	66.019	0.319	2.6	690.0	O K
240 min Summer	66.043	0.343	2.6	743.2	O K
360 min Summer	66.071	0.371	2.6	807.8	O K
480 min Summer	66.087	0.387	2.6	845.4	O K
600 min Summer	66.097	0.397	2.6	869.7	O K
720 min Summer	66.104	0.404	2.6	886.1	O K
960 min Summer	66.112	0.412	2.6	904.8	O K
1440 min Summer	66.117	0.417	2.6	915.3	O K
2160 min Summer	66.115	0.415	2.6	910.5	O K
2880 min Summer	66.109	0.409	2.6	898.0	O K
4320 min Summer	66.106	0.406	2.6	889.4	O K
5760 min Summer	66.105	0.405	2.6	888.1	O K
7200 min Summer	66.105	0.405	2.6	889.3	O K
8640 min Summer	66.107	0.407	2.6	892.6	O K
10080 min Summer	66.109	0.409	2.6	898.2	O K
15 min Winter	65.844	0.144	2.3	302.7	O K
30 min Winter	65.883	0.183	2.4	385.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	168.8	27
30 min Summer	40.330	0.0	192.2	42
60 min Summer	24.684	0.0	358.5	72
120 min Summer	16.119	0.0	407.7	130
180 min Summer	12.243	0.0	418.0	190
240 min Summer	9.954	0.0	421.0	250
360 min Summer	7.306	0.0	420.2	370
480 min Summer	5.808	0.0	416.5	488
600 min Summer	4.840	0.0	411.9	608
720 min Summer	4.161	0.0	406.9	728
960 min Summer	3.266	0.0	396.6	966
1440 min Summer	2.313	0.0	375.6	1444
2160 min Summer	1.649	0.0	780.2	2160
2880 min Summer	1.307	0.0	753.9	2628
4320 min Summer	0.958	0.0	695.1	3336
5760 min Summer	0.780	0.0	1364.3	4144
7200 min Summer	0.671	0.0	1404.0	4968
8640 min Summer	0.597	0.0	1379.4	5800
10080 min Summer	0.545	0.0	1328.9	6664
15 min Winter	63.159	0.0	168.8	27
30 min Winter	40.330	0.0	192.3	41

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.921	0.221	2.5	470.1	O K
120 min Winter	65.984	0.284	2.5	609.7	O K
180 min Winter	66.019	0.319	2.6	690.0	O K
240 min Winter	66.043	0.343	2.6	743.1	O K
360 min Winter	66.071	0.371	2.6	807.8	O K
480 min Winter	66.087	0.387	2.6	845.4	O K
600 min Winter	66.097	0.397	2.6	869.7	O K
720 min Winter	66.104	0.404	2.6	886.2	O K
960 min Winter	66.112	0.412	2.6	904.9	O K
1440 min Winter	66.117	0.417	2.6	915.9	O K
2160 min Winter	66.115	0.415	2.6	912.7	O K
2880 min Winter	66.110	0.410	2.6	901.1	O K
4320 min Winter	66.102	0.402	2.6	880.8	O K
5760 min Winter	66.098	0.398	2.6	870.9	O K
7200 min Winter	66.093	0.393	2.6	861.0	O K
8640 min Winter	66.090	0.390	2.6	852.4	O K
10080 min Winter	66.087	0.387	2.6	845.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	24.684	0.0	358.5	70
120 min Winter	16.119	0.0	407.9	128
180 min Winter	12.243	0.0	418.3	188
240 min Winter	9.954	0.0	421.4	246
360 min Winter	7.306	0.0	420.8	364
480 min Winter	5.808	0.0	417.3	482
600 min Winter	4.840	0.0	412.9	598
720 min Winter	4.161	0.0	408.1	716
960 min Winter	3.266	0.0	398.2	950
1440 min Winter	2.313	0.0	378.1	1412
2160 min Winter	1.649	0.0	783.7	2084
2880 min Winter	1.307	0.0	758.8	2736
4320 min Winter	0.958	0.0	703.4	3420
5760 min Winter	0.780	0.0	1367.2	4336
7200 min Winter	0.671	0.0	1413.4	5264
8640 min Winter	0.597	0.0	1397.6	6224
10080 min Winter	0.545	0.0	1353.6	7152

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.516	0.166	1.7	132.6	O K
30 min Summer	65.559	0.209	1.7	168.8	O K
60 min Summer	65.601	0.251	1.8	205.1	O K
120 min Summer	65.668	0.318	1.8	264.8	O K
180 min Summer	65.704	0.354	1.8	298.4	O K
240 min Summer	65.728	0.378	1.8	320.0	O K
360 min Summer	65.754	0.404	1.8	344.8	O K
480 min Summer	65.768	0.418	1.8	357.8	O K
600 min Summer	65.775	0.425	1.8	365.0	O K
720 min Summer	65.779	0.429	1.8	368.6	O K
960 min Summer	65.780	0.430	1.8	369.8	O K
1440 min Summer	65.770	0.420	1.8	360.4	O K
2160 min Summer	65.753	0.403	1.8	344.2	O K
2880 min Summer	65.741	0.391	1.8	332.5	O K
4320 min Summer	65.723	0.373	1.8	316.1	O K
5760 min Summer	65.710	0.360	1.8	303.4	O K
7200 min Summer	65.699	0.349	1.8	293.0	O K
8640 min Summer	65.690	0.340	1.8	284.7	O K
10080 min Summer	65.682	0.332	1.8	278.1	O K
15 min Winter	65.516	0.166	1.7	132.6	O K
30 min Winter	65.559	0.209	1.7	168.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	106.6	27
30 min Summer	40.330	0.0	128.9	41
60 min Summer	24.684	0.0	194.3	70
120 min Summer	16.119	0.0	248.4	130
180 min Summer	12.243	0.0	272.9	190
240 min Summer	9.954	0.0	283.0	250
360 min Summer	7.306	0.0	286.9	368
480 min Summer	5.808	0.0	285.9	488
600 min Summer	4.840	0.0	283.6	606
720 min Summer	4.161	0.0	280.9	726
960 min Summer	3.266	0.0	274.8	964
1440 min Summer	2.313	0.0	261.9	1440
2160 min Summer	1.649	0.0	482.5	1760
2880 min Summer	1.307	0.0	497.2	2116
4320 min Summer	0.958	0.0	480.4	2940
5760 min Summer	0.780	0.0	631.4	3752
7200 min Summer	0.671	0.0	677.7	4552
8640 min Summer	0.597	0.0	722.3	5368
10080 min Summer	0.545	0.0	764.3	6168
15 min Winter	63.159	0.0	106.6	26
30 min Winter	40.330	0.0	128.9	41

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.601	0.251	1.8	205.1	O K
120 min Winter	65.668	0.318	1.8	264.8	O K
180 min Winter	65.704	0.354	1.8	298.4	O K
240 min Winter	65.728	0.378	1.8	320.1	O K
360 min Winter	65.754	0.404	1.8	345.0	O K
480 min Winter	65.768	0.418	1.8	358.0	O K
600 min Winter	65.775	0.425	1.8	365.2	O K
720 min Winter	65.779	0.429	1.8	369.0	O K
960 min Winter	65.781	0.431	1.8	370.3	O K
1440 min Winter	65.772	0.422	1.8	361.8	O K
2160 min Winter	65.751	0.401	1.8	342.0	O K
2880 min Winter	65.736	0.386	1.8	327.6	O K
4320 min Winter	65.709	0.359	1.8	302.7	O K
5760 min Winter	65.685	0.335	1.8	280.5	O K
7200 min Winter	65.663	0.313	1.8	260.9	O K
8640 min Winter	65.645	0.295	1.8	244.0	O K
10080 min Winter	65.629	0.279	1.8	229.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	24.684	0.0	194.3	70
120 min Winter	16.119	0.0	248.4	128
180 min Winter	12.243	0.0	273.0	186
240 min Winter	9.954	0.0	283.2	244
360 min Winter	7.306	0.0	287.2	362
480 min Winter	5.808	0.0	286.3	478
600 min Winter	4.840	0.0	284.2	596
720 min Winter	4.161	0.0	281.5	710
960 min Winter	3.266	0.0	275.7	940
1440 min Winter	2.313	0.0	263.5	1384
2160 min Winter	1.649	0.0	482.9	1948
2880 min Winter	1.307	0.0	498.8	2220
4320 min Winter	0.958	0.0	487.1	3120
5760 min Winter	0.780	0.0	631.5	4032
7200 min Winter	0.671	0.0	678.0	4896
8640 min Winter	0.597	0.0	722.9	5712
10080 min Winter	0.545	0.0	765.6	6552

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	75.535	0.135	1.6	74.4	O K
30 min Summer	75.569	0.169	1.7	94.4	O K
60 min Summer	75.603	0.203	1.7	114.1	O K
120 min Summer	75.655	0.255	1.8	146.0	O K
180 min Summer	75.682	0.282	1.8	163.2	O K
240 min Summer	75.699	0.299	1.8	173.6	O K
360 min Summer	75.715	0.315	1.8	183.9	O K
480 min Summer	75.720	0.320	1.8	187.6	O K
600 min Summer	75.721	0.321	1.8	187.9	O K
720 min Summer	75.719	0.319	1.8	186.4	O K
960 min Summer	75.711	0.311	1.8	181.4	O K
1440 min Summer	75.696	0.296	1.8	171.7	O K
2160 min Summer	75.676	0.276	1.8	159.3	O K
2880 min Summer	75.659	0.259	1.8	148.6	O K
4320 min Summer	75.632	0.232	1.8	131.7	O K
5760 min Summer	75.610	0.210	1.7	118.6	O K
7200 min Summer	75.593	0.193	1.7	108.2	O K
8640 min Summer	75.579	0.179	1.7	99.8	O K
10080 min Summer	75.567	0.167	1.7	93.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	66.2	26
30 min Summer	40.330	0.0	85.1	41
60 min Summer	24.684	0.0	113.4	70
120 min Summer	16.119	0.0	148.6	128
180 min Summer	12.243	0.0	169.3	188
240 min Summer	9.954	0.0	183.3	248
360 min Summer	7.306	0.0	201.2	366
480 min Summer	5.808	0.0	212.4	484
600 min Summer	4.840	0.0	220.4	602
720 min Summer	4.161	0.0	226.3	720
960 min Summer	3.266	0.0	234.1	822
1440 min Summer	2.313	0.0	239.9	1056
2160 min Summer	1.649	0.0	281.2	1456
2880 min Summer	1.307	0.0	296.7	1852
4320 min Summer	0.958	0.0	324.3	2648
5760 min Summer	0.780	0.0	357.7	3456
7200 min Summer	0.671	0.0	384.2	4184
8640 min Summer	0.597	0.0	409.8	4936
10080 min Summer	0.545	0.0	434.4	5656

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	75.535	0.135	1.6	74.4	O K
30 min Winter	75.570	0.170	1.7	94.4	O K
60 min Winter	75.603	0.203	1.7	114.1	O K
120 min Winter	75.655	0.255	1.8	146.1	O K
180 min Winter	75.682	0.282	1.8	163.3	O K
240 min Winter	75.699	0.299	1.8	173.7	O K
360 min Winter	75.715	0.315	1.8	184.1	O K
480 min Winter	75.721	0.321	1.8	187.8	O K
600 min Winter	75.722	0.322	1.8	188.3	O K
720 min Winter	75.720	0.320	1.8	187.0	O K
960 min Winter	75.711	0.311	1.8	181.2	O K
1440 min Winter	75.692	0.292	1.8	169.0	O K
2160 min Winter	75.665	0.265	1.8	152.5	O K
2880 min Winter	75.641	0.241	1.8	137.4	O K
4320 min Winter	75.601	0.201	1.7	113.0	O K
5760 min Winter	75.570	0.170	1.7	94.4	O K
7200 min Winter	75.545	0.145	1.6	80.3	O K
8640 min Winter	75.527	0.127	1.6	69.6	O K
10080 min Winter	75.513	0.113	1.5	61.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	63.159	0.0	66.2	26
30 min Winter	40.330	0.0	85.1	40
60 min Winter	24.684	0.0	113.4	68
120 min Winter	16.119	0.0	148.6	126
180 min Winter	12.243	0.0	169.3	184
240 min Winter	9.954	0.0	183.3	242
360 min Winter	7.306	0.0	201.2	358
480 min Winter	5.808	0.0	212.5	472
600 min Winter	4.840	0.0	220.5	584
720 min Winter	4.161	0.0	226.4	694
960 min Winter	3.266	0.0	234.4	898
1440 min Winter	2.313	0.0	240.8	1106
2160 min Winter	1.649	0.0	281.2	1556
2880 min Winter	1.307	0.0	296.8	1992
4320 min Winter	0.958	0.0	324.6	2812
5760 min Winter	0.780	0.0	357.7	3576
7200 min Winter	0.671	0.0	384.2	4328
8640 min Winter	0.597	0.0	409.9	5024
10080 min Winter	0.545	0.0	434.7	5752

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	58.140	0.140	2.0	268.2	O K
30 min Summer	58.177	0.177	2.1	341.8	O K
60 min Summer	58.215	0.215	2.2	416.6	O K
120 min Summer	58.275	0.275	2.2	540.4	O K
180 min Summer	58.310	0.310	2.2	611.7	O K
240 min Summer	58.332	0.332	2.2	658.9	O K
360 min Summer	58.359	0.359	2.2	716.4	O K
480 min Summer	58.375	0.375	2.2	749.9	O K
600 min Summer	58.385	0.385	2.2	771.7	O K
720 min Summer	58.392	0.392	2.2	786.5	O K
960 min Summer	58.400	0.400	2.2	803.5	O K
1440 min Summer	58.405	0.405	2.2	813.9	O K
2160 min Summer	58.404	0.404	2.2	811.1	O K
2880 min Summer	58.399	0.399	2.2	800.8	O K
4320 min Summer	58.396	0.396	2.2	793.4	O K
5760 min Summer	58.395	0.395	2.2	792.8	O K
7200 min Summer	58.396	0.396	2.2	794.5	O K
8640 min Summer	58.398	0.398	2.2	798.3	O K
10080 min Summer	58.400	0.400	2.2	804.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	148.3	27
30 min Summer	40.330	0.0	167.6	42
60 min Summer	24.684	0.0	315.1	72
120 min Summer	16.119	0.0	354.8	130
180 min Summer	12.243	0.0	362.8	190
240 min Summer	9.954	0.0	364.9	250
360 min Summer	7.306	0.0	363.7	370
480 min Summer	5.808	0.0	360.2	490
600 min Summer	4.840	0.0	356.1	608
720 min Summer	4.161	0.0	351.7	728
960 min Summer	3.266	0.0	342.7	966
1440 min Summer	2.313	0.0	324.7	1444
2160 min Summer	1.649	0.0	675.9	2160
2880 min Summer	1.307	0.0	652.6	2688
4320 min Summer	0.958	0.0	601.8	3384
5760 min Summer	0.780	0.0	1202.4	4160
7200 min Summer	0.671	0.0	1226.6	4976
8640 min Summer	0.597	0.0	1198.4	5872
10080 min Summer	0.545	0.0	1152.8	6672

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	58.140	0.140	2.0	268.2	O K
30 min Winter	58.177	0.177	2.1	341.9	O K
60 min Winter	58.215	0.215	2.2	416.6	O K
120 min Winter	58.275	0.275	2.2	540.4	O K
180 min Winter	58.310	0.310	2.2	611.7	O K
240 min Winter	58.332	0.332	2.2	658.9	O K
360 min Winter	58.359	0.359	2.2	716.4	O K
480 min Winter	58.375	0.375	2.2	749.9	O K
600 min Winter	58.385	0.385	2.2	771.7	O K
720 min Winter	58.392	0.392	2.2	786.5	O K
960 min Winter	58.400	0.400	2.2	803.7	O K
1440 min Winter	58.405	0.405	2.2	814.3	O K
2160 min Winter	58.405	0.405	2.2	812.9	O K
2880 min Winter	58.400	0.400	2.2	803.9	O K
4320 min Winter	58.392	0.392	2.2	786.3	O K
5760 min Winter	58.389	0.389	2.2	778.7	O K
7200 min Winter	58.385	0.385	2.2	771.2	O K
8640 min Winter	58.382	0.382	2.2	764.7	O K
10080 min Winter	58.380	0.380	2.2	759.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	63.159	0.0	148.3	27
30 min Winter	40.330	0.0	167.6	41
60 min Winter	24.684	0.0	315.1	70
120 min Winter	16.119	0.0	354.9	130
180 min Winter	12.243	0.0	363.1	188
240 min Winter	9.954	0.0	365.3	246
360 min Winter	7.306	0.0	364.2	364
480 min Winter	5.808	0.0	360.9	482
600 min Winter	4.840	0.0	356.9	598
720 min Winter	4.161	0.0	352.7	716
960 min Winter	3.266	0.0	344.1	950
1440 min Winter	2.313	0.0	326.7	1412
2160 min Winter	1.649	0.0	678.8	2084
2880 min Winter	1.307	0.0	656.8	2740
4320 min Winter	0.958	0.0	608.9	3460
5760 min Winter	0.780	0.0	1205.4	4384
7200 min Winter	0.671	0.0	1236.0	5328
8640 min Winter	0.597	0.0	1214.6	6232
10080 min Winter	0.545	0.0	1174.6	7160

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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Summary of Results for 10 year Return Period

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	62.313	0.213	1.4	216.4	O K
30 min Summer	62.367	0.267	1.5	275.9	O K
60 min Summer	62.422	0.322	1.5	336.5	O K
120 min Summer	62.509	0.409	1.5	436.8	O K
180 min Summer	62.557	0.457	1.5	494.9	O K
240 min Summer	62.589	0.489	1.5	533.7	O K
360 min Summer	62.628	0.528	1.5	581.8	O K
480 min Summer	62.651	0.551	1.5	610.6	O K
600 min Summer	62.667	0.567	1.5	629.7	O K
720 min Summer	62.677	0.577	1.5	643.1	O K
960 min Summer	62.690	0.590	1.5	659.8	O K
1440 min Summer	62.701	0.601	1.5	674.0	O K
2160 min Summer	62.706	0.606	1.5	680.8	O K
2880 min Summer	62.707	0.607	1.5	680.9	O K
4320 min Summer	62.703	0.603	1.5	675.7	O K
5760 min Summer	62.702	0.602	1.5	674.4	O K
7200 min Summer	62.704	0.604	1.5	677.2	O K
8640 min Summer	62.708	0.608	1.5	683.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	118.3	27
30 min Summer	40.330	0.0	122.8	42
60 min Summer	24.684	0.0	242.2	72
120 min Summer	16.119	0.0	245.1	132
180 min Summer	12.243	0.0	240.5	190
240 min Summer	9.954	0.0	235.0	250
360 min Summer	7.306	0.0	224.4	370
480 min Summer	5.808	0.0	216.4	490
600 min Summer	4.840	0.0	211.2	610
720 min Summer	4.161	0.0	207.5	730
960 min Summer	3.266	0.0	202.5	968
1440 min Summer	2.313	0.0	196.9	1446
2160 min Summer	1.649	0.0	416.3	2164
2880 min Summer	1.307	0.0	402.3	2884
4320 min Summer	0.958	0.0	382.2	4112
5760 min Summer	0.780	0.0	835.5	4800
7200 min Summer	0.671	0.0	802.3	5616
8640 min Summer	0.597	0.0	769.5	6400

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	62.715	0.615	1.5	692.0	O K
15 min Winter	62.313	0.213	1.4	216.4	O K
30 min Winter	62.367	0.267	1.5	276.0	O K
60 min Winter	62.422	0.322	1.5	336.4	O K
120 min Winter	62.509	0.409	1.5	436.8	O K
180 min Winter	62.557	0.457	1.5	495.0	O K
240 min Winter	62.589	0.489	1.5	533.8	O K
360 min Winter	62.628	0.528	1.5	581.9	O K
480 min Winter	62.651	0.551	1.5	610.7	O K
600 min Winter	62.667	0.567	1.5	629.8	O K
720 min Winter	62.677	0.577	1.5	643.3	O K
960 min Winter	62.690	0.590	1.5	660.0	O K
1440 min Winter	62.702	0.602	1.5	674.4	O K
2160 min Winter	62.707	0.607	1.5	681.7	O K
2880 min Winter	62.708	0.608	1.5	682.6	O K
4320 min Winter	62.705	0.605	1.5	679.4	O K
5760 min Winter	62.700	0.600	1.5	672.9	O K
7200 min Winter	62.698	0.598	1.5	670.3	O K
8640 min Winter	62.700	0.600	1.5	672.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.545	0.0	741.2	7256
15 min Winter	63.159	0.0	118.3	27
30 min Winter	40.330	0.0	122.8	41
60 min Winter	24.684	0.0	242.3	70
120 min Winter	16.119	0.0	245.2	130
180 min Winter	12.243	0.0	240.6	188
240 min Winter	9.954	0.0	235.2	248
360 min Winter	7.306	0.0	224.6	366
480 min Winter	5.808	0.0	216.7	484
600 min Winter	4.840	0.0	211.6	602
720 min Winter	4.161	0.0	208.0	720
960 min Winter	3.266	0.0	203.1	954
1440 min Winter	2.313	0.0	197.6	1422
2160 min Winter	1.649	0.0	417.6	2116
2880 min Winter	1.307	0.0	404.2	2796
4320 min Winter	0.958	0.0	385.0	4112
5760 min Winter	0.780	0.0	840.8	5312
7200 min Winter	0.671	0.0	810.1	5760
8640 min Winter	0.597	0.0	779.6	6664

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	62.702	0.602	1.5	675.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.545	0.0	753.0	7656

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Summary of Results for 10 year Return Period

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	63.251	0.151	0.7	116.1	O K
30 min Summer	63.290	0.190	0.7	148.0	O K
60 min Summer	63.329	0.229	0.7	180.6	O K
120 min Summer	63.392	0.292	0.7	234.5	O K
180 min Summer	63.428	0.328	0.7	265.7	O K
240 min Summer	63.451	0.351	0.7	286.6	O K
360 min Summer	63.480	0.380	0.7	312.5	O K
480 min Summer	63.497	0.397	0.7	328.1	O K
600 min Summer	63.508	0.408	0.7	338.7	O K
720 min Summer	63.516	0.416	0.7	346.1	O K
960 min Summer	63.527	0.427	0.7	355.6	O K
1440 min Summer	63.536	0.436	0.7	364.2	O K
2160 min Summer	63.541	0.441	0.7	369.2	O K
2880 min Summer	63.543	0.443	0.7	370.6	O K
4320 min Summer	63.542	0.442	0.7	370.1	O K
5760 min Summer	63.542	0.442	0.7	370.3	O K
7200 min Summer	63.545	0.445	0.7	372.8	O K
8640 min Summer	63.549	0.449	0.7	376.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	60.3	27
30 min Summer	40.330	0.0	62.7	42
60 min Summer	24.684	0.0	124.1	72
120 min Summer	16.119	0.0	125.8	132
180 min Summer	12.243	0.0	124.1	190
240 min Summer	9.954	0.0	121.9	250
360 min Summer	7.306	0.0	117.8	370
480 min Summer	5.808	0.0	113.9	490
600 min Summer	4.840	0.0	110.8	610
720 min Summer	4.161	0.0	108.5	730
960 min Summer	3.266	0.0	105.1	968
1440 min Summer	2.313	0.0	100.9	1446
2160 min Summer	1.649	0.0	214.6	2164
2880 min Summer	1.307	0.0	206.8	2884
4320 min Summer	0.958	0.0	194.9	4280
5760 min Summer	0.780	0.0	428.1	4904
7200 min Summer	0.671	0.0	410.9	5696
8640 min Summer	0.597	0.0	394.4	6488

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.555	0.455	0.7	382.2	O K
15 min Winter	63.251	0.151	0.7	116.1	O K
30 min Winter	63.290	0.190	0.7	148.1	O K
60 min Winter	63.329	0.229	0.7	180.5	O K
120 min Winter	63.392	0.292	0.7	234.5	O K
180 min Winter	63.428	0.328	0.7	265.8	O K
240 min Winter	63.451	0.351	0.7	286.7	O K
360 min Winter	63.480	0.380	0.7	312.5	O K
480 min Winter	63.497	0.397	0.7	328.2	O K
600 min Winter	63.508	0.408	0.7	338.7	O K
720 min Winter	63.517	0.417	0.7	346.2	O K
960 min Winter	63.527	0.427	0.7	355.6	O K
1440 min Winter	63.536	0.436	0.7	364.3	O K
2160 min Winter	63.541	0.441	0.7	369.5	O K
2880 min Winter	63.543	0.443	0.7	371.2	O K
4320 min Winter	63.544	0.444	0.7	371.8	O K
5760 min Winter	63.542	0.442	0.7	370.2	O K
7200 min Winter	63.541	0.441	0.7	369.2	O K
8640 min Winter	63.543	0.443	0.7	371.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.545	0.0	380.1	7272
15 min Winter	63.159	0.0	60.3	27
30 min Winter	40.330	0.0	62.7	41
60 min Winter	24.684	0.0	124.1	70
120 min Winter	16.119	0.0	125.9	130
180 min Winter	12.243	0.0	124.1	188
240 min Winter	9.954	0.0	122.0	248
360 min Winter	7.306	0.0	117.9	366
480 min Winter	5.808	0.0	114.1	484
600 min Winter	4.840	0.0	111.0	602
720 min Winter	4.161	0.0	108.7	720
960 min Winter	3.266	0.0	105.5	954
1440 min Winter	2.313	0.0	101.4	1422
2160 min Winter	1.649	0.0	215.4	2120
2880 min Winter	1.307	0.0	208.0	2800
4320 min Winter	0.958	0.0	196.7	4116
5760 min Winter	0.780	0.0	431.1	5368
7200 min Winter	0.671	0.0	415.1	5840
8640 min Winter	0.597	0.0	399.7	6744

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.547	0.447	0.7	374.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.545	0.0	386.3	7672

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Summary of Results for 10 year Return Period

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	63.323	0.223	1.0	153.7	O K
30 min Summer	63.380	0.280	1.0	196.0	O K
60 min Summer	63.435	0.335	1.0	239.0	O K
120 min Summer	63.524	0.424	1.0	310.4	O K
180 min Summer	63.574	0.474	1.0	351.9	O K
240 min Summer	63.606	0.506	1.0	379.4	O K
360 min Summer	63.645	0.545	1.0	413.3	O K
480 min Summer	63.667	0.567	1.0	433.4	O K
600 min Summer	63.682	0.582	1.0	446.7	O K
720 min Summer	63.692	0.592	1.0	456.0	O K
960 min Summer	63.705	0.605	1.0	467.4	O K
1440 min Summer	63.715	0.615	1.0	476.7	O K
2160 min Summer	63.719	0.619	1.0	480.4	O K
2880 min Summer	63.718	0.618	1.0	479.4	O K
4320 min Summer	63.713	0.613	1.0	474.4	O K
5760 min Summer	63.712	0.612	1.0	473.6	O K
7200 min Summer	63.714	0.614	1.0	475.6	O K
8640 min Summer	63.719	0.619	1.0	479.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	63.159	0.0	83.4	27
30 min Summer	40.330	0.0	84.8	42
60 min Summer	24.684	0.0	167.9	72
120 min Summer	16.119	0.0	163.7	132
180 min Summer	12.243	0.0	155.2	192
240 min Summer	9.954	0.0	150.4	250
360 min Summer	7.306	0.0	146.4	370
480 min Summer	5.808	0.0	145.5	490
600 min Summer	4.840	0.0	145.8	610
720 min Summer	4.161	0.0	146.5	728
960 min Summer	3.266	0.0	146.9	968
1440 min Summer	2.313	0.0	145.6	1446
2160 min Summer	1.649	0.0	291.2	2164
2880 min Summer	1.307	0.0	287.3	2884
4320 min Summer	0.958	0.0	281.1	4016
5760 min Summer	0.780	0.0	585.6	4680
7200 min Summer	0.671	0.0	566.5	5480
8640 min Summer	0.597	0.0	549.6	6304

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.725	0.625	1.0	486.2	O K
15 min Winter	63.323	0.223	1.0	153.7	O K
30 min Winter	63.380	0.280	1.0	196.0	O K
60 min Winter	63.435	0.335	1.0	238.9	O K
120 min Winter	63.524	0.424	1.0	310.4	O K
180 min Winter	63.574	0.474	1.0	351.9	O K
240 min Winter	63.606	0.506	1.0	379.5	O K
360 min Winter	63.645	0.545	1.0	413.4	O K
480 min Winter	63.667	0.567	1.0	433.6	O K
600 min Winter	63.682	0.582	1.0	447.0	O K
720 min Winter	63.693	0.593	1.0	456.3	O K
960 min Winter	63.706	0.606	1.0	468.0	O K
1440 min Winter	63.716	0.616	1.0	477.7	O K
2160 min Winter	63.721	0.621	1.0	482.1	O K
2880 min Winter	63.721	0.621	1.0	482.1	O K
4320 min Winter	63.717	0.617	1.0	478.7	O K
5760 min Winter	63.712	0.612	1.0	473.5	O K
7200 min Winter	63.711	0.611	1.0	473.3	O K
8640 min Winter	63.713	0.613	1.0	474.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.545	0.0	539.2	7152
15 min Winter	63.159	0.0	83.4	27
30 min Winter	40.330	0.0	84.8	41
60 min Winter	24.684	0.0	167.9	70
120 min Winter	16.119	0.0	163.7	130
180 min Winter	12.243	0.0	155.3	188
240 min Winter	9.954	0.0	150.5	248
360 min Winter	7.306	0.0	146.5	366
480 min Winter	5.808	0.0	145.6	484
600 min Winter	4.840	0.0	145.9	602
720 min Winter	4.161	0.0	146.5	718
960 min Winter	3.266	0.0	146.9	954
1440 min Winter	2.313	0.0	145.5	1420
2160 min Winter	1.649	0.0	291.1	2108
2880 min Winter	1.307	0.0	287.2	2792
4320 min Winter	0.958	0.0	281.3	4104
5760 min Winter	0.780	0.0	586.6	5192
7200 min Winter	0.671	0.0	568.5	5632
8640 min Winter	0.597	0.0	552.6	6576

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Summary of Results for 10 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.716	0.616	1.0	477.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.545	0.0	543.1	7560

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+0

Time Area Diagram

Total Area (ha) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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1 in 30 year return period plus 20% climate change allowance

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

Summary of Results for 30 year Return Period (+20%)

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	65.928	0.228	2.5	485.8	O K
30 min Summer	65.989	0.289	2.6	621.9	O K
60 min Summer	66.051	0.351	2.6	761.5	O K
120 min Summer	66.136	0.436	2.6	960.9	O K
180 min Summer	66.185	0.485	2.6	1078.8	O K
240 min Summer	66.218	0.518	2.6	1159.3	O K
360 min Summer	66.260	0.560	2.6	1262.0	O K
480 min Summer	66.286	0.586	2.6	1324.7	O K
600 min Summer	66.303	0.603	2.6	1367.3	O K
720 min Summer	66.315	0.615	2.6	1397.8	O K
960 min Summer	66.330	0.630	2.6	1437.1	O K
1440 min Summer	66.346	0.646	2.6	1475.9	O K
2160 min Summer	66.355	0.655	2.6	1500.3	O K
2880 min Summer	66.359	0.659	2.6	1510.4	O K
4320 min Summer	66.364	0.664	2.6	1523.1	O K
5760 min Summer	66.365	0.665	2.6	1525.6	O K
7200 min Summer	66.366	0.666	2.6	1527.0	O K
8640 min Summer	66.370	0.670	2.6	1536.6	O K
10080 min Summer	66.376	0.676	2.6	1552.3	O K
15 min Winter	65.928	0.228	2.5	485.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	206.0	27
30 min Summer	64.863	0.0	214.7	42
60 min Summer	39.824	0.0	429.6	72
120 min Summer	25.254	0.0	434.2	132
180 min Summer	18.990	0.0	430.0	192
240 min Summer	15.373	0.0	424.6	250
360 min Summer	11.253	0.0	414.4	370
480 min Summer	8.934	0.0	405.2	490
600 min Summer	7.437	0.0	397.0	610
720 min Summer	6.387	0.0	389.7	730
960 min Summer	5.004	0.0	377.0	968
1440 min Summer	3.535	0.0	357.1	1448
2160 min Summer	2.507	0.0	751.8	2168
2880 min Summer	1.977	0.0	721.7	2884
4320 min Summer	1.440	0.0	669.0	4320
5760 min Summer	1.165	0.0	1469.0	5592
7200 min Summer	0.994	0.0	1404.8	6200
8640 min Summer	0.879	0.0	1342.0	7016
10080 min Summer	0.797	0.0	1285.0	7864
15 min Winter	101.181	0.0	206.0	27

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
30 min Winter	65.989	0.289	2.6	621.9	O K
60 min Winter	66.050	0.350	2.6	761.4	O K
120 min Winter	66.136	0.436	2.6	961.0	O K
180 min Winter	66.185	0.485	2.6	1078.9	O K
240 min Winter	66.218	0.518	2.6	1159.4	O K
360 min Winter	66.260	0.560	2.6	1262.1	O K
480 min Winter	66.286	0.586	2.6	1324.9	O K
600 min Winter	66.303	0.603	2.6	1367.5	O K
720 min Winter	66.315	0.615	2.6	1398.0	O K
960 min Winter	66.331	0.631	2.6	1437.4	O K
1440 min Winter	66.346	0.646	2.6	1476.3	O K
2160 min Winter	66.356	0.656	2.6	1501.1	O K
2880 min Winter	66.360	0.660	2.6	1511.6	O K
4320 min Winter	66.365	0.665	2.6	1525.7	O K
5760 min Winter	66.367	0.667	2.6	1529.6	O K
7200 min Winter	66.364	0.664	2.6	1522.1	O K
8640 min Winter	66.361	0.661	2.6	1515.7	O K
10080 min Winter	66.364	0.664	2.6	1523.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	64.863	0.0	214.7	41
60 min Winter	39.824	0.0	429.7	70
120 min Winter	25.254	0.0	434.4	130
180 min Winter	18.990	0.0	430.2	188
240 min Winter	15.373	0.0	424.9	248
360 min Winter	11.253	0.0	414.8	366
480 min Winter	8.934	0.0	405.7	484
600 min Winter	7.437	0.0	397.6	602
720 min Winter	6.387	0.0	390.4	720
960 min Winter	5.004	0.0	378.0	956
1440 min Winter	3.535	0.0	358.6	1428
2160 min Winter	2.507	0.0	754.4	2124
2880 min Winter	1.977	0.0	725.6	2824
4320 min Winter	1.440	0.0	676.1	4188
5760 min Winter	1.165	0.0	1482.2	5480
7200 min Winter	0.994	0.0	1425.0	6712
8640 min Winter	0.879	0.0	1370.4	7192
10080 min Winter	0.797	0.0	1320.0	7976

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.610	0.260	1.8	213.2	O K
30 min Summer	65.677	0.327	1.8	272.8	O K
60 min Summer	65.742	0.392	1.8	333.3	O K
120 min Summer	65.831	0.481	1.8	419.4	O K
180 min Summer	65.881	0.531	1.8	469.7	O K
240 min Summer	65.914	0.564	1.8	503.7	O K
360 min Summer	65.955	0.605	1.8	545.8	O K
480 min Summer	65.978	0.628	1.8	570.1	O K
600 min Summer	65.992	0.642	1.8	585.3	O K
720 min Summer	66.001	0.651	1.8	595.2	O K
960 min Summer	66.011	0.661	1.8	605.3	O K
1440 min Summer	66.013	0.663	1.8	608.2	O K
2160 min Summer	66.004	0.654	1.8	598.3	O K
2880 min Summer	65.990	0.640	1.8	583.0	O K
4320 min Summer	65.970	0.620	1.8	561.6	O K
5760 min Summer	65.958	0.608	1.8	548.9	O K
7200 min Summer	65.948	0.598	1.8	538.5	O K
8640 min Summer	65.941	0.591	1.8	531.4	O K
10080 min Summer	65.937	0.587	1.8	527.1	O K
15 min Winter	65.610	0.260	1.8	213.2	O K
30 min Winter	65.677	0.327	1.8	272.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	143.3	27
30 min Summer	64.863	0.0	149.1	42
60 min Summer	39.824	0.0	286.6	72
120 min Summer	25.254	0.0	295.2	130
180 min Summer	18.990	0.0	289.6	190
240 min Summer	15.373	0.0	282.1	250
360 min Summer	11.253	0.0	269.7	370
480 min Summer	8.934	0.0	262.4	490
600 min Summer	7.437	0.0	257.4	608
720 min Summer	6.387	0.0	253.7	728
960 min Summer	5.004	0.0	248.0	968
1440 min Summer	3.535	0.0	240.2	1446
2160 min Summer	2.507	0.0	515.3	2164
2880 min Summer	1.977	0.0	496.8	2860
4320 min Summer	1.440	0.0	461.2	3548
5760 min Summer	1.165	0.0	932.9	4320
7200 min Summer	0.994	0.0	963.8	5120
8640 min Summer	0.879	0.0	936.1	5968
10080 min Summer	0.797	0.0	893.5	6856
15 min Winter	101.181	0.0	143.3	27
30 min Winter	64.863	0.0	149.2	41

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.742	0.392	1.8	333.3	O K
120 min Winter	65.831	0.481	1.8	419.5	O K
180 min Winter	65.881	0.531	1.8	469.8	O K
240 min Winter	65.914	0.564	1.8	503.8	O K
360 min Winter	65.955	0.605	1.8	546.0	O K
480 min Winter	65.978	0.628	1.8	570.3	O K
600 min Winter	65.992	0.642	1.8	585.6	O K
720 min Winter	66.002	0.652	1.8	595.5	O K
960 min Winter	66.011	0.661	1.8	605.8	O K
1440 min Winter	66.014	0.664	1.8	609.1	O K
2160 min Winter	66.006	0.656	1.8	600.0	O K
2880 min Winter	65.993	0.643	1.8	585.8	O K
4320 min Winter	65.966	0.616	1.8	557.7	O K
5760 min Winter	65.947	0.597	1.8	538.0	O K
7200 min Winter	65.929	0.579	1.8	518.5	O K
8640 min Winter	65.910	0.560	1.8	499.3	O K
10080 min Winter	65.894	0.544	1.8	482.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	39.824	0.0	286.6	70
120 min Winter	25.254	0.0	295.3	130
180 min Winter	18.990	0.0	289.7	188
240 min Winter	15.373	0.0	282.3	246
360 min Winter	11.253	0.0	269.9	364
480 min Winter	8.934	0.0	262.7	482
600 min Winter	7.437	0.0	257.8	600
720 min Winter	6.387	0.0	254.1	716
960 min Winter	5.004	0.0	248.6	952
1440 min Winter	3.535	0.0	241.0	1414
2160 min Winter	2.507	0.0	517.0	2096
2880 min Winter	1.977	0.0	499.7	2748
4320 min Winter	1.440	0.0	467.1	3936
5760 min Winter	1.165	0.0	934.2	4496
7200 min Winter	0.994	0.0	974.4	5408
8640 min Winter	0.879	0.0	967.8	6320
10080 min Winter	0.797	0.0	939.2	7256

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	75.612	0.212	1.7	119.7	O K
30 min Summer	75.666	0.266	1.8	152.9	O K
60 min Summer	75.718	0.318	1.8	186.2	O K
120 min Summer	75.789	0.389	1.8	232.8	O K
180 min Summer	75.827	0.427	1.8	259.1	O K
240 min Summer	75.852	0.452	1.8	276.1	O K
360 min Summer	75.880	0.480	1.8	295.6	O K
480 min Summer	75.893	0.493	1.8	305.2	O K
600 min Summer	75.899	0.499	1.8	309.7	O K
720 min Summer	75.901	0.501	1.8	311.3	O K
960 min Summer	75.898	0.498	1.8	308.9	O K
1440 min Summer	75.878	0.478	1.8	294.6	O K
2160 min Summer	75.851	0.451	1.8	275.3	O K
2880 min Summer	75.830	0.430	1.8	260.6	O K
4320 min Summer	75.798	0.398	1.8	239.2	O K
5760 min Summer	75.774	0.374	1.8	222.5	O K
7200 min Summer	75.751	0.351	1.8	207.8	O K
8640 min Summer	75.732	0.332	1.8	195.4	O K
10080 min Summer	75.716	0.316	1.8	185.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	106.1	27
30 min Summer	64.863	0.0	130.5	41
60 min Summer	39.824	0.0	183.7	70
120 min Summer	25.254	0.0	231.1	130
180 min Summer	18.990	0.0	257.1	190
240 min Summer	15.373	0.0	272.1	248
360 min Summer	11.253	0.0	283.0	368
480 min Summer	8.934	0.0	283.2	486
600 min Summer	7.437	0.0	281.4	606
720 min Summer	6.387	0.0	278.9	724
960 min Summer	5.004	0.0	273.4	962
1440 min Summer	3.535	0.0	261.9	1368
2160 min Summer	2.507	0.0	425.9	1668
2880 min Summer	1.977	0.0	445.5	2028
4320 min Summer	1.440	0.0	468.9	2852
5760 min Summer	1.165	0.0	534.7	3640
7200 min Summer	0.994	0.0	570.1	4464
8640 min Summer	0.879	0.0	604.3	5272
10080 min Summer	0.797	0.0	637.1	6048

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	75.612	0.212	1.7	119.7	O K
30 min Winter	75.666	0.266	1.8	152.9	O K
60 min Winter	75.718	0.318	1.8	186.2	O K
120 min Winter	75.789	0.389	1.8	232.9	O K
180 min Winter	75.828	0.428	1.8	259.2	O K
240 min Winter	75.852	0.452	1.8	276.3	O K
360 min Winter	75.880	0.480	1.8	295.8	O K
480 min Winter	75.893	0.493	1.8	305.5	O K
600 min Winter	75.900	0.500	1.8	310.1	O K
720 min Winter	75.902	0.502	1.8	311.7	O K
960 min Winter	75.899	0.499	1.8	309.6	O K
1440 min Winter	75.880	0.480	1.8	296.0	O K
2160 min Winter	75.847	0.447	1.8	272.4	O K
2880 min Winter	75.820	0.420	1.8	253.8	O K
4320 min Winter	75.774	0.374	1.8	222.6	O K
5760 min Winter	75.734	0.334	1.8	196.1	O K
7200 min Winter	75.697	0.297	1.8	172.8	O K
8640 min Winter	75.666	0.266	1.8	153.1	O K
10080 min Winter	75.640	0.240	1.8	136.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	101.181	0.0	106.1	26
30 min Winter	64.863	0.0	130.5	41
60 min Winter	39.824	0.0	183.7	70
120 min Winter	25.254	0.0	231.1	128
180 min Winter	18.990	0.0	257.1	186
240 min Winter	15.373	0.0	272.1	244
360 min Winter	11.253	0.0	283.2	362
480 min Winter	8.934	0.0	283.6	478
600 min Winter	7.437	0.0	281.9	594
720 min Winter	6.387	0.0	279.5	710
960 min Winter	5.004	0.0	274.3	936
1440 min Winter	3.535	0.0	263.4	1372
2160 min Winter	2.507	0.0	426.0	1708
2880 min Winter	1.977	0.0	445.9	2144
4320 min Winter	1.440	0.0	472.8	3032
5760 min Winter	1.165	0.0	534.8	3872
7200 min Winter	0.994	0.0	570.2	4688
8640 min Winter	0.879	0.0	604.4	5456
10080 min Winter	0.797	0.0	637.5	6256

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 30 year Return Period (+20%)

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	58.221	0.221	2.2	430.4	O K
30 min Summer	58.281	0.281	2.2	551.1	O K
60 min Summer	58.340	0.340	2.2	674.8	O K
120 min Summer	58.423	0.423	2.2	851.7	O K
180 min Summer	58.470	0.470	2.2	956.3	O K
240 min Summer	58.503	0.503	2.2	1027.7	O K
360 min Summer	58.543	0.543	2.2	1119.1	O K
480 min Summer	58.568	0.568	2.2	1175.0	O K
600 min Summer	58.585	0.585	2.2	1213.0	O K
720 min Summer	58.596	0.596	2.2	1240.5	O K
960 min Summer	58.612	0.612	2.2	1276.1	O K
1440 min Summer	58.627	0.627	2.2	1312.1	O K
2160 min Summer	58.638	0.638	2.2	1336.2	O K
2880 min Summer	58.643	0.643	2.2	1347.4	O K
4320 min Summer	58.649	0.649	2.2	1362.4	O K
5760 min Summer	58.651	0.651	2.2	1366.7	O K
7200 min Summer	58.651	0.651	2.2	1368.1	O K
8640 min Summer	58.655	0.655	2.2	1376.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	179.1	27
30 min Summer	64.863	0.0	186.0	42
60 min Summer	39.824	0.0	372.4	72
120 min Summer	25.254	0.0	374.8	132
180 min Summer	18.990	0.0	370.5	192
240 min Summer	15.373	0.0	365.4	250
360 min Summer	11.253	0.0	355.7	370
480 min Summer	8.934	0.0	347.1	490
600 min Summer	7.437	0.0	339.4	610
720 min Summer	6.387	0.0	332.6	730
960 min Summer	5.004	0.0	321.0	970
1440 min Summer	3.535	0.0	303.3	1448
2160 min Summer	2.507	0.0	639.2	2168
2880 min Summer	1.977	0.0	613.0	2884
4320 min Summer	1.440	0.0	570.4	4324
5760 min Summer	1.165	0.0	1255.7	5704
7200 min Summer	0.994	0.0	1201.9	6272
8640 min Summer	0.879	0.0	1151.8	7088

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	58.661	0.661	2.2	1389.8	O K
15 min Winter	58.221	0.221	2.2	430.4	O K
30 min Winter	58.281	0.281	2.2	551.1	O K
60 min Winter	58.340	0.340	2.2	674.7	O K
120 min Winter	58.423	0.423	2.2	851.7	O K
180 min Winter	58.470	0.470	2.2	956.3	O K
240 min Winter	58.503	0.503	2.2	1027.8	O K
360 min Winter	58.543	0.543	2.2	1119.2	O K
480 min Winter	58.568	0.568	2.2	1175.1	O K
600 min Winter	58.585	0.585	2.2	1213.2	O K
720 min Winter	58.597	0.597	2.2	1240.6	O K
960 min Winter	58.612	0.612	2.2	1276.3	O K
1440 min Winter	58.628	0.628	2.2	1312.3	O K
2160 min Winter	58.638	0.638	2.2	1336.6	O K
2880 min Winter	58.643	0.643	2.2	1348.2	O K
4320 min Winter	58.650	0.650	2.2	1364.3	O K
5760 min Winter	58.653	0.653	2.2	1370.6	O K
7200 min Winter	58.651	0.651	2.2	1367.2	O K
8640 min Winter	58.649	0.649	2.2	1363.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.797	0.0	1109.0	7872
15 min Winter	101.181	0.0	179.1	27
30 min Winter	64.863	0.0	186.1	41
60 min Winter	39.824	0.0	372.5	70
120 min Winter	25.254	0.0	375.0	130
180 min Winter	18.990	0.0	370.7	188
240 min Winter	15.373	0.0	365.6	248
360 min Winter	11.253	0.0	356.0	366
480 min Winter	8.934	0.0	347.5	484
600 min Winter	7.437	0.0	339.9	602
720 min Winter	6.387	0.0	333.2	720
960 min Winter	5.004	0.0	321.8	956
1440 min Winter	3.535	0.0	304.6	1428
2160 min Winter	2.507	0.0	641.6	2124
2880 min Winter	1.977	0.0	616.6	2824
4320 min Winter	1.440	0.0	576.7	4192
5760 min Winter	1.165	0.0	1266.5	5488
7200 min Winter	0.994	0.0	1216.7	6768
8640 min Winter	0.879	0.0	1170.5	7872

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	58.652	0.652	2.2	1369.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.797	0.0	1130.7	8072

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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Summary of Results for 30 year Return Period (+20%)

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	62.431	0.331	1.5	347.5	O K
30 min Summer	62.516	0.416	1.5	445.1	O K
60 min Summer	62.599	0.499	1.5	545.2	O K
120 min Summer	62.713	0.613	1.5	688.9	O K
180 min Summer	62.778	0.678	1.5	773.8	O K
240 min Summer	62.821	0.721	1.5	831.9	O K
360 min Summer	62.875	0.775	1.5	906.3	O K
480 min Summer	62.908	0.808	1.5	951.9	O K
600 min Summer	62.930	0.830	1.5	983.0	O K
720 min Summer	62.946	0.846	1.5	1005.5	O K
960 min Summer	62.966	0.866	1.5	1034.8	O K
1440 min Summer	62.986	0.886	1.5	1064.6	O K
2160 min Summer	63.000	0.900	1.5	1084.9	O K
2880 min Summer	63.007	0.907	1.5	1094.6	O K
4320 min Summer	63.015	0.915	1.5	1106.8	O K
5760 min Summer	63.018	0.918	1.5	1110.5	O K
7200 min Summer	63.020	0.920	1.5	1114.2	O K
8640 min Summer	63.026	0.926	1.5	1122.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	124.5	27
30 min Summer	64.863	0.0	121.8	42
60 min Summer	39.824	0.0	237.7	72
120 min Summer	25.254	0.0	214.6	132
180 min Summer	18.990	0.0	214.5	192
240 min Summer	15.373	0.0	220.5	252
360 min Summer	11.253	0.0	227.6	370
480 min Summer	8.934	0.0	231.2	490
600 min Summer	7.437	0.0	233.1	610
720 min Summer	6.387	0.0	234.1	730
960 min Summer	5.004	0.0	234.3	970
1440 min Summer	3.535	0.0	231.5	1448
2160 min Summer	2.507	0.0	465.9	2168
2880 min Summer	1.977	0.0	463.0	2884
4320 min Summer	1.440	0.0	451.5	4320
5760 min Summer	1.165	0.0	908.5	5584
7200 min Summer	0.994	0.0	906.9	6192
8640 min Summer	0.879	0.0	898.5	6920

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.035	0.935	1.5	1135.7	O K
15 min Winter	62.431	0.331	1.5	347.5	O K
30 min Winter	62.516	0.416	1.5	445.0	O K
60 min Winter	62.599	0.499	1.5	545.2	O K
120 min Winter	62.713	0.613	1.5	688.9	O K
180 min Winter	62.778	0.678	1.5	773.9	O K
240 min Winter	62.821	0.721	1.5	832.1	O K
360 min Winter	62.875	0.775	1.5	906.7	O K
480 min Winter	62.908	0.808	1.5	952.5	O K
600 min Winter	62.930	0.830	1.5	983.8	O K
720 min Winter	62.946	0.846	1.5	1006.5	O K
960 min Winter	62.967	0.867	1.5	1036.2	O K
1440 min Winter	62.988	0.888	1.5	1066.9	O K
2160 min Winter	63.003	0.903	1.5	1088.7	O K
2880 min Winter	63.011	0.911	1.5	1100.0	O K
4320 min Winter	63.022	0.922	1.5	1116.4	O K
5760 min Winter	63.028	0.928	1.5	1124.8	O K
7200 min Winter	63.028	0.928	1.5	1125.6	O K
8640 min Winter	63.029	0.929	1.5	1127.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.797	0.0	884.2	7768
15 min Winter	101.181	0.0	124.5	27
30 min Winter	64.863	0.0	121.8	42
60 min Winter	39.824	0.0	237.7	72
120 min Winter	25.254	0.0	214.7	130
180 min Winter	18.990	0.0	214.5	190
240 min Winter	15.373	0.0	220.5	248
360 min Winter	11.253	0.0	227.5	366
480 min Winter	8.934	0.0	230.9	484
600 min Winter	7.437	0.0	232.8	602
720 min Winter	6.387	0.0	233.7	722
960 min Winter	5.004	0.0	233.7	956
1440 min Winter	3.535	0.0	230.5	1428
2160 min Winter	2.507	0.0	464.4	2124
2880 min Winter	1.977	0.0	461.0	2824
4320 min Winter	1.440	0.0	448.6	4160
5760 min Winter	1.165	0.0	905.7	5480
7200 min Winter	0.994	0.0	903.8	6704
8640 min Winter	0.879	0.0	895.4	7096

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.037	0.937	1.5	1138.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.797	0.0	881.5	7968

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Summary of Results for 30 year Return Period (+20%)

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	63.336	0.236	0.7	186.4	O K
30 min Summer	63.397	0.297	0.7	238.7	O K
60 min Summer	63.458	0.358	0.7	292.5	O K
120 min Summer	63.542	0.442	0.7	369.6	O K
180 min Summer	63.590	0.490	0.7	415.3	O K
240 min Summer	63.622	0.522	0.7	446.6	O K
360 min Summer	63.662	0.562	0.7	486.8	O K
480 min Summer	63.687	0.587	0.7	511.5	O K
600 min Summer	63.704	0.604	0.7	528.5	O K
720 min Summer	63.716	0.616	0.7	540.8	O K
960 min Summer	63.732	0.632	0.8	557.1	O K
1440 min Summer	63.748	0.648	0.8	574.2	O K
2160 min Summer	63.760	0.660	0.8	586.7	O K
2880 min Summer	63.766	0.666	0.8	593.4	O K
4320 min Summer	63.775	0.675	0.8	602.9	O K
5760 min Summer	63.780	0.680	0.8	607.4	O K
7200 min Summer	63.782	0.682	0.8	610.2	O K
8640 min Summer	63.788	0.688	0.8	615.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	63.8	27
30 min Summer	64.863	0.0	62.8	42
60 min Summer	39.824	0.0	123.6	72
120 min Summer	25.254	0.0	112.1	132
180 min Summer	18.990	0.0	110.0	192
240 min Summer	15.373	0.0	112.4	252
360 min Summer	11.253	0.0	115.9	370
480 min Summer	8.934	0.0	117.7	490
600 min Summer	7.437	0.0	118.7	610
720 min Summer	6.387	0.0	119.1	730
960 min Summer	5.004	0.0	119.2	970
1440 min Summer	3.535	0.0	117.6	1448
2160 min Summer	2.507	0.0	237.5	2168
2880 min Summer	1.977	0.0	235.8	2884
4320 min Summer	1.440	0.0	229.6	4324
5760 min Summer	1.165	0.0	465.4	5712
7200 min Summer	0.994	0.0	464.1	6280
8640 min Summer	0.879	0.0	459.6	7096

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.795	0.695	0.8	623.8	O K
15 min Winter	63.336	0.236	0.7	186.4	O K
30 min Winter	63.397	0.297	0.7	238.7	O K
60 min Winter	63.458	0.358	0.7	292.5	O K
120 min Winter	63.542	0.442	0.7	369.6	O K
180 min Winter	63.590	0.490	0.7	415.4	O K
240 min Winter	63.622	0.522	0.7	446.7	O K
360 min Winter	63.663	0.563	0.7	487.0	O K
480 min Winter	63.687	0.587	0.7	511.8	O K
600 min Winter	63.704	0.604	0.7	528.9	O K
720 min Winter	63.716	0.616	0.7	541.3	O K
960 min Winter	63.732	0.632	0.8	557.7	O K
1440 min Winter	63.749	0.649	0.8	575.2	O K
2160 min Winter	63.762	0.662	0.8	588.4	O K
2880 min Winter	63.769	0.669	0.8	595.9	O K
4320 min Winter	63.780	0.680	0.8	607.5	O K
5760 min Winter	63.786	0.686	0.8	614.5	O K
7200 min Winter	63.789	0.689	0.8	617.1	O K
8640 min Winter	63.791	0.691	0.8	619.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.797	0.0	452.2	7960
15 min Winter	101.181	0.0	63.8	27
30 min Winter	64.863	0.0	62.8	42
60 min Winter	39.824	0.0	123.6	72
120 min Winter	25.254	0.0	112.1	130
180 min Winter	18.990	0.0	110.1	190
240 min Winter	15.373	0.0	112.4	248
360 min Winter	11.253	0.0	115.9	366
480 min Winter	8.934	0.0	117.7	484
600 min Winter	7.437	0.0	118.6	604
720 min Winter	6.387	0.0	119.0	722
960 min Winter	5.004	0.0	118.9	958
1440 min Winter	3.535	0.0	117.2	1428
2160 min Winter	2.507	0.0	236.9	2124
2880 min Winter	1.977	0.0	235.0	2824
4320 min Winter	1.440	0.0	228.4	4192
5760 min Winter	1.165	0.0	464.1	5488
7200 min Winter	0.994	0.0	462.7	6768
8640 min Winter	0.879	0.0	458.1	7872

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.797	0.697	0.8	625.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.797	0.0	450.8	8072

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Summary of Results for 30 year Return Period (+20%)

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	63.445	0.345	1.0	246.8	O K
30 min Summer	63.531	0.431	1.0	316.1	O K
60 min Summer	63.615	0.515	1.0	387.3	O K
120 min Summer	63.729	0.629	1.0	489.0	O K
180 min Summer	63.793	0.693	1.0	549.2	O K
240 min Summer	63.835	0.735	1.0	590.3	O K
360 min Summer	63.889	0.789	1.0	642.9	O K
480 min Summer	63.920	0.820	1.1	675.1	O K
600 min Summer	63.942	0.842	1.1	697.0	O K
720 min Summer	63.957	0.857	1.1	712.7	O K
960 min Summer	63.977	0.877	1.1	733.1	O K
1440 min Summer	63.996	0.896	1.1	753.5	O K
2160 min Summer	64.008	0.908	1.1	766.6	O K
2880 min Summer	64.014	0.914	1.1	772.3	O K
4320 min Summer	64.020	0.920	1.1	778.6	O K
5760 min Summer	64.021	0.921	1.1	779.9	O K
7200 min Summer	64.023	0.923	1.1	782.5	O K
8640 min Summer	64.029	0.929	1.1	788.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.181	0.0	84.3	27
30 min Summer	64.863	0.0	79.3	42
60 min Summer	39.824	0.0	152.1	72
120 min Summer	25.254	0.0	152.7	132
180 min Summer	18.990	0.0	160.0	192
240 min Summer	15.373	0.0	164.5	252
360 min Summer	11.253	0.0	169.4	370
480 min Summer	8.934	0.0	171.9	490
600 min Summer	7.437	0.0	173.2	610
720 min Summer	6.387	0.0	173.8	730
960 min Summer	5.004	0.0	173.7	968
1440 min Summer	3.535	0.0	171.1	1448
2160 min Summer	2.507	0.0	344.5	2164
2880 min Summer	1.977	0.0	341.7	2884
4320 min Summer	1.440	0.0	331.9	4320
5760 min Summer	1.165	0.0	668.5	5368
7200 min Summer	0.994	0.0	666.3	6056
8640 min Summer	0.879	0.0	659.0	6832

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	64.037	0.937	1.1	797.2	O K
15 min Winter	63.445	0.345	1.0	246.8	O K
30 min Winter	63.531	0.431	1.0	316.1	O K
60 min Winter	63.615	0.515	1.0	387.3	O K
120 min Winter	63.729	0.629	1.0	489.1	O K
180 min Winter	63.793	0.693	1.0	549.4	O K
240 min Winter	63.836	0.736	1.0	590.6	O K
360 min Winter	63.889	0.789	1.0	643.3	O K
480 min Winter	63.921	0.821	1.1	675.7	O K
600 min Winter	63.943	0.843	1.1	697.8	O K
720 min Winter	63.958	0.858	1.1	713.7	O K
960 min Winter	63.978	0.878	1.1	734.4	O K
1440 min Winter	63.998	0.898	1.1	755.5	O K
2160 min Winter	64.011	0.911	1.1	769.9	O K
2880 min Winter	64.018	0.918	1.1	777.0	O K
4320 min Winter	64.027	0.927	1.1	786.8	O K
5760 min Winter	64.031	0.931	1.1	791.0	O K
7200 min Winter	64.030	0.930	1.1	790.1	O K
8640 min Winter	64.033	0.933	1.1	792.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.797	0.0	647.2	7576
15 min Winter	101.181	0.0	84.3	27
30 min Winter	64.863	0.0	79.3	42
60 min Winter	39.824	0.0	152.1	72
120 min Winter	25.254	0.0	152.7	130
180 min Winter	18.990	0.0	159.9	188
240 min Winter	15.373	0.0	164.4	248
360 min Winter	11.253	0.0	169.2	366
480 min Winter	8.934	0.0	171.6	484
600 min Winter	7.437	0.0	172.8	602
720 min Winter	6.387	0.0	173.3	720
960 min Winter	5.004	0.0	173.0	956
1440 min Winter	3.535	0.0	170.1	1428
2160 min Winter	2.507	0.0	343.0	2124
2880 min Winter	1.977	0.0	339.7	2808
4320 min Winter	1.440	0.0	329.1	4156
5760 min Winter	1.165	0.0	665.7	5472
7200 min Winter	0.994	0.0	663.1	6632
8640 min Winter	0.879	0.0	655.6	6928

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Summary of Results for 30 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	64.040	0.940	1.1	800.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.797	0.0	644.0	7872

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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1 in 30 year return period plus 40% climate change allowance

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

Summary of Results for 30 year Return Period (+40%)

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	65.965	0.265	2.5	567.0	O K
30 min Summer	66.035	0.335	2.6	726.1	O K
60 min Summer	66.106	0.406	2.6	889.3	O K
120 min Summer	66.204	0.504	2.6	1123.1	O K
180 min Summer	66.260	0.560	2.6	1261.8	O K
240 min Summer	66.298	0.598	2.6	1356.8	O K
360 min Summer	66.347	0.647	2.6	1479.3	O K
480 min Summer	66.377	0.677	2.6	1555.3	O K
600 min Summer	66.397	0.697	2.6	1607.6	O K
720 min Summer	66.412	0.712	2.6	1645.6	O K
960 min Summer	66.431	0.731	2.6	1695.8	O K
1440 min Summer	66.452	0.752	2.6	1749.1	O K
2160 min Summer	66.467	0.767	2.6	1788.9	O K
2880 min Summer	66.475	0.775	2.6	1811.2	O K
4320 min Summer	66.488	0.788	2.6	1844.0	O K
5760 min Summer	66.494	0.794	2.6	1861.3	O K
7200 min Summer	66.497	0.797	2.6	1867.9	O K
8640 min Summer	66.503	0.803	2.6	1883.5	O K
10080 min Summer	66.511	0.811	2.6	1906.0	O K
15 min Winter	65.965	0.265	2.5	567.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	212.6	27
30 min Summer	75.673	0.0	217.8	42
60 min Summer	46.461	0.0	436.1	72
120 min Summer	29.463	0.0	431.2	132
180 min Summer	22.155	0.0	421.7	192
240 min Summer	17.935	0.0	411.8	252
360 min Summer	13.129	0.0	392.8	370
480 min Summer	10.422	0.0	376.3	490
600 min Summer	8.677	0.0	365.2	610
720 min Summer	7.452	0.0	358.1	730
960 min Summer	5.839	0.0	350.0	970
1440 min Summer	4.124	0.0	344.3	1448
2160 min Summer	2.924	0.0	711.0	2168
2880 min Summer	2.306	0.0	694.0	2884
4320 min Summer	1.680	0.0	678.0	4324
5760 min Summer	1.359	0.0	1432.3	5760
7200 min Summer	1.160	0.0	1387.8	6696
8640 min Summer	1.025	0.0	1357.9	7344
10080 min Summer	0.929	0.0	1341.1	8072
15 min Winter	118.044	0.0	212.6	27

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
30 min Winter	66.035	0.335	2.6	726.1	O K
60 min Winter	66.105	0.405	2.6	889.2	O K
120 min Winter	66.204	0.504	2.6	1123.1	O K
180 min Winter	66.260	0.560	2.6	1261.8	O K
240 min Winter	66.299	0.599	2.6	1356.9	O K
360 min Winter	66.347	0.647	2.6	1479.4	O K
480 min Winter	66.377	0.677	2.6	1555.4	O K
600 min Winter	66.397	0.697	2.6	1607.7	O K
720 min Winter	66.412	0.712	2.6	1645.6	O K
960 min Winter	66.431	0.731	2.6	1695.9	O K
1440 min Winter	66.452	0.752	2.6	1749.4	O K
2160 min Winter	66.467	0.767	2.6	1789.7	O K
2880 min Winter	66.476	0.776	2.6	1813.1	O K
4320 min Winter	66.490	0.790	2.6	1849.0	O K
5760 min Winter	66.498	0.798	2.6	1870.9	O K
7200 min Winter	66.501	0.801	2.6	1879.1	O K
8640 min Winter	66.503	0.803	2.6	1885.5	O K
10080 min Winter	66.507	0.807	2.6	1896.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	75.673	0.0	217.9	41
60 min Winter	46.461	0.0	436.2	72
120 min Winter	29.463	0.0	431.4	130
180 min Winter	22.155	0.0	421.9	188
240 min Winter	17.935	0.0	412.0	248
360 min Winter	13.129	0.0	393.2	366
480 min Winter	10.422	0.0	376.8	484
600 min Winter	8.677	0.0	365.8	604
720 min Winter	7.452	0.0	358.8	722
960 min Winter	5.839	0.0	351.0	958
1440 min Winter	4.124	0.0	345.6	1430
2160 min Winter	2.924	0.0	713.1	2128
2880 min Winter	2.306	0.0	696.6	2828
4320 min Winter	1.680	0.0	681.7	4196
5760 min Winter	1.359	0.0	1438.1	5536
7200 min Winter	1.160	0.0	1395.3	6840
8640 min Winter	1.025	0.0	1366.7	8040
10080 min Winter	0.929	0.0	1352.0	8360

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.650	0.300	1.8	249.0	O K
30 min Summer	65.726	0.376	1.8	318.6	O K
60 min Summer	65.801	0.451	1.8	389.6	O K
120 min Summer	65.902	0.552	1.8	491.0	O K
180 min Summer	65.959	0.609	1.8	550.6	O K
240 min Summer	65.997	0.647	1.8	590.7	O K
360 min Summer	66.043	0.693	1.8	640.6	O K
480 min Summer	66.070	0.720	1.8	669.8	O K
600 min Summer	66.086	0.736	1.8	688.6	O K
720 min Summer	66.098	0.748	1.8	701.1	O K
960 min Summer	66.110	0.760	1.8	715.1	O K
1440 min Summer	66.116	0.766	1.8	722.6	O K
2160 min Summer	66.112	0.762	1.8	717.0	O K
2880 min Summer	66.101	0.751	1.8	704.6	O K
4320 min Summer	66.082	0.732	1.8	684.2	O K
5760 min Summer	66.073	0.723	1.8	673.7	O K
7200 min Summer	66.066	0.716	1.8	665.9	O K
8640 min Summer	66.063	0.713	1.8	662.2	O K
10080 min Summer	66.062	0.712	1.8	661.7	O K
15 min Winter	65.650	0.300	1.8	249.0	O K
30 min Winter	65.726	0.376	1.8	318.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	148.0	27
30 min Summer	75.673	0.0	150.2	42
60 min Summer	46.461	0.0	296.0	72
120 min Summer	29.463	0.0	288.0	132
180 min Summer	22.155	0.0	273.8	190
240 min Summer	17.935	0.0	265.8	250
360 min Summer	13.129	0.0	258.4	370
480 min Summer	10.422	0.0	255.7	490
600 min Summer	8.677	0.0	255.0	610
720 min Summer	7.452	0.0	255.2	728
960 min Summer	5.839	0.0	256.0	968
1440 min Summer	4.124	0.0	253.8	1446
2160 min Summer	2.924	0.0	512.4	2164
2880 min Summer	2.306	0.0	499.6	2880
4320 min Summer	1.680	0.0	482.6	3680
5760 min Summer	1.359	0.0	1024.3	4448
7200 min Summer	1.160	0.0	988.8	5256
8640 min Summer	1.025	0.0	945.4	6056
10080 min Summer	0.929	0.0	904.1	6952
15 min Winter	118.044	0.0	148.0	27
30 min Winter	75.673	0.0	150.2	41

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.801	0.451	1.8	389.6	O K
120 min Winter	65.902	0.552	1.8	491.1	O K
180 min Winter	65.960	0.610	1.8	550.7	O K
240 min Winter	65.997	0.647	1.8	590.8	O K
360 min Winter	66.043	0.693	1.8	640.9	O K
480 min Winter	66.070	0.720	1.8	670.2	O K
600 min Winter	66.087	0.737	1.8	689.2	O K
720 min Winter	66.098	0.748	1.8	701.9	O K
960 min Winter	66.111	0.761	1.8	716.1	O K
1440 min Winter	66.118	0.768	1.8	724.4	O K
2160 min Winter	66.114	0.764	1.8	720.1	O K
2880 min Winter	66.105	0.755	1.8	709.5	O K
4320 min Winter	66.085	0.735	1.8	687.0	O K
5760 min Winter	66.069	0.719	1.8	669.4	O K
7200 min Winter	66.057	0.707	1.8	655.8	O K
8640 min Winter	66.047	0.697	1.8	644.4	O K
10080 min Winter	66.039	0.689	1.8	635.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	46.461	0.0	296.1	70
120 min Winter	29.463	0.0	288.1	130
180 min Winter	22.155	0.0	274.0	188
240 min Winter	17.935	0.0	265.9	248
360 min Winter	13.129	0.0	258.5	364
480 min Winter	10.422	0.0	255.8	482
600 min Winter	8.677	0.0	255.0	600
720 min Winter	7.452	0.0	255.2	718
960 min Winter	5.839	0.0	255.9	952
1440 min Winter	4.124	0.0	253.7	1418
2160 min Winter	2.924	0.0	512.4	2100
2880 min Winter	2.306	0.0	500.0	2772
4320 min Winter	1.680	0.0	484.2	4024
5760 min Winter	1.359	0.0	1028.1	4560
7200 min Winter	1.160	0.0	996.6	5480
8640 min Winter	1.025	0.0	957.1	6480
10080 min Winter	0.929	0.0	918.9	7368

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	75.645	0.245	1.8	139.9	O K
30 min Summer	75.707	0.307	1.8	178.8	O K
60 min Summer	75.767	0.367	1.8	217.9	O K
120 min Summer	75.847	0.447	1.8	273.0	O K
180 min Summer	75.892	0.492	1.8	304.5	O K
240 min Summer	75.921	0.521	1.8	325.1	O K
360 min Summer	75.954	0.554	1.8	349.7	O K
480 min Summer	75.971	0.571	1.8	362.7	O K
600 min Summer	75.981	0.581	1.8	369.9	O K
720 min Summer	75.986	0.586	1.8	373.6	O K
960 min Summer	75.987	0.587	1.8	374.4	O K
1440 min Summer	75.974	0.574	1.8	364.5	O K
2160 min Summer	75.942	0.542	1.8	340.9	O K
2880 min Summer	75.918	0.518	1.8	323.3	O K
4320 min Summer	75.886	0.486	1.8	300.3	O K
5760 min Summer	75.862	0.462	1.8	283.2	O K
7200 min Summer	75.841	0.441	1.8	268.3	O K
8640 min Summer	75.823	0.423	1.8	255.9	O K
10080 min Summer	75.808	0.408	1.8	245.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	121.6	27
30 min Summer	75.673	0.0	142.1	41
60 min Summer	46.461	0.0	213.6	70
120 min Summer	29.463	0.0	264.6	130
180 min Summer	22.155	0.0	284.2	190
240 min Summer	17.935	0.0	287.4	250
360 min Summer	13.129	0.0	283.8	368
480 min Summer	10.422	0.0	278.3	488
600 min Summer	8.677	0.0	273.2	608
720 min Summer	7.452	0.0	268.9	726
960 min Summer	5.839	0.0	261.7	966
1440 min Summer	4.124	0.0	250.2	1442
2160 min Summer	2.924	0.0	490.9	1868
2880 min Summer	2.306	0.0	505.2	2196
4320 min Summer	1.680	0.0	486.4	2948
5760 min Summer	1.359	0.0	623.9	3760
7200 min Summer	1.160	0.0	665.0	4608
8640 min Summer	1.025	0.0	704.8	5368
10080 min Summer	0.929	0.0	743.4	6160

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	75.645	0.245	1.8	139.9	O K
30 min Winter	75.707	0.307	1.8	178.8	O K
60 min Winter	75.767	0.367	1.8	217.9	O K
120 min Winter	75.848	0.448	1.8	273.1	O K
180 min Winter	75.892	0.492	1.8	304.6	O K
240 min Winter	75.921	0.521	1.8	325.3	O K
360 min Winter	75.954	0.554	1.8	349.9	O K
480 min Winter	75.972	0.572	1.8	363.0	O K
600 min Winter	75.981	0.581	1.8	370.2	O K
720 min Winter	75.986	0.586	1.8	373.9	O K
960 min Winter	75.987	0.587	1.8	374.8	O K
1440 min Winter	75.975	0.575	1.8	365.2	O K
2160 min Winter	75.942	0.542	1.8	340.7	O K
2880 min Winter	75.911	0.511	1.8	318.5	O K
4320 min Winter	75.867	0.467	1.8	286.5	O K
5760 min Winter	75.827	0.427	1.8	259.0	O K
7200 min Winter	75.791	0.391	1.8	233.9	O K
8640 min Winter	75.758	0.358	1.8	212.2	O K
10080 min Winter	75.730	0.330	1.8	193.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	118.044	0.0	121.6	26
30 min Winter	75.673	0.0	142.1	41
60 min Winter	46.461	0.0	213.6	70
120 min Winter	29.463	0.0	264.6	128
180 min Winter	22.155	0.0	284.3	186
240 min Winter	17.935	0.0	287.5	246
360 min Winter	13.129	0.0	284.0	362
480 min Winter	10.422	0.0	278.6	480
600 min Winter	8.677	0.0	273.6	596
720 min Winter	7.452	0.0	269.5	714
960 min Winter	5.839	0.0	262.6	944
1440 min Winter	4.124	0.0	251.8	1398
2160 min Winter	2.924	0.0	491.4	2028
2880 min Winter	2.306	0.0	507.3	2256
4320 min Winter	1.680	0.0	495.5	3156
5760 min Winter	1.359	0.0	623.9	4032
7200 min Winter	1.160	0.0	665.2	4840
8640 min Winter	1.025	0.0	705.1	5704
10080 min Winter	0.929	0.0	744.0	6464

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 30 year Return Period (+40%)

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	58.257	0.257	2.2	502.4	O K
30 min Summer	58.325	0.325	2.2	643.4	O K
60 min Summer	58.393	0.393	2.2	788.1	O K
120 min Summer	58.488	0.488	2.2	995.4	O K
180 min Summer	58.543	0.543	2.2	1118.4	O K
240 min Summer	58.580	0.580	2.2	1202.8	O K
360 min Summer	58.627	0.627	2.2	1311.8	O K
480 min Summer	58.656	0.656	2.2	1379.3	O K
600 min Summer	58.676	0.676	2.2	1425.8	O K
720 min Summer	58.690	0.690	2.2	1459.6	O K
960 min Summer	58.709	0.709	2.2	1504.4	O K
1440 min Summer	58.729	0.729	2.2	1552.3	O K
2160 min Summer	58.744	0.744	2.2	1588.6	O K
2880 min Summer	58.753	0.753	2.2	1609.4	O K
4320 min Summer	58.765	0.765	2.2	1640.3	O K
5760 min Summer	58.773	0.773	2.2	1657.5	O K
7200 min Summer	58.775	0.775	2.2	1664.5	O K
8640 min Summer	58.781	0.781	2.2	1679.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	184.4	27
30 min Summer	75.673	0.0	188.4	42
60 min Summer	46.461	0.0	376.9	72
120 min Summer	29.463	0.0	371.2	132
180 min Summer	22.155	0.0	361.9	192
240 min Summer	17.935	0.0	352.2	252
360 min Summer	13.129	0.0	333.4	370
480 min Summer	10.422	0.0	319.5	490
600 min Summer	8.677	0.0	311.8	610
720 min Summer	7.452	0.0	307.4	730
960 min Summer	5.839	0.0	303.5	970
1440 min Summer	4.124	0.0	300.8	1448
2160 min Summer	2.924	0.0	614.7	2168
2880 min Summer	2.306	0.0	604.1	2884
4320 min Summer	1.680	0.0	592.7	4324
5760 min Summer	1.359	0.0	1239.4	5760
7200 min Summer	1.160	0.0	1206.2	6696
8640 min Summer	1.025	0.0	1188.1	7352

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	58.790	0.790	2.2	1699.9	O K
15 min Winter	58.257	0.257	2.2	502.4	O K
30 min Winter	58.325	0.325	2.2	643.4	O K
60 min Winter	58.393	0.393	2.2	788.0	O K
120 min Winter	58.488	0.488	2.2	995.4	O K
180 min Winter	58.543	0.543	2.2	1118.4	O K
240 min Winter	58.580	0.580	2.2	1202.9	O K
360 min Winter	58.627	0.627	2.2	1311.9	O K
480 min Winter	58.656	0.656	2.2	1379.4	O K
600 min Winter	58.676	0.676	2.2	1425.8	O K
720 min Winter	58.690	0.690	2.2	1459.7	O K
960 min Winter	58.709	0.709	2.2	1504.5	O K
1440 min Winter	58.729	0.729	2.2	1552.7	O K
2160 min Winter	58.745	0.745	2.2	1589.6	O K
2880 min Winter	58.754	0.754	2.2	1611.4	O K
4320 min Winter	58.768	0.768	2.2	1645.4	O K
5760 min Winter	58.776	0.776	2.2	1666.8	O K
7200 min Winter	58.780	0.780	2.2	1676.0	O K
8640 min Winter	58.783	0.783	2.2	1683.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.929	0.0	1173.9	8160
15 min Winter	118.044	0.0	184.4	27
30 min Winter	75.673	0.0	188.4	41
60 min Winter	46.461	0.0	377.0	72
120 min Winter	29.463	0.0	371.4	130
180 min Winter	22.155	0.0	362.1	188
240 min Winter	17.935	0.0	352.4	248
360 min Winter	13.129	0.0	333.6	366
480 min Winter	10.422	0.0	319.9	484
600 min Winter	8.677	0.0	312.3	604
720 min Winter	7.452	0.0	308.0	722
960 min Winter	5.839	0.0	304.2	958
1440 min Winter	4.124	0.0	301.8	1430
2160 min Winter	2.924	0.0	616.1	2128
2880 min Winter	2.306	0.0	605.8	2828
4320 min Winter	1.680	0.0	595.2	4196
5760 min Winter	1.359	0.0	1243.3	5536
7200 min Winter	1.160	0.0	1211.1	6840
8640 min Winter	1.025	0.0	1193.9	8040

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	58.787	0.787	2.2	1693.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.929	0.0	1181.6	8376

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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Summary of Results for 30 year Return Period (+40%)

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	62.482	0.382	1.5	405.6	O K
30 min Summer	62.578	0.478	1.5	519.7	O K
60 min Summer	62.672	0.572	1.5	636.9	O K
120 min Summer	62.801	0.701	1.5	804.7	O K
180 min Summer	62.874	0.774	1.5	904.2	O K
240 min Summer	62.922	0.822	1.5	972.4	O K
360 min Summer	62.983	0.883	1.5	1060.2	O K
480 min Summer	63.021	0.921	1.5	1114.5	O K
600 min Summer	63.046	0.946	1.5	1151.8	O K
720 min Summer	63.064	0.964	1.6	1179.0	O K
960 min Summer	63.088	0.988	1.6	1215.2	O K
1440 min Summer	63.113	1.013	1.6	1254.1	O K
2160 min Summer	63.133	1.033	1.6	1283.7	O K
2880 min Summer	63.144	1.044	1.6	1300.9	O K
4320 min Summer	63.160	1.060	1.6	1326.5	O K
5760 min Summer	63.169	1.069	1.6	1340.9	O K
7200 min Summer	63.174	1.074	1.6	1348.5	O K
8640 min Summer	63.183	1.083	1.6	1362.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	123.5	27
30 min Summer	75.673	0.0	117.4	42
60 min Summer	46.461	0.0	221.4	72
120 min Summer	29.463	0.0	218.1	132
180 min Summer	22.155	0.0	228.6	192
240 min Summer	17.935	0.0	235.0	252
360 min Summer	13.129	0.0	242.2	370
480 min Summer	10.422	0.0	245.9	490
600 min Summer	8.677	0.0	247.8	610
720 min Summer	7.452	0.0	248.7	730
960 min Summer	5.839	0.0	248.7	970
1440 min Summer	4.124	0.0	245.3	1448
2160 min Summer	2.924	0.0	496.4	2168
2880 min Summer	2.306	0.0	492.6	2884
4320 min Summer	1.680	0.0	479.3	4324
5760 min Summer	1.359	0.0	975.7	5760
7200 min Summer	1.160	0.0	972.4	6560
8640 min Summer	1.025	0.0	962.4	7264

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.195	1.095	1.6	1381.4	O K
15 min Winter	62.482	0.382	1.5	405.6	O K
30 min Winter	62.578	0.478	1.5	519.6	O K
60 min Winter	62.672	0.572	1.5	636.9	O K
120 min Winter	62.801	0.701	1.5	804.7	O K
180 min Winter	62.874	0.774	1.5	904.4	O K
240 min Winter	62.923	0.823	1.5	972.8	O K
360 min Winter	62.984	0.884	1.5	1060.8	O K
480 min Winter	63.021	0.921	1.5	1115.2	O K
600 min Winter	63.046	0.946	1.5	1152.8	O K
720 min Winter	63.065	0.965	1.6	1180.3	O K
960 min Winter	63.089	0.989	1.6	1217.0	O K
1440 min Winter	63.115	1.015	1.6	1256.9	O K
2160 min Winter	63.135	1.035	1.6	1288.2	O K
2880 min Winter	63.148	1.048	1.6	1307.3	O K
4320 min Winter	63.167	1.067	1.6	1337.5	O K
5760 min Winter	63.180	1.080	1.6	1357.4	O K
7200 min Winter	63.186	1.086	1.6	1367.5	O K
8640 min Winter	63.192	1.092	1.6	1376.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.929	0.0	946.6	7984
15 min Winter	118.044	0.0	123.5	27
30 min Winter	75.673	0.0	117.4	42
60 min Winter	46.461	0.0	221.4	72
120 min Winter	29.463	0.0	218.1	130
180 min Winter	22.155	0.0	228.5	190
240 min Winter	17.935	0.0	234.9	248
360 min Winter	13.129	0.0	242.0	366
480 min Winter	10.422	0.0	245.5	484
600 min Winter	8.677	0.0	247.2	604
720 min Winter	7.452	0.0	248.0	722
960 min Winter	5.839	0.0	247.7	958
1440 min Winter	4.124	0.0	243.8	1430
2160 min Winter	2.924	0.0	494.3	2128
2880 min Winter	2.306	0.0	489.7	2828
4320 min Winter	1.680	0.0	475.0	4196
5760 min Winter	1.359	0.0	971.1	5528
7200 min Winter	1.160	0.0	966.8	6776
8640 min Winter	1.025	0.0	956.2	7960

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.200	1.100	1.6	1389.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.929	0.0	940.2	8176

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Summary of Results for 30 year Return Period (+40%)

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	63.373	0.273	0.7	217.6	O K
30 min Summer	63.442	0.342	0.7	278.7	O K
60 min Summer	63.512	0.412	0.7	341.6	O K
120 min Summer	63.607	0.507	0.7	431.8	O K
180 min Summer	63.661	0.561	0.7	485.3	O K
240 min Summer	63.697	0.597	0.7	522.0	O K
360 min Summer	63.743	0.643	0.8	569.4	O K
480 min Summer	63.771	0.671	0.8	598.7	O K
600 min Summer	63.791	0.691	0.8	619.1	O K
720 min Summer	63.805	0.705	0.8	634.0	O K
960 min Summer	63.823	0.723	0.8	653.9	O K
1440 min Summer	63.843	0.743	0.8	675.9	O K
2160 min Summer	63.859	0.759	0.8	693.4	O K
2880 min Summer	63.869	0.769	0.8	704.2	O K
4320 min Summer	63.884	0.784	0.8	721.1	O K
5760 min Summer	63.894	0.794	0.8	731.8	O K
7200 min Summer	63.899	0.799	0.8	737.5	O K
8640 min Summer	63.907	0.807	0.8	746.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	63.5	27
30 min Summer	75.673	0.0	61.3	42
60 min Summer	46.461	0.0	116.4	72
120 min Summer	29.463	0.0	111.3	132
180 min Summer	22.155	0.0	116.5	192
240 min Summer	17.935	0.0	119.8	252
360 min Summer	13.129	0.0	123.4	370
480 min Summer	10.422	0.0	125.2	490
600 min Summer	8.677	0.0	126.1	610
720 min Summer	7.452	0.0	126.6	730
960 min Summer	5.839	0.0	126.5	970
1440 min Summer	4.124	0.0	124.7	1448
2160 min Summer	2.924	0.0	253.1	2168
2880 min Summer	2.306	0.0	251.0	2884
4320 min Summer	1.680	0.0	243.9	4324
5760 min Summer	1.359	0.0	499.4	5760
7200 min Summer	1.160	0.0	497.3	6712
8640 min Summer	1.025	0.0	492.0	7432

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	63.916	0.816	0.8	757.2	O K
15 min Winter	63.373	0.273	0.7	217.6	O K
30 min Winter	63.442	0.342	0.7	278.7	O K
60 min Winter	63.512	0.412	0.7	341.6	O K
120 min Winter	63.607	0.507	0.7	431.8	O K
180 min Winter	63.661	0.561	0.7	485.4	O K
240 min Winter	63.698	0.598	0.7	522.2	O K
360 min Winter	63.744	0.644	0.8	569.6	O K
480 min Winter	63.772	0.672	0.8	599.1	O K
600 min Winter	63.791	0.691	0.8	619.5	O K
720 min Winter	63.805	0.705	0.8	634.5	O K
960 min Winter	63.824	0.724	0.8	654.7	O K
1440 min Winter	63.845	0.745	0.8	677.2	O K
2160 min Winter	63.861	0.761	0.8	695.5	O K
2880 min Winter	63.872	0.772	0.8	707.3	O K
4320 min Winter	63.889	0.789	0.8	726.4	O K
5760 min Winter	63.901	0.801	0.8	739.8	O K
7200 min Winter	63.908	0.808	0.8	747.7	O K
8640 min Winter	63.914	0.814	0.8	754.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.929	0.0	483.9	8176
15 min Winter	118.044	0.0	63.5	27
30 min Winter	75.673	0.0	61.3	42
60 min Winter	46.461	0.0	116.4	72
120 min Winter	29.463	0.0	111.3	130
180 min Winter	22.155	0.0	116.5	190
240 min Winter	17.935	0.0	119.7	248
360 min Winter	13.129	0.0	123.3	366
480 min Winter	10.422	0.0	125.0	486
600 min Winter	8.677	0.0	125.9	604
720 min Winter	7.452	0.0	126.3	722
960 min Winter	5.839	0.0	126.1	958
1440 min Winter	4.124	0.0	124.0	1430
2160 min Winter	2.924	0.0	252.1	2128
2880 min Winter	2.306	0.0	249.7	2828
4320 min Winter	1.680	0.0	241.9	4196
5760 min Winter	1.359	0.0	497.2	5536
7200 min Winter	1.160	0.0	494.7	6840
8640 min Winter	1.025	0.0	489.0	8048

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	63.921	0.821	0.8	762.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.929	0.0	480.6	9072

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Summary of Results for 30 year Return Period (+40%)

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	63.497	0.397	1.0	288.1	O K
30 min Summer	63.594	0.494	1.0	369.1	O K
60 min Summer	63.688	0.588	1.0	452.2	O K
120 min Summer	63.816	0.716	1.0	571.2	O K
180 min Summer	63.887	0.787	1.0	641.8	O K
240 min Summer	63.935	0.835	1.1	690.1	O K
360 min Summer	63.995	0.895	1.1	752.2	O K
480 min Summer	64.031	0.931	1.1	790.6	O K
600 min Summer	64.055	0.955	1.1	816.9	O K
720 min Summer	64.073	0.973	1.2	836.0	O K
960 min Summer	64.096	0.996	1.2	861.3	O K
1440 min Summer	64.120	1.020	1.2	888.1	O K
2160 min Summer	64.137	1.037	1.2	907.9	O K
2880 min Summer	64.147	1.047	1.2	919.0	O K
4320 min Summer	64.161	1.061	1.2	934.8	O K
5760 min Summer	64.168	1.068	1.2	942.9	O K
7200 min Summer	64.172	1.072	1.2	948.1	O K
8640 min Summer	64.181	1.081	1.2	957.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.044	0.0	82.2	27
30 min Summer	75.673	0.0	73.0	42
60 min Summer	46.461	0.0	149.5	72
120 min Summer	29.463	0.0	162.8	132
180 min Summer	22.155	0.0	170.3	192
240 min Summer	17.935	0.0	174.9	252
360 min Summer	13.129	0.0	180.0	370
480 min Summer	10.422	0.0	182.4	490
600 min Summer	8.677	0.0	183.7	610
720 min Summer	7.452	0.0	184.1	730
960 min Summer	5.839	0.0	183.9	970
1440 min Summer	4.124	0.0	180.9	1448
2160 min Summer	2.924	0.0	366.2	2168
2880 min Summer	2.306	0.0	362.7	2884
4320 min Summer	1.680	0.0	351.6	4324
5760 min Summer	1.359	0.0	716.7	5712
7200 min Summer	1.160	0.0	713.1	6280
8640 min Summer	1.025	0.0	704.5	7096

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	64.192	1.092	1.2	970.9	O K
15 min Winter	63.497	0.397	1.0	288.1	O K
30 min Winter	63.594	0.494	1.0	369.1	O K
60 min Winter	63.688	0.588	1.0	452.2	O K
120 min Winter	63.816	0.716	1.0	571.3	O K
180 min Winter	63.888	0.788	1.0	642.0	O K
240 min Winter	63.935	0.835	1.1	690.4	O K
360 min Winter	63.995	0.895	1.1	752.7	O K
480 min Winter	64.031	0.931	1.1	791.2	O K
600 min Winter	64.056	0.956	1.1	817.7	O K
720 min Winter	64.074	0.974	1.2	837.1	O K
960 min Winter	64.097	0.997	1.2	862.7	O K
1440 min Winter	64.122	1.022	1.2	890.3	O K
2160 min Winter	64.140	1.040	1.2	911.5	O K
2880 min Winter	64.151	1.051	1.2	924.1	O K
4320 min Winter	64.168	1.068	1.2	943.5	O K
5760 min Winter	64.179	1.079	1.2	955.9	O K
7200 min Winter	64.184	1.084	1.2	961.4	O K
8640 min Winter	64.188	1.088	1.2	966.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.929	0.0	691.8	7960
15 min Winter	118.044	0.0	82.2	27
30 min Winter	75.673	0.0	73.0	42
60 min Winter	46.461	0.0	149.5	72
120 min Winter	29.463	0.0	162.8	130
180 min Winter	22.155	0.0	170.2	190
240 min Winter	17.935	0.0	174.8	248
360 min Winter	13.129	0.0	179.7	366
480 min Winter	10.422	0.0	182.1	484
600 min Winter	8.677	0.0	183.2	604
720 min Winter	7.452	0.0	183.5	722
960 min Winter	5.839	0.0	183.0	958
1440 min Winter	4.124	0.0	179.6	1428
2160 min Winter	2.924	0.0	364.4	2124
2880 min Winter	2.306	0.0	360.4	2824
4320 min Winter	1.680	0.0	348.1	4192
5760 min Winter	1.359	0.0	713.0	5488
7200 min Winter	1.160	0.0	708.6	6768
8640 min Winter	1.025	0.0	699.5	7872

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Winter	64.197	1.097	1.2	977.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.929	0.0	686.4	8072

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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1 in 100 year return period plus 20% climate change allowance

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.993	0.293	2.6	630.1	O K
30 min Summer	66.073	0.373	2.6	814.6	O K
60 min Summer	66.153	0.453	2.6	1001.0	O K
120 min Summer	66.260	0.560	2.6	1261.4	O K
180 min Summer	66.327	0.627	2.6	1428.6	O K
240 min Summer	66.375	0.675	2.6	1550.6	O K
360 min Summer	66.440	0.740	2.6	1719.4	O K
480 min Summer	66.482	0.782	2.6	1829.3	O K
600 min Summer	66.511	0.811	2.6	1905.6	O K
720 min Summer	66.532	0.832	2.6	1961.1	O K
960 min Summer	66.558	0.858	2.6	2032.7	O K
1440 min Summer	66.583	0.883	2.6	2101.4	O K
2160 min Summer	66.594	0.894	2.6	2132.0	O K
2880 min Summer	66.596	0.896	2.6	2135.7	O K
4320 min Summer	66.590	0.890	2.6	2119.1	O K
5760 min Summer	66.579	0.879	2.6	2088.7	O K
7200 min Summer	66.569	0.869	2.6	2061.2	O K
8640 min Summer	66.564	0.864	2.6	2049.1	O K
10080 min Summer	66.565	0.865	2.6	2050.7	O K
15 min Winter	65.993	0.293	2.6	630.1	O K
30 min Winter	66.073	0.373	2.6	814.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	215.9	27
30 min Summer	84.847	0.0	218.7	42
60 min Summer	52.256	0.0	436.7	72
120 min Summer	33.050	0.0	424.2	132
180 min Summer	25.036	0.0	406.3	192
240 min Summer	20.441	0.0	385.3	252
360 min Summer	15.200	0.0	363.0	372
480 min Summer	12.203	0.0	361.8	490
600 min Summer	10.231	0.0	366.1	610
720 min Summer	8.827	0.0	368.7	730
960 min Summer	6.946	0.0	370.4	970
1440 min Summer	4.903	0.0	367.1	1448
2160 min Summer	3.437	0.0	739.5	2168
2880 min Summer	2.674	0.0	732.6	2884
4320 min Summer	1.893	0.0	710.5	4324
5760 min Summer	1.495	0.0	1443.2	5760
7200 min Summer	1.255	0.0	1415.9	6848
8640 min Summer	1.096	0.0	1398.5	7440
10080 min Summer	0.984	0.0	1375.9	8184
15 min Winter	131.136	0.0	215.9	27
30 min Winter	84.847	0.0	218.8	42

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	66.153	0.453	2.6	1001.0	O K
120 min Winter	66.260	0.560	2.6	1261.5	O K
180 min Winter	66.327	0.627	2.6	1428.6	O K
240 min Winter	66.375	0.675	2.6	1550.7	O K
360 min Winter	66.440	0.740	2.6	1719.5	O K
480 min Winter	66.482	0.782	2.6	1829.5	O K
600 min Winter	66.511	0.811	2.6	1905.9	O K
720 min Winter	66.532	0.832	2.6	1961.6	O K
960 min Winter	66.558	0.858	2.6	2033.5	O K
1440 min Winter	66.584	0.884	2.6	2103.0	O K
2160 min Winter	66.596	0.896	2.6	2134.8	O K
2880 min Winter	66.597	0.897	2.6	2140.2	O K
4320 min Winter	66.593	0.893	2.6	2127.4	O K
5760 min Winter	66.583	0.883	2.6	2101.8	O K
7200 min Winter	66.575	0.875	2.6	2078.4	O K
8640 min Winter	66.568	0.868	2.6	2059.2	O K
10080 min Winter	66.563	0.863	2.6	2047.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	52.256	0.0	436.8	72
120 min Winter	33.050	0.0	424.3	130
180 min Winter	25.036	0.0	406.5	190
240 min Winter	20.441	0.0	385.5	248
360 min Winter	15.200	0.0	363.4	366
480 min Winter	12.203	0.0	362.1	486
600 min Winter	10.231	0.0	366.4	604
720 min Winter	8.827	0.0	369.0	722
960 min Winter	6.946	0.0	370.6	958
1440 min Winter	4.903	0.0	367.2	1430
2160 min Winter	3.437	0.0	739.5	2136
2880 min Winter	2.674	0.0	732.7	2828
4320 min Winter	1.893	0.0	711.0	4196
5760 min Winter	1.495	0.0	1444.8	5536
7200 min Winter	1.255	0.0	1418.7	6848
8640 min Winter	1.096	0.0	1403.1	8048
10080 min Winter	0.984	0.0	1382.8	9080

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.681	0.331	1.8	276.8	O K
30 min Summer	65.767	0.417	1.8	357.6	O K
60 min Summer	65.851	0.501	1.8	438.9	O K
120 min Summer	65.961	0.611	1.8	552.1	O K
180 min Summer	66.028	0.678	1.8	623.7	O K
240 min Summer	66.074	0.724	1.8	675.2	O K
360 min Summer	66.136	0.786	1.8	744.9	O K
480 min Summer	66.174	0.824	1.8	788.9	O K
600 min Summer	66.199	0.849	1.8	818.0	O K
720 min Summer	66.216	0.866	1.8	838.1	O K
960 min Summer	66.235	0.885	1.8	860.9	O K
1440 min Summer	66.246	0.896	1.8	874.2	O K
2160 min Summer	66.237	0.887	1.8	863.1	O K
2880 min Summer	66.218	0.868	1.8	841.3	O K
4320 min Summer	66.179	0.829	1.8	794.4	O K
5760 min Summer	66.150	0.800	1.8	761.3	O K
7200 min Summer	66.131	0.781	1.8	739.4	O K
8640 min Summer	66.119	0.769	1.8	725.0	O K
10080 min Summer	66.111	0.761	1.8	716.5	O K
15 min Winter	65.681	0.331	1.8	276.7	O K
30 min Winter	65.767	0.417	1.8	357.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	149.8	27
30 min Summer	84.847	0.0	149.6	42
60 min Summer	52.256	0.0	295.8	72
120 min Summer	33.050	0.0	275.3	132
180 min Summer	25.036	0.0	263.5	192
240 min Summer	20.441	0.0	259.6	250
360 min Summer	15.200	0.0	262.7	370
480 min Summer	12.203	0.0	268.4	490
600 min Summer	10.231	0.0	271.7	610
720 min Summer	8.827	0.0	273.5	728
960 min Summer	6.946	0.0	274.5	968
1440 min Summer	4.903	0.0	271.6	1446
2160 min Summer	3.437	0.0	532.5	2164
2880 min Summer	2.674	0.0	527.2	2880
4320 min Summer	1.893	0.0	508.5	3848
5760 min Summer	1.495	0.0	1040.4	4552
7200 min Summer	1.255	0.0	1000.7	5328
8640 min Summer	1.096	0.0	959.7	6136
10080 min Summer	0.984	0.0	923.6	6960
15 min Winter	131.136	0.0	149.9	27
30 min Winter	84.847	0.0	149.7	41

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.851	0.501	1.8	438.9	O K
120 min Winter	65.961	0.611	1.8	552.1	O K
180 min Winter	66.028	0.678	1.8	623.9	O K
240 min Winter	66.075	0.725	1.8	675.4	O K
360 min Winter	66.136	0.786	1.8	745.4	O K
480 min Winter	66.175	0.825	1.8	789.5	O K
600 min Winter	66.200	0.850	1.8	819.0	O K
720 min Winter	66.217	0.867	1.8	839.3	O K
960 min Winter	66.236	0.886	1.8	862.6	O K
1440 min Winter	66.248	0.898	1.8	876.9	O K
2160 min Winter	66.240	0.890	1.8	867.5	O K
2880 min Winter	66.224	0.874	1.8	847.7	O K
4320 min Winter	66.185	0.835	1.8	802.1	O K
5760 min Winter	66.149	0.799	1.8	760.3	O K
7200 min Winter	66.126	0.776	1.8	733.0	O K
8640 min Winter	66.107	0.757	1.8	711.3	O K
10080 min Winter	66.092	0.742	1.8	694.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	52.256	0.0	295.9	70
120 min Winter	33.050	0.0	275.3	130
180 min Winter	25.036	0.0	263.6	188
240 min Winter	20.441	0.0	259.6	248
360 min Winter	15.200	0.0	262.6	366
480 min Winter	12.203	0.0	268.2	484
600 min Winter	10.231	0.0	271.4	600
720 min Winter	8.827	0.0	273.1	718
960 min Winter	6.946	0.0	273.9	954
1440 min Winter	4.903	0.0	270.7	1420
2160 min Winter	3.437	0.0	531.4	2108
2880 min Winter	2.674	0.0	526.0	2776
4320 min Winter	1.893	0.0	507.9	4068
5760 min Winter	1.495	0.0	1041.8	4664
7200 min Winter	1.255	0.0	1005.1	5552
8640 min Winter	1.096	0.0	967.6	6488
10080 min Winter	0.984	0.0	934.1	7456

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	75.670	0.270	1.8	155.5	O K
30 min Summer	75.741	0.341	1.8	200.7	O K
60 min Summer	75.808	0.408	1.8	245.6	O K
120 min Summer	75.896	0.496	1.8	307.4	O K
180 min Summer	75.949	0.549	1.8	346.0	O K
240 min Summer	75.986	0.586	1.8	373.5	O K
360 min Summer	76.033	0.633	1.8	409.4	O K
480 min Summer	76.060	0.660	1.8	430.6	O K
600 min Summer	76.076	0.676	1.8	443.4	O K
720 min Summer	76.085	0.685	1.8	451.0	O K
960 min Summer	76.092	0.692	1.8	456.6	O K
1440 min Summer	76.084	0.684	1.8	450.2	O K
2160 min Summer	76.052	0.652	1.8	424.7	O K
2880 min Summer	76.021	0.621	1.8	400.1	O K
4320 min Summer	75.970	0.570	1.8	361.5	O K
5760 min Summer	75.927	0.527	1.8	329.9	O K
7200 min Summer	75.895	0.495	1.8	306.4	O K
8640 min Summer	75.869	0.469	1.8	287.9	O K
10080 min Summer	75.847	0.447	1.8	272.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	131.8	27
30 min Summer	84.847	0.0	146.5	41
60 min Summer	52.256	0.0	238.7	72
120 min Summer	33.050	0.0	284.4	130
180 min Summer	25.036	0.0	288.0	190
240 min Summer	20.441	0.0	282.4	250
360 min Summer	15.200	0.0	272.4	370
480 min Summer	12.203	0.0	265.9	488
600 min Summer	10.231	0.0	261.4	608
720 min Summer	8.827	0.0	257.9	728
960 min Summer	6.946	0.0	252.4	966
1440 min Summer	4.903	0.0	243.6	1444
2160 min Summer	3.437	0.0	523.0	2108
2880 min Summer	2.674	0.0	506.4	2424
4320 min Summer	1.893	0.0	470.4	3160
5760 min Summer	1.495	0.0	686.0	3880
7200 min Summer	1.255	0.0	719.7	4680
8640 min Summer	1.096	0.0	753.2	5456
10080 min Summer	0.984	0.0	786.5	6256

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	75.670	0.270	1.8	155.5	O K
30 min Winter	75.741	0.341	1.8	200.7	O K
60 min Winter	75.808	0.408	1.8	245.6	O K
120 min Winter	75.896	0.496	1.8	307.4	O K
180 min Winter	75.949	0.549	1.8	346.1	O K
240 min Winter	75.986	0.586	1.8	373.6	O K
360 min Winter	76.033	0.633	1.8	409.6	O K
480 min Winter	76.060	0.660	1.8	430.9	O K
600 min Winter	76.076	0.676	1.8	443.8	O K
720 min Winter	76.086	0.686	1.8	451.6	O K
960 min Winter	76.093	0.693	1.8	457.5	O K
1440 min Winter	76.086	0.686	1.8	451.6	O K
2160 min Winter	76.055	0.655	1.8	427.2	O K
2880 min Winter	76.019	0.619	1.8	398.8	O K
4320 min Winter	75.954	0.554	1.8	349.9	O K
5760 min Winter	75.896	0.496	1.8	307.4	O K
7200 min Winter	75.847	0.447	1.8	273.0	O K
8640 min Winter	75.806	0.406	1.8	244.2	O K
10080 min Winter	75.770	0.370	1.8	220.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	131.136	0.0	131.8	26
30 min Winter	84.847	0.0	146.5	41
60 min Winter	52.256	0.0	238.7	70
120 min Winter	33.050	0.0	284.4	128
180 min Winter	25.036	0.0	288.1	188
240 min Winter	20.441	0.0	282.5	246
360 min Winter	15.200	0.0	272.6	364
480 min Winter	12.203	0.0	266.2	480
600 min Winter	10.231	0.0	261.7	598
720 min Winter	8.827	0.0	258.1	714
960 min Winter	6.946	0.0	252.7	946
1440 min Winter	4.903	0.0	244.3	1404
2160 min Winter	3.437	0.0	524.7	2060
2880 min Winter	2.674	0.0	510.2	2660
4320 min Winter	1.893	0.0	483.9	3288
5760 min Winter	1.495	0.0	686.1	4144
7200 min Winter	1.255	0.0	719.9	4968
8640 min Winter	1.096	0.0	753.7	5792
10080 min Winter	0.984	0.0	787.6	6560

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1.043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	58.284	0.284	2.2	558.3	O K
30 min Summer	58.362	0.362	2.2	721.8	O K
60 min Summer	58.439	0.439	2.2	887.1	O K
120 min Summer	58.543	0.543	2.2	1118.0	O K
180 min Summer	58.608	0.608	2.2	1266.3	O K
240 min Summer	58.654	0.654	2.2	1374.5	O K
360 min Summer	58.717	0.717	2.2	1524.1	O K
480 min Summer	58.758	0.758	2.2	1621.6	O K
600 min Summer	58.786	0.786	2.2	1689.4	O K
720 min Summer	58.806	0.806	2.2	1738.7	O K
960 min Summer	58.831	0.831	2.2	1802.5	O K
1440 min Summer	58.856	0.856	2.2	1864.2	O K
2160 min Summer	58.867	0.867	2.2	1892.4	O K
2880 min Summer	58.869	0.869	2.2	1896.7	O K
4320 min Summer	58.864	0.864	2.2	1884.0	O K
5760 min Summer	58.854	0.854	2.2	1858.9	O K
7200 min Summer	58.845	0.845	2.2	1835.9	O K
8640 min Summer	58.841	0.841	2.2	1825.9	O K
10080 min Summer	58.842	0.842	2.2	1828.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	187.0	27
30 min Summer	84.847	0.0	188.9	42
60 min Summer	52.256	0.0	376.8	72
120 min Summer	33.050	0.0	364.1	132
180 min Summer	25.036	0.0	346.2	192
240 min Summer	20.441	0.0	326.8	252
360 min Summer	15.200	0.0	313.3	372
480 min Summer	12.203	0.0	316.8	490
600 min Summer	10.231	0.0	320.6	610
720 min Summer	8.827	0.0	322.9	730
960 min Summer	6.946	0.0	324.2	970
1440 min Summer	4.903	0.0	321.2	1448
2160 min Summer	3.437	0.0	647.6	2168
2880 min Summer	2.674	0.0	641.3	2884
4320 min Summer	1.893	0.0	621.3	4324
5760 min Summer	1.495	0.0	1256.4	5760
7200 min Summer	1.255	0.0	1239.4	6848
8640 min Summer	1.096	0.0	1224.7	7448
10080 min Summer	0.984	0.0	1204.5	8272

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	58.284	0.284	2.2	558.3	O K
30 min Winter	58.362	0.362	2.2	721.8	O K
60 min Winter	58.439	0.439	2.2	887.0	O K
120 min Winter	58.543	0.543	2.2	1118.0	O K
180 min Winter	58.608	0.608	2.2	1266.3	O K
240 min Winter	58.654	0.654	2.2	1374.6	O K
360 min Winter	58.717	0.717	2.2	1524.2	O K
480 min Winter	58.758	0.758	2.2	1621.8	O K
600 min Winter	58.786	0.786	2.2	1689.8	O K
720 min Winter	58.806	0.806	2.2	1739.3	O K
960 min Winter	58.832	0.832	2.2	1803.4	O K
1440 min Winter	58.857	0.857	2.2	1865.8	O K
2160 min Winter	58.868	0.868	2.2	1895.1	O K
2880 min Winter	58.871	0.871	2.2	1901.0	O K
4320 min Winter	58.867	0.867	2.2	1891.8	O K
5760 min Winter	58.859	0.859	2.2	1871.2	O K
7200 min Winter	58.851	0.851	2.2	1852.4	O K
8640 min Winter	58.845	0.845	2.2	1837.0	O K
10080 min Winter	58.842	0.842	2.2	1828.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	131.136	0.0	187.0	27
30 min Winter	84.847	0.0	188.9	42
60 min Winter	52.256	0.0	376.8	72
120 min Winter	33.050	0.0	364.2	130
180 min Winter	25.036	0.0	346.3	190
240 min Winter	20.441	0.0	327.0	248
360 min Winter	15.200	0.0	313.5	366
480 min Winter	12.203	0.0	317.0	486
600 min Winter	10.231	0.0	320.8	604
720 min Winter	8.827	0.0	323.0	722
960 min Winter	6.946	0.0	324.2	958
1440 min Winter	4.903	0.0	321.0	1430
2160 min Winter	3.437	0.0	647.4	2136
2880 min Winter	2.674	0.0	641.0	2828
4320 min Winter	1.893	0.0	621.2	4200
5760 min Winter	1.495	0.0	1256.8	5536
7200 min Winter	1.255	0.0	1240.8	6848
8640 min Winter	1.096	0.0	1227.4	8120
10080 min Winter	0.984	0.0	1208.9	9176

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	62.520	0.420	1.5	450.8	O K
30 min Summer	62.629	0.529	1.5	583.0	O K
60 min Summer	62.734	0.634	1.5	716.8	O K
120 min Summer	62.873	0.773	1.5	903.3	O K
180 min Summer	62.958	0.858	1.5	1022.9	O K
240 min Summer	63.017	0.917	1.5	1110.0	O K
360 min Summer	63.098	0.998	1.6	1230.4	O K
480 min Summer	63.149	1.049	1.6	1309.1	O K
600 min Summer	63.184	1.084	1.6	1363.8	O K
720 min Summer	63.209	1.109	1.7	1403.8	O K
960 min Summer	63.241	1.141	1.7	1455.4	O K
1440 min Summer	63.272	1.172	1.7	1505.7	O K
2160 min Summer	63.287	1.187	1.7	1529.1	O K
2880 min Summer	63.289	1.189	1.7	1533.2	O K
4320 min Summer	63.283	1.183	1.7	1523.9	O K
5760 min Summer	63.271	1.171	1.7	1504.4	O K
7200 min Summer	63.261	1.161	1.7	1487.3	O K
8640 min Summer	63.257	1.157	1.7	1481.6	O K
10080 min Summer	63.260	1.160	1.7	1485.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	122.0	27
30 min Summer	84.847	0.0	110.2	42
60 min Summer	52.256	0.0	214.3	72
120 min Summer	33.050	0.0	228.9	132
180 min Summer	25.036	0.0	240.3	192
240 min Summer	20.441	0.0	247.8	252
360 min Summer	15.200	0.0	256.7	370
480 min Summer	12.203	0.0	261.4	490
600 min Summer	10.231	0.0	264.0	610
720 min Summer	8.827	0.0	265.2	730
960 min Summer	6.946	0.0	265.3	970
1440 min Summer	4.903	0.0	261.1	1448
2160 min Summer	3.437	0.0	529.1	2168
2880 min Summer	2.674	0.0	521.6	2884
4320 min Summer	1.893	0.0	501.1	4324
5760 min Summer	1.495	0.0	1017.7	5760
7200 min Summer	1.255	0.0	1006.3	6712
8640 min Summer	1.096	0.0	990.3	7360
10080 min Summer	0.984	0.0	970.0	8168

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	62.520	0.420	1.5	450.8	O K
30 min Winter	62.629	0.529	1.5	583.0	O K
60 min Winter	62.734	0.634	1.5	716.7	O K
120 min Winter	62.873	0.773	1.5	903.5	O K
180 min Winter	62.958	0.858	1.5	1023.2	O K
240 min Winter	63.018	0.918	1.5	1110.4	O K
360 min Winter	63.098	0.998	1.6	1231.1	O K
480 min Winter	63.150	1.050	1.6	1310.1	O K
600 min Winter	63.185	1.085	1.6	1365.1	O K
720 min Winter	63.210	1.110	1.7	1405.2	O K
960 min Winter	63.243	1.143	1.7	1457.5	O K
1440 min Winter	63.274	1.174	1.7	1508.8	O K
2160 min Winter	63.290	1.190	1.7	1534.0	O K
2880 min Winter	63.293	1.193	1.7	1540.3	O K
4320 min Winter	63.291	1.191	1.7	1535.7	O K
5760 min Winter	63.282	1.182	1.7	1521.8	O K
7200 min Winter	63.274	1.174	1.7	1509.2	O K
8640 min Winter	63.268	1.168	1.7	1499.5	O K
10080 min Winter	63.266	1.166	1.7	1495.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	131.136	0.0	122.0	27
30 min Winter	84.847	0.0	110.3	42
60 min Winter	52.256	0.0	214.3	72
120 min Winter	33.050	0.0	228.8	130
180 min Winter	25.036	0.0	240.2	190
240 min Winter	20.441	0.0	247.6	248
360 min Winter	15.200	0.0	256.3	366
480 min Winter	12.203	0.0	260.9	486
600 min Winter	10.231	0.0	263.3	604
720 min Winter	8.827	0.0	264.3	722
960 min Winter	6.946	0.0	264.1	958
1440 min Winter	4.903	0.0	259.2	1430
2160 min Winter	3.437	0.0	526.5	2132
2880 min Winter	2.674	0.0	518.1	2828
4320 min Winter	1.893	0.0	496.0	4196
5760 min Winter	1.495	0.0	1012.1	5536
7200 min Winter	1.255	0.0	999.7	6840
8640 min Winter	1.096	0.0	983.0	8040
10080 min Winter	0.984	0.0	962.2	8376

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	63.401	0.301	0.7	241.8	O K
30 min Summer	63.480	0.380	0.7	312.7	O K
60 min Summer	63.557	0.457	0.7	384.5	O K
120 min Summer	63.660	0.560	0.7	484.7	O K
180 min Summer	63.724	0.624	0.7	549.0	O K
240 min Summer	63.769	0.669	0.8	595.8	O K
360 min Summer	63.829	0.729	0.8	660.7	O K
480 min Summer	63.868	0.768	0.8	703.2	O K
600 min Summer	63.895	0.795	0.8	732.8	O K
720 min Summer	63.914	0.814	0.8	754.5	O K
960 min Summer	63.939	0.839	0.9	782.8	O K
1440 min Summer	63.963	0.863	0.9	810.9	O K
2160 min Summer	63.976	0.876	0.9	825.1	O K
2880 min Summer	63.979	0.879	0.9	829.0	O K
4320 min Summer	63.978	0.878	0.9	827.3	O K
5760 min Summer	63.971	0.871	0.9	819.9	O K
7200 min Summer	63.965	0.865	0.9	812.8	O K
8640 min Summer	63.963	0.863	0.9	810.5	O K
10080 min Summer	63.966	0.866	0.9	813.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	63.0	27
30 min Summer	84.847	0.0	58.8	42
60 min Summer	52.256	0.0	111.4	72
120 min Summer	33.050	0.0	116.7	132
180 min Summer	25.036	0.0	122.5	192
240 min Summer	20.441	0.0	126.3	252
360 min Summer	15.200	0.0	130.8	372
480 min Summer	12.203	0.0	133.2	490
600 min Summer	10.231	0.0	134.4	610
720 min Summer	8.827	0.0	135.0	730
960 min Summer	6.946	0.0	135.1	970
1440 min Summer	4.903	0.0	132.8	1448
2160 min Summer	3.437	0.0	269.8	2168
2880 min Summer	2.674	0.0	265.9	2888
4320 min Summer	1.893	0.0	255.1	4324
5760 min Summer	1.495	0.0	520.8	5760
7200 min Summer	1.255	0.0	514.6	6992
8640 min Summer	1.096	0.0	506.2	7528
10080 min Summer	0.984	0.0	495.8	8368

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	63.401	0.301	0.7	241.8	O K
30 min Winter	63.480	0.380	0.7	312.7	O K
60 min Winter	63.557	0.457	0.7	384.5	O K
120 min Winter	63.660	0.560	0.7	484.7	O K
180 min Winter	63.724	0.624	0.7	549.1	O K
240 min Winter	63.769	0.669	0.8	596.0	O K
360 min Winter	63.830	0.730	0.8	661.0	O K
480 min Winter	63.869	0.769	0.8	703.6	O K
600 min Winter	63.895	0.795	0.8	733.4	O K
720 min Winter	63.915	0.815	0.8	755.2	O K
960 min Winter	63.940	0.840	0.9	783.8	O K
1440 min Winter	63.965	0.865	0.9	812.4	O K
2160 min Winter	63.978	0.878	0.9	827.5	O K
2880 min Winter	63.982	0.882	0.9	832.4	O K
4320 min Winter	63.982	0.882	0.9	832.9	O K
5760 min Winter	63.978	0.878	0.9	828.2	O K
7200 min Winter	63.975	0.875	0.9	824.1	O K
8640 min Winter	63.972	0.872	0.9	821.1	O K
10080 min Winter	63.972	0.872	0.9	820.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	131.136	0.0	63.0	27
30 min Winter	84.847	0.0	58.8	42
60 min Winter	52.256	0.0	111.5	72
120 min Winter	33.050	0.0	116.7	130
180 min Winter	25.036	0.0	122.5	190
240 min Winter	20.441	0.0	126.2	248
360 min Winter	15.200	0.0	130.6	366
480 min Winter	12.203	0.0	132.9	486
600 min Winter	10.231	0.0	134.1	604
720 min Winter	8.827	0.0	134.6	722
960 min Winter	6.946	0.0	134.5	960
1440 min Winter	4.903	0.0	131.9	1430
2160 min Winter	3.437	0.0	268.6	2136
2880 min Winter	2.674	0.0	264.2	2828
4320 min Winter	1.893	0.0	252.7	4200
5760 min Winter	1.495	0.0	518.1	5544
7200 min Winter	1.255	0.0	511.4	6848
8640 min Winter	1.096	0.0	502.6	8120
10080 min Winter	0.984	0.0	491.9	9272

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	63.536	0.436	1.0	320.2	O K
30 min Summer	63.645	0.545	1.0	414.0	O K
60 min Summer	63.750	0.650	1.0	508.9	O K
120 min Summer	63.887	0.787	1.0	641.3	O K
180 min Summer	63.970	0.870	1.1	726.1	O K
240 min Summer	64.028	0.928	1.1	787.8	O K
360 min Summer	64.106	1.006	1.2	873.1	O K
480 min Summer	64.155	1.055	1.2	928.8	O K
600 min Summer	64.189	1.089	1.2	967.5	O K
720 min Summer	64.213	1.113	1.2	995.6	O K
960 min Summer	64.244	1.144	1.2	1032.0	O K
1440 min Summer	64.273	1.173	1.3	1066.9	O K
2160 min Summer	64.286	1.186	1.3	1082.3	O K
2880 min Summer	64.287	1.187	1.3	1084.1	O K
4320 min Summer	64.280	1.180	1.3	1075.2	O K
5760 min Summer	64.267	1.167	1.2	1059.1	O K
7200 min Summer	64.256	1.156	1.2	1046.2	O K
8640 min Summer	64.252	1.152	1.2	1042.1	O K
10080 min Summer	64.255	1.155	1.2	1044.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.136	0.0	79.0	27
30 min Summer	84.847	0.0	73.9	42
60 min Summer	52.256	0.0	155.5	72
120 min Summer	33.050	0.0	170.6	132
180 min Summer	25.036	0.0	178.8	192
240 min Summer	20.441	0.0	184.0	252
360 min Summer	15.200	0.0	190.3	370
480 min Summer	12.203	0.0	193.5	490
600 min Summer	10.231	0.0	195.2	610
720 min Summer	8.827	0.0	195.9	730
960 min Summer	6.946	0.0	195.6	970
1440 min Summer	4.903	0.0	192.0	1448
2160 min Summer	3.437	0.0	389.4	2168
2880 min Summer	2.674	0.0	383.2	2884
4320 min Summer	1.893	0.0	366.9	4324
5760 min Summer	1.495	0.0	746.7	5760
7200 min Summer	1.255	0.0	737.2	6560
8640 min Summer	1.096	0.0	724.3	7264
10080 min Summer	0.984	0.0	708.3	7976

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Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	63.536	0.436	1.0	320.2	O K
30 min Winter	63.645	0.545	1.0	414.0	O K
60 min Winter	63.750	0.650	1.0	508.9	O K
120 min Winter	63.887	0.787	1.0	641.4	O K
180 min Winter	63.970	0.870	1.1	726.3	O K
240 min Winter	64.029	0.929	1.1	788.2	O K
360 min Winter	64.107	1.007	1.2	873.7	O K
480 min Winter	64.156	1.056	1.2	929.6	O K
600 min Winter	64.190	1.090	1.2	968.4	O K
720 min Winter	64.214	1.114	1.2	996.8	O K
960 min Winter	64.245	1.145	1.2	1033.5	O K
1440 min Winter	64.275	1.175	1.3	1069.3	O K
2160 min Winter	64.289	1.189	1.3	1086.1	O K
2880 min Winter	64.292	1.192	1.3	1089.5	O K
4320 min Winter	64.287	1.187	1.3	1084.2	O K
5760 min Winter	64.278	1.178	1.3	1072.5	O K
7200 min Winter	64.269	1.169	1.3	1061.8	O K
8640 min Winter	64.262	1.162	1.2	1053.5	O K
10080 min Winter	64.261	1.161	1.2	1051.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	131.136	0.0	79.0	27
30 min Winter	84.847	0.0	73.9	42
60 min Winter	52.256	0.0	155.5	72
120 min Winter	33.050	0.0	170.5	130
180 min Winter	25.036	0.0	178.7	190
240 min Winter	20.441	0.0	183.9	248
360 min Winter	15.200	0.0	190.0	366
480 min Winter	12.203	0.0	193.1	486
600 min Winter	10.231	0.0	194.6	604
720 min Winter	8.827	0.0	195.2	722
960 min Winter	6.946	0.0	194.7	958
1440 min Winter	4.903	0.0	190.6	1430
2160 min Winter	3.437	0.0	387.4	2128
2880 min Winter	2.674	0.0	380.6	2828
4320 min Winter	1.893	0.0	363.0	4196
5760 min Winter	1.495	0.0	742.4	5536
7200 min Winter	1.255	0.0	732.1	6784
8640 min Winter	1.096	0.0	718.6	7960
10080 min Winter	0.984	0.0	702.2	8176

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+20

Time Area Diagram

Total Area (ha) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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1 in 100 year return period plus 25% climate change allowance – sensitivity check

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	66.005	0.305	2.6	656.4	O K
30 min Summer	66.088	0.388	2.6	848.7	O K
60 min Summer	66.170	0.470	2.6	1043.0	O K
120 min Summer	66.282	0.582	2.6	1314.6	O K
180 min Summer	66.351	0.651	2.6	1489.1	O K
240 min Summer	66.401	0.701	2.6	1616.4	O K
360 min Summer	66.468	0.768	2.6	1792.4	O K
480 min Summer	66.511	0.811	2.6	1907.2	O K
600 min Summer	66.541	0.841	2.6	1987.0	O K
720 min Summer	66.563	0.863	2.6	2045.2	O K
960 min Summer	66.590	0.890	2.6	2120.6	O K
1440 min Summer	66.617	0.917	2.6	2193.7	Flood Risk
2160 min Summer	66.629	0.929	2.6	2227.9	Flood Risk
2880 min Summer	66.631	0.931	2.6	2234.0	Flood Risk
4320 min Summer	66.627	0.927	2.6	2220.9	Flood Risk
5760 min Summer	66.617	0.917	2.6	2193.3	Flood Risk
7200 min Summer	66.607	0.907	2.6	2167.4	Flood Risk
8640 min Summer	66.603	0.903	2.6	2155.9	Flood Risk
10080 min Summer	66.604	0.904	2.6	2159.1	Flood Risk
15 min Winter	66.005	0.305	2.6	656.4	O K
30 min Winter	66.088	0.388	2.6	848.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	216.9	27
30 min Summer	88.383	0.0	218.7	42
60 min Summer	54.434	0.0	436.1	72
120 min Summer	34.428	0.0	420.2	132
180 min Summer	26.079	0.0	397.9	192
240 min Summer	21.292	0.0	375.4	252
360 min Summer	15.833	0.0	362.2	372
480 min Summer	12.711	0.0	367.7	490
600 min Summer	10.657	0.0	372.2	610
720 min Summer	9.195	0.0	374.8	730
960 min Summer	7.235	0.0	376.4	970
1440 min Summer	5.107	0.0	373.0	1448
2160 min Summer	3.580	0.0	752.4	2168
2880 min Summer	2.785	0.0	745.1	2884
4320 min Summer	1.972	0.0	722.1	4324
5760 min Summer	1.557	0.0	1457.5	5760
7200 min Summer	1.308	0.0	1441.5	6984
8640 min Summer	1.142	0.0	1424.6	7520
10080 min Summer	1.025	0.0	1401.3	8280
15 min Winter	136.600	0.0	216.9	27
30 min Winter	88.383	0.0	218.8	42

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	66.170	0.470	2.6	1043.0	O K
120 min Winter	66.282	0.582	2.6	1314.6	O K
180 min Winter	66.351	0.651	2.6	1489.1	O K
240 min Winter	66.401	0.701	2.6	1616.5	O K
360 min Winter	66.468	0.768	2.6	1792.5	O K
480 min Winter	66.512	0.812	2.6	1907.5	O K
600 min Winter	66.541	0.841	2.6	1987.5	O K
720 min Winter	66.563	0.863	2.6	2045.9	O K
960 min Winter	66.591	0.891	2.6	2121.6	O K
1440 min Winter	66.618	0.918	2.6	2195.7	Flood Risk
2160 min Winter	66.630	0.930	2.6	2231.2	Flood Risk
2880 min Winter	66.633	0.933	2.6	2239.1	Flood Risk
4320 min Winter	66.630	0.930	2.6	2230.2	Flood Risk
5760 min Winter	66.622	0.922	2.6	2207.8	Flood Risk
7200 min Winter	66.615	0.915	2.6	2187.4	Flood Risk
8640 min Winter	66.609	0.909	2.6	2170.8	Flood Risk
10080 min Winter	66.605	0.905	2.6	2161.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	54.434	0.0	436.2	72
120 min Winter	34.428	0.0	420.4	130
180 min Winter	26.079	0.0	398.1	190
240 min Winter	21.292	0.0	375.6	248
360 min Winter	15.833	0.0	362.4	366
480 min Winter	12.711	0.0	367.9	486
600 min Winter	10.657	0.0	372.4	604
720 min Winter	9.195	0.0	374.9	722
960 min Winter	7.235	0.0	376.4	958
1440 min Winter	5.107	0.0	372.7	1430
2160 min Winter	3.580	0.0	751.9	2136
2880 min Winter	2.785	0.0	744.5	2828
4320 min Winter	1.972	0.0	721.6	4200
5760 min Winter	1.557	0.0	1457.6	5536
7200 min Winter	1.308	0.0	1442.6	6848
8640 min Winter	1.142	0.0	1427.0	8120
10080 min Winter	1.025	0.0	1405.6	9184

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	65.694	0.344	1.8	288.3	O K
30 min Summer	65.783	0.433	1.8	372.6	O K
60 min Summer	65.869	0.519	1.8	457.4	O K
120 min Summer	65.983	0.633	1.8	575.4	O K
180 min Summer	66.052	0.702	1.8	650.2	O K
240 min Summer	66.100	0.750	1.8	703.9	O K
360 min Summer	66.164	0.814	1.8	776.8	O K
480 min Summer	66.203	0.853	1.8	822.9	O K
600 min Summer	66.229	0.879	1.8	853.6	O K
720 min Summer	66.246	0.896	1.8	874.7	O K
960 min Summer	66.266	0.916	1.8	899.1	Flood Risk
1440 min Summer	66.279	0.929	1.8	914.1	Flood Risk
2160 min Summer	66.270	0.920	1.8	904.1	Flood Risk
2880 min Summer	66.253	0.903	1.8	882.9	Flood Risk
4320 min Summer	66.214	0.864	1.8	835.7	O K
5760 min Summer	66.185	0.835	1.8	801.9	O K
7200 min Summer	66.166	0.816	1.8	779.8	O K
8640 min Summer	66.154	0.804	1.8	765.6	O K
10080 min Summer	66.147	0.797	1.8	757.5	O K
15 min Winter	65.694	0.344	1.8	288.3	O K
30 min Winter	65.783	0.433	1.8	372.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	150.3	27
30 min Summer	88.383	0.0	149.2	42
60 min Summer	54.434	0.0	294.3	72
120 min Summer	34.428	0.0	271.2	132
180 min Summer	26.079	0.0	261.6	192
240 min Summer	21.292	0.0	260.0	250
360 min Summer	15.833	0.0	267.2	370
480 min Summer	12.711	0.0	273.0	490
600 min Summer	10.657	0.0	276.2	610
720 min Summer	9.195	0.0	278.0	728
960 min Summer	7.235	0.0	279.0	968
1440 min Summer	5.107	0.0	275.9	1446
2160 min Summer	3.580	0.0	542.3	2164
2880 min Summer	2.785	0.0	536.7	2880
4320 min Summer	1.972	0.0	517.5	3928
5760 min Summer	1.557	0.0	1046.6	4568
7200 min Summer	1.308	0.0	1008.7	5336
8640 min Summer	1.142	0.0	971.4	6144
10080 min Summer	1.025	0.0	942.2	6968
15 min Winter	136.600	0.0	150.3	27
30 min Winter	88.383	0.0	149.2	41

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	65.869	0.519	1.8	457.4	O K
120 min Winter	65.983	0.633	1.8	575.5	O K
180 min Winter	66.052	0.702	1.8	650.3	O K
240 min Winter	66.100	0.750	1.8	704.2	O K
360 min Winter	66.164	0.814	1.8	777.3	O K
480 min Winter	66.204	0.854	1.8	823.6	O K
600 min Winter	66.230	0.880	1.8	854.6	O K
720 min Winter	66.247	0.897	1.8	876.0	O K
960 min Winter	66.268	0.918	1.8	900.9	Flood Risk
1440 min Winter	66.281	0.931	1.8	917.0	Flood Risk
2160 min Winter	66.274	0.924	1.8	908.8	Flood Risk
2880 min Winter	66.259	0.909	1.8	889.7	Flood Risk
4320 min Winter	66.221	0.871	1.8	844.8	O K
5760 min Winter	66.185	0.835	1.8	802.2	O K
7200 min Winter	66.162	0.812	1.8	775.3	O K
8640 min Winter	66.144	0.794	1.8	754.1	O K
10080 min Winter	66.130	0.780	1.8	738.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	54.434	0.0	294.4	70
120 min Winter	34.428	0.0	271.3	130
180 min Winter	26.079	0.0	261.6	188
240 min Winter	21.292	0.0	260.0	248
360 min Winter	15.833	0.0	267.1	366
480 min Winter	12.711	0.0	272.7	484
600 min Winter	10.657	0.0	275.9	602
720 min Winter	9.195	0.0	277.5	718
960 min Winter	7.235	0.0	278.3	954
1440 min Winter	5.107	0.0	274.8	1420
2160 min Winter	3.580	0.0	540.9	2108
2880 min Winter	2.785	0.0	535.1	2792
4320 min Winter	1.972	0.0	516.3	4068
5760 min Winter	1.557	0.0	1046.9	4680
7200 min Winter	1.308	0.0	1011.5	5552
8640 min Winter	1.142	0.0	977.2	6488
10080 min Winter	1.025	0.0	950.1	7464

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	75.680	0.280	1.8	162.1	O K
30 min Summer	75.753	0.353	1.8	209.2	O K
60 min Summer	75.823	0.423	1.8	256.0	O K
120 min Summer	75.914	0.514	1.8	320.6	O K
180 min Summer	75.969	0.569	1.8	361.1	O K
240 min Summer	76.007	0.607	1.8	389.9	O K
360 min Summer	76.056	0.656	1.8	427.4	O K
480 min Summer	76.084	0.684	1.8	449.7	O K
600 min Summer	76.101	0.701	1.8	463.3	O K
720 min Summer	76.111	0.711	1.8	471.5	O K
960 min Summer	76.119	0.719	1.8	477.9	O K
1440 min Summer	76.112	0.712	1.8	472.1	O K
2160 min Summer	76.080	0.680	1.8	447.0	O K
2880 min Summer	76.048	0.648	1.8	421.9	O K
4320 min Summer	76.000	0.600	1.8	384.2	O K
5760 min Summer	75.959	0.559	1.8	353.2	O K
7200 min Summer	75.925	0.525	1.8	328.5	O K
8640 min Summer	75.899	0.499	1.8	309.5	O K
10080 min Summer	75.878	0.478	1.8	294.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	135.3	27
30 min Summer	88.383	0.0	147.5	41
60 min Summer	54.434	0.0	247.7	72
120 min Summer	34.428	0.0	288.0	130
180 min Summer	26.079	0.0	286.2	190
240 min Summer	21.292	0.0	279.2	250
360 min Summer	15.833	0.0	269.6	370
480 min Summer	12.711	0.0	263.8	488
600 min Summer	10.657	0.0	259.8	608
720 min Summer	9.195	0.0	256.8	728
960 min Summer	7.235	0.0	252.3	966
1440 min Summer	5.107	0.0	245.4	1444
2160 min Summer	3.580	0.0	523.8	2144
2880 min Summer	2.785	0.0	505.9	2452
4320 min Summer	1.972	0.0	464.6	3200
5760 min Summer	1.557	0.0	714.4	3976
7200 min Summer	1.308	0.0	749.4	4752
8640 min Summer	1.142	0.0	784.1	5536
10080 min Summer	1.025	0.0	818.0	6352

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	75.680	0.280	1.8	162.1	O K
30 min Winter	75.754	0.354	1.8	209.2	O K
60 min Winter	75.823	0.423	1.8	256.1	O K
120 min Winter	75.914	0.514	1.8	320.7	O K
180 min Winter	75.969	0.569	1.8	361.2	O K
240 min Winter	76.007	0.607	1.8	390.0	O K
360 min Winter	76.056	0.656	1.8	427.7	O K
480 min Winter	76.084	0.684	1.8	450.1	O K
600 min Winter	76.101	0.701	1.8	463.8	O K
720 min Winter	76.112	0.712	1.8	472.2	O K
960 min Winter	76.120	0.720	1.8	478.9	O K
1440 min Winter	76.114	0.714	1.8	473.9	O K
2160 min Winter	76.084	0.684	1.8	449.9	O K
2880 min Winter	76.048	0.648	1.8	421.8	O K
4320 min Winter	75.988	0.588	1.8	375.0	O K
5760 min Winter	75.929	0.529	1.8	331.4	O K
7200 min Winter	75.880	0.480	1.8	295.6	O K
8640 min Winter	75.837	0.437	1.8	265.9	O K
10080 min Winter	75.801	0.401	1.8	241.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	136.600	0.0	135.3	27
30 min Winter	88.383	0.0	147.6	41
60 min Winter	54.434	0.0	247.7	70
120 min Winter	34.428	0.0	288.0	128
180 min Winter	26.079	0.0	286.3	188
240 min Winter	21.292	0.0	279.4	246
360 min Winter	15.833	0.0	269.8	364
480 min Winter	12.711	0.0	263.9	480
600 min Winter	10.657	0.0	260.0	598
720 min Winter	9.195	0.0	256.9	714
960 min Winter	7.235	0.0	252.4	948
1440 min Winter	5.107	0.0	245.7	1404
2160 min Winter	3.580	0.0	525.0	2064
2880 min Winter	2.785	0.0	509.0	2684
4320 min Winter	1.972	0.0	473.8	3332
5760 min Winter	1.557	0.0	714.5	4200
7200 min Winter	1.308	0.0	749.7	5040
8640 min Winter	1.142	0.0	784.8	5872
10080 min Winter	1.025	0.0	819.6	6656

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1.043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	58.295	0.295	2.2	581.7	O K
30 min Summer	58.376	0.376	2.2	752.0	O K
60 min Summer	58.456	0.456	2.2	924.3	O K
120 min Summer	58.564	0.564	2.2	1165.0	O K
180 min Summer	58.631	0.631	2.2	1319.9	O K
240 min Summer	58.679	0.679	2.2	1432.8	O K
360 min Summer	58.744	0.744	2.2	1588.7	O K
480 min Summer	58.786	0.786	2.2	1690.6	O K
600 min Summer	58.815	0.815	2.2	1761.5	O K
720 min Summer	58.836	0.836	2.2	1813.3	O K
960 min Summer	58.863	0.863	2.2	1880.4	O K
1440 min Summer	58.889	0.889	2.2	1945.9	O K
2160 min Summer	58.901	0.901	2.2	1977.3	Flood Risk
2880 min Summer	58.904	0.904	2.2	1983.8	Flood Risk
4320 min Summer	58.900	0.900	2.2	1974.3	O K
5760 min Summer	58.891	0.891	2.2	1951.7	O K
7200 min Summer	58.882	0.882	2.2	1930.3	O K
8640 min Summer	58.879	0.879	2.2	1920.7	O K
10080 min Summer	58.880	0.880	2.2	1924.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	187.8	27
30 min Summer	88.383	0.0	188.8	42
60 min Summer	54.434	0.0	376.0	72
120 min Summer	34.428	0.0	360.1	132
180 min Summer	26.079	0.0	337.5	192
240 min Summer	21.292	0.0	320.1	252
360 min Summer	15.833	0.0	315.5	372
480 min Summer	12.711	0.0	322.1	490
600 min Summer	10.657	0.0	326.0	610
720 min Summer	9.195	0.0	328.2	730
960 min Summer	7.235	0.0	329.5	970
1440 min Summer	5.107	0.0	326.3	1448
2160 min Summer	3.580	0.0	658.9	2168
2880 min Summer	2.785	0.0	652.2	2888
4320 min Summer	1.972	0.0	631.5	4324
5760 min Summer	1.557	0.0	1273.2	5760
7200 min Summer	1.308	0.0	1262.8	6992
8640 min Summer	1.142	0.0	1247.5	7528
10080 min Summer	1.025	0.0	1226.8	8368

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	58.295	0.295	2.2	581.7	O K
30 min Winter	58.376	0.376	2.2	752.0	O K
60 min Winter	58.456	0.456	2.2	924.2	O K
120 min Winter	58.564	0.564	2.2	1165.1	O K
180 min Winter	58.631	0.631	2.2	1320.0	O K
240 min Winter	58.679	0.679	2.2	1432.8	O K
360 min Winter	58.744	0.744	2.2	1588.9	O K
480 min Winter	58.786	0.786	2.2	1690.9	O K
600 min Winter	58.815	0.815	2.2	1762.0	O K
720 min Winter	58.836	0.836	2.2	1813.9	O K
960 min Winter	58.863	0.863	2.2	1881.4	O K
1440 min Winter	58.889	0.889	2.2	1947.8	O K
2160 min Winter	58.902	0.902	2.2	1980.5	Flood Risk
2880 min Winter	58.905	0.905	2.2	1988.6	Flood Risk
4320 min Winter	58.903	0.903	2.2	1982.9	Flood Risk
5760 min Winter	58.896	0.896	2.2	1965.0	O K
7200 min Winter	58.890	0.890	2.2	1948.9	O K
8640 min Winter	58.885	0.885	2.2	1936.0	O K
10080 min Winter	58.882	0.882	2.2	1929.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	136.600	0.0	187.8	27
30 min Winter	88.383	0.0	188.8	42
60 min Winter	54.434	0.0	376.0	72
120 min Winter	34.428	0.0	360.2	130
180 min Winter	26.079	0.0	337.6	190
240 min Winter	21.292	0.0	320.3	248
360 min Winter	15.833	0.0	315.7	366
480 min Winter	12.711	0.0	322.3	486
600 min Winter	10.657	0.0	326.1	604
720 min Winter	9.195	0.0	328.2	722
960 min Winter	7.235	0.0	329.4	958
1440 min Winter	5.107	0.0	325.9	1430
2160 min Winter	3.580	0.0	658.2	2136
2880 min Winter	2.785	0.0	651.3	2828
4320 min Winter	1.972	0.0	630.5	4200
5760 min Winter	1.557	0.0	1272.5	5544
7200 min Winter	1.308	0.0	1262.8	6848
8640 min Winter	1.142	0.0	1248.4	8128
10080 min Winter	1.025	0.0	1228.9	9272

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	62.536	0.436	1.5	469.6	O K
30 min Summer	62.649	0.549	1.5	607.4	O K
60 min Summer	62.757	0.657	1.5	746.8	O K
120 min Summer	62.900	0.800	1.5	941.2	O K
180 min Summer	62.987	0.887	1.5	1066.0	O K
240 min Summer	63.049	0.949	1.5	1156.7	O K
360 min Summer	63.132	1.032	1.6	1282.5	O K
480 min Summer	63.184	1.084	1.6	1364.7	O K
600 min Summer	63.221	1.121	1.7	1422.1	O K
720 min Summer	63.247	1.147	1.7	1463.9	O K
960 min Summer	63.280	1.180	1.7	1518.3	O K
1440 min Summer	63.312	1.212	1.7	1571.8	Flood Risk
2160 min Summer	63.328	1.228	1.7	1597.9	Flood Risk
2880 min Summer	63.332	1.232	1.7	1603.8	Flood Risk
4320 min Summer	63.328	1.228	1.7	1597.3	Flood Risk
5760 min Summer	63.317	1.217	1.7	1580.0	Flood Risk
7200 min Summer	63.308	1.208	1.7	1564.0	Flood Risk
8640 min Summer	63.305	1.205	1.7	1558.8	Flood Risk
10080 min Summer	63.308	1.208	1.7	1563.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	121.1	27
30 min Summer	88.383	0.0	107.1	42
60 min Summer	54.434	0.0	214.1	72
120 min Summer	34.428	0.0	232.8	132
180 min Summer	26.079	0.0	244.3	192
240 min Summer	21.292	0.0	251.8	252
360 min Summer	15.833	0.0	260.8	372
480 min Summer	12.711	0.0	265.6	490
600 min Summer	10.657	0.0	268.1	610
720 min Summer	9.195	0.0	269.3	730
960 min Summer	7.235	0.0	269.3	970
1440 min Summer	5.107	0.0	264.9	1448
2160 min Summer	3.580	0.0	537.5	2168
2880 min Summer	2.785	0.0	529.7	2884
4320 min Summer	1.972	0.0	508.6	4324
5760 min Summer	1.557	0.0	1035.8	5760
7200 min Summer	1.308	0.0	1023.8	6848
8640 min Summer	1.142	0.0	1007.3	7440
10080 min Summer	1.025	0.0	986.5	8272

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	62.536	0.436	1.5	469.6	O K
30 min Winter	62.649	0.549	1.5	607.4	O K
60 min Winter	62.757	0.657	1.5	746.7	O K
120 min Winter	62.900	0.800	1.5	941.4	O K
180 min Winter	62.988	0.888	1.5	1066.2	O K
240 min Winter	63.049	0.949	1.5	1157.2	O K
360 min Winter	63.132	1.032	1.6	1283.2	O K
480 min Winter	63.185	1.085	1.6	1365.7	O K
600 min Winter	63.221	1.121	1.7	1423.3	O K
720 min Winter	63.248	1.148	1.7	1465.5	O K
960 min Winter	63.281	1.181	1.7	1520.4	O K
1440 min Winter	63.314	1.214	1.7	1575.1	Flood Risk
2160 min Winter	63.331	1.231	1.7	1602.9	Flood Risk
2880 min Winter	63.336	1.236	1.7	1611.0	Flood Risk
4320 min Winter	63.335	1.235	1.7	1609.3	Flood Risk
5760 min Winter	63.328	1.228	1.7	1597.6	Flood Risk
7200 min Winter	63.322	1.222	1.7	1587.2	Flood Risk
8640 min Winter	63.317	1.217	1.7	1579.2	Flood Risk
10080 min Winter	63.315	1.215	1.7	1576.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	136.600	0.0	121.1	27
30 min Winter	88.383	0.0	107.2	42
60 min Winter	54.434	0.0	214.2	72
120 min Winter	34.428	0.0	232.7	130
180 min Winter	26.079	0.0	244.2	190
240 min Winter	21.292	0.0	251.6	248
360 min Winter	15.833	0.0	260.4	366
480 min Winter	12.711	0.0	265.0	486
600 min Winter	10.657	0.0	267.3	604
720 min Winter	9.195	0.0	268.4	722
960 min Winter	7.235	0.0	268.0	958
1440 min Winter	5.107	0.0	262.9	1430
2160 min Winter	3.580	0.0	534.8	2136
2880 min Winter	2.785	0.0	526.1	2828
4320 min Winter	1.972	0.0	503.2	4200
5760 min Winter	1.557	0.0	1029.9	5536
7200 min Winter	1.308	0.0	1016.8	6848
8640 min Winter	1.142	0.0	999.3	8056
10080 min Winter	1.025	0.0	978.0	9168

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	63.412	0.312	0.7	251.9	O K
30 min Summer	63.494	0.394	0.7	325.8	O K
60 min Summer	63.574	0.474	0.7	400.6	O K
120 min Summer	63.681	0.581	0.7	505.0	O K
180 min Summer	63.746	0.646	0.8	572.0	O K
240 min Summer	63.792	0.692	0.8	620.9	O K
360 min Summer	63.855	0.755	0.8	688.6	O K
480 min Summer	63.895	0.795	0.8	733.0	O K
600 min Summer	63.922	0.822	0.8	764.0	O K
720 min Summer	63.942	0.842	0.9	786.8	O K
960 min Summer	63.968	0.868	0.9	816.5	O K
1440 min Summer	63.994	0.894	0.9	846.4	O K
2160 min Summer	64.007	0.907	0.9	862.1	Flood Risk
2880 min Summer	64.011	0.911	0.9	866.9	Flood Risk
4320 min Summer	64.011	0.911	0.9	866.7	Flood Risk
5760 min Summer	64.006	0.906	0.9	860.5	Flood Risk
7200 min Summer	64.001	0.901	0.9	854.4	Flood Risk
8640 min Summer	63.999	0.899	0.9	852.3	O K
10080 min Summer	64.002	0.902	0.9	856.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	62.6	27
30 min Summer	88.383	0.0	57.3	42
60 min Summer	54.434	0.0	110.8	72
120 min Summer	34.428	0.0	118.7	132
180 min Summer	26.079	0.0	124.5	192
240 min Summer	21.292	0.0	128.3	252
360 min Summer	15.833	0.0	132.9	372
480 min Summer	12.711	0.0	135.3	490
600 min Summer	10.657	0.0	136.5	610
720 min Summer	9.195	0.0	137.1	730
960 min Summer	7.235	0.0	137.1	970
1440 min Summer	5.107	0.0	134.8	1448
2160 min Summer	3.580	0.0	274.1	2168
2880 min Summer	2.785	0.0	270.0	2888
4320 min Summer	1.972	0.0	259.0	4324
5760 min Summer	1.557	0.0	530.0	5760
7200 min Summer	1.308	0.0	523.6	7128
8640 min Summer	1.142	0.0	514.9	7696
10080 min Summer	1.025	0.0	504.2	8472

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	63.412	0.312	0.7	251.9	O K
30 min Winter	63.494	0.394	0.7	325.8	O K
60 min Winter	63.574	0.474	0.7	400.6	O K
120 min Winter	63.681	0.581	0.7	505.1	O K
180 min Winter	63.746	0.646	0.8	572.2	O K
240 min Winter	63.792	0.692	0.8	621.1	O K
360 min Winter	63.855	0.755	0.8	688.9	O K
480 min Winter	63.895	0.795	0.8	733.5	O K
600 min Winter	63.923	0.823	0.8	764.6	O K
720 min Winter	63.943	0.843	0.9	787.5	O K
960 min Winter	63.969	0.869	0.9	817.5	O K
1440 min Winter	63.995	0.895	0.9	847.9	O K
2160 min Winter	64.009	0.909	0.9	864.5	Flood Risk
2880 min Winter	64.014	0.914	0.9	870.4	Flood Risk
4320 min Winter	64.016	0.916	0.9	872.5	Flood Risk
5760 min Winter	64.013	0.913	0.9	869.0	Flood Risk
7200 min Winter	64.011	0.911	0.9	866.0	Flood Risk
8640 min Winter	64.009	0.909	0.9	864.2	Flood Risk
10080 min Winter	64.009	0.909	0.9	864.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	136.600	0.0	62.7	27
30 min Winter	88.383	0.0	57.3	42
60 min Winter	54.434	0.0	110.8	72
120 min Winter	34.428	0.0	118.7	130
180 min Winter	26.079	0.0	124.5	190
240 min Winter	21.292	0.0	128.2	248
360 min Winter	15.833	0.0	132.7	366
480 min Winter	12.711	0.0	135.0	486
600 min Winter	10.657	0.0	136.2	604
720 min Winter	9.195	0.0	136.7	722
960 min Winter	7.235	0.0	136.5	960
1440 min Winter	5.107	0.0	133.9	1432
2160 min Winter	3.580	0.0	272.8	2140
2880 min Winter	2.785	0.0	268.3	2832
4320 min Winter	1.972	0.0	256.4	4200
5760 min Winter	1.557	0.0	527.1	5544
7200 min Winter	1.308	0.0	520.1	6856
8640 min Winter	1.142	0.0	511.0	8128
10080 min Winter	1.025	0.0	499.9	9280

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	63.552	0.452	1.0	333.6	O K
30 min Summer	63.665	0.565	1.0	431.3	O K
60 min Summer	63.773	0.673	1.0	530.2	O K
120 min Summer	63.914	0.814	1.1	668.2	O K
180 min Summer	63.999	0.899	1.1	756.6	O K
240 min Summer	64.059	0.959	1.1	821.0	O K
360 min Summer	64.139	1.039	1.2	910.1	O K
480 min Summer	64.190	1.090	1.2	968.3	O K
600 min Summer	64.224	1.124	1.2	1008.8	O K
720 min Summer	64.249	1.149	1.2	1038.4	O K
960 min Summer	64.281	1.181	1.3	1076.6	O K
1440 min Summer	64.312	1.212	1.3	1113.8	Flood Risk
2160 min Summer	64.326	1.226	1.3	1131.2	Flood Risk
2880 min Summer	64.328	1.228	1.3	1134.3	Flood Risk
4320 min Summer	64.323	1.223	1.3	1127.4	Flood Risk
5760 min Summer	64.311	1.211	1.3	1112.9	Flood Risk
7200 min Summer	64.301	1.201	1.3	1100.5	Flood Risk
8640 min Summer	64.298	1.198	1.3	1096.8	O K
10080 min Summer	64.300	1.200	1.3	1100.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.600	0.0	77.1	27
30 min Summer	88.383	0.0	75.1	42
60 min Summer	54.434	0.0	158.2	72
120 min Summer	34.428	0.0	173.4	132
180 min Summer	26.079	0.0	181.7	192
240 min Summer	21.292	0.0	186.9	252
360 min Summer	15.833	0.0	193.2	370
480 min Summer	12.711	0.0	196.4	490
600 min Summer	10.657	0.0	198.1	610
720 min Summer	9.195	0.0	198.8	730
960 min Summer	7.235	0.0	198.4	970
1440 min Summer	5.107	0.0	194.7	1448
2160 min Summer	3.580	0.0	395.4	2168
2880 min Summer	2.785	0.0	388.9	2884
4320 min Summer	1.972	0.0	372.1	4324
5760 min Summer	1.557	0.0	759.6	5760
7200 min Summer	1.308	0.0	749.6	6704
8640 min Summer	1.142	0.0	736.4	7352
10080 min Summer	1.025	0.0	720.0	8072

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Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	63.552	0.452	1.0	333.6	O K
30 min Winter	63.665	0.565	1.0	431.3	O K
60 min Winter	63.773	0.673	1.0	530.2	O K
120 min Winter	63.914	0.814	1.1	668.3	O K
180 min Winter	63.999	0.899	1.1	756.9	O K
240 min Winter	64.059	0.959	1.1	821.4	O K
360 min Winter	64.140	1.040	1.2	910.7	O K
480 min Winter	64.190	1.090	1.2	969.1	O K
600 min Winter	64.225	1.125	1.2	1009.8	O K
720 min Winter	64.250	1.150	1.2	1039.6	O K
960 min Winter	64.282	1.182	1.3	1078.2	O K
1440 min Winter	64.314	1.214	1.3	1116.3	Flood Risk
2160 min Winter	64.329	1.229	1.3	1135.0	Flood Risk
2880 min Winter	64.333	1.233	1.3	1139.7	Flood Risk
4320 min Winter	64.330	1.230	1.3	1136.5	Flood Risk
5760 min Winter	64.322	1.222	1.3	1126.3	Flood Risk
7200 min Winter	64.314	1.214	1.3	1117.1	Flood Risk
8640 min Winter	64.309	1.209	1.3	1110.0	Flood Risk
10080 min Winter	64.307	1.207	1.3	1108.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	136.600	0.0	77.1	27
30 min Winter	88.383	0.0	75.1	42
60 min Winter	54.434	0.0	158.2	72
120 min Winter	34.428	0.0	173.3	130
180 min Winter	26.079	0.0	181.5	190
240 min Winter	21.292	0.0	186.8	248
360 min Winter	15.833	0.0	192.9	366
480 min Winter	12.711	0.0	196.0	486
600 min Winter	10.657	0.0	197.5	604
720 min Winter	9.195	0.0	198.0	722
960 min Winter	7.235	0.0	197.5	958
1440 min Winter	5.107	0.0	193.2	1430
2160 min Winter	3.580	0.0	393.3	2128
2880 min Winter	2.785	0.0	386.2	2828
4320 min Winter	1.972	0.0	368.1	4196
5760 min Winter	1.557	0.0	755.1	5536
7200 min Winter	1.308	0.0	744.3	6840
8640 min Winter	1.142	0.0	730.3	8040
10080 min Winter	1.025	0.0	713.4	8272

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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 %	+25

Time Area Diagram

Total Area (ha) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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1 in 100 year return period plus 40% climate change allowance

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

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	66.039	0.339	2.6	735.5	O K
30 min Summer	66.132	0.432	2.6	950.9	O K
60 min Summer	66.222	0.522	2.6	1169.0	O K
120 min Summer	66.345	0.645	2.6	1474.1	O K
180 min Summer	66.422	0.722	2.6	1670.4	O K
240 min Summer	66.476	0.776	2.6	1813.3	O K
360 min Summer	66.550	0.850	2.6	2011.1	O K
480 min Summer	66.598	0.898	2.6	2140.8	O K
600 min Summer	66.630	0.930	2.6	2231.3	Flood Risk
720 min Summer	66.654	0.954	2.6	2297.6	Flood Risk
960 min Summer	66.685	0.985	2.6	2384.3	Flood Risk
1440 min Summer	66.716	1.016	2.6	2470.8	Flood Risk
2160 min Summer	66.732	1.032	2.6	2515.9	Flood Risk
2880 min Summer	66.736	1.036	2.6	2529.3	Flood Risk
4320 min Summer	66.736	1.036	2.6	2527.4	Flood Risk
5760 min Summer	66.729	1.029	2.6	2508.3	Flood Risk
7200 min Summer	66.722	1.022	2.6	2489.6	Flood Risk
8640 min Summer	66.719	1.019	2.6	2480.0	Flood Risk
10080 min Summer	66.722	1.022	2.6	2488.0	Flood Risk
15 min Winter	66.039	0.339	2.6	735.5	O K
30 min Winter	66.132	0.432	2.6	950.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	218.9	27
30 min Summer	98.988	0.0	218.0	42
60 min Summer	60.966	0.0	431.9	72
120 min Summer	38.559	0.0	402.4	132
180 min Summer	29.209	0.0	371.3	192
240 min Summer	23.847	0.0	364.8	252
360 min Summer	17.733	0.0	377.2	372
480 min Summer	14.237	0.0	385.2	490
600 min Summer	11.936	0.0	389.8	610
720 min Summer	10.299	0.0	392.4	730
960 min Summer	8.103	0.0	393.8	970
1440 min Summer	5.720	0.0	389.7	1448
2160 min Summer	4.009	0.0	789.0	2168
2880 min Summer	3.120	0.0	780.6	2888
4320 min Summer	2.209	0.0	755.3	4324
5760 min Summer	1.744	0.0	1529.8	5760
7200 min Summer	1.465	0.0	1517.7	7200
8640 min Summer	1.279	0.0	1498.8	7872
10080 min Summer	1.148	0.0	1473.8	8568
15 min Winter	152.992	0.0	218.9	27
30 min Winter	98.988	0.0	218.1	42

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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	66.222	0.522	2.6	1168.9	O K
120 min Winter	66.345	0.645	2.6	1474.2	O K
180 min Winter	66.422	0.722	2.6	1670.5	O K
240 min Winter	66.476	0.776	2.6	1813.4	O K
360 min Winter	66.550	0.850	2.6	2011.4	O K
480 min Winter	66.598	0.898	2.6	2141.3	O K
600 min Winter	66.631	0.931	2.6	2232.1	Flood Risk
720 min Winter	66.655	0.955	2.6	2298.7	Flood Risk
960 min Winter	66.686	0.986	2.6	2385.9	Flood Risk
1440 min Winter	66.717	1.017	2.6	2473.6	Flood Risk
2160 min Winter	66.733	1.033	2.6	2520.5	Flood Risk
2880 min Winter	66.739	1.039	2.6	2536.1	Flood Risk
4320 min Winter	66.740	1.040	2.6	2539.2	Flood Risk
5760 min Winter	66.735	1.035	2.6	2526.3	Flood Risk
7200 min Winter	66.731	1.031	2.6	2514.9	Flood Risk
8640 min Winter	66.729	1.029	2.6	2507.0	Flood Risk
10080 min Winter	66.728	1.028	2.6	2505.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	60.966	0.0	432.0	72
120 min Winter	38.559	0.0	402.5	130
180 min Winter	29.209	0.0	371.4	190
240 min Winter	23.847	0.0	364.9	248
360 min Winter	17.733	0.0	377.3	368
480 min Winter	14.237	0.0	385.2	486
600 min Winter	11.936	0.0	389.7	604
720 min Winter	10.299	0.0	392.1	722
960 min Winter	8.103	0.0	393.2	960
1440 min Winter	5.720	0.0	388.6	1432
2160 min Winter	4.009	0.0	787.3	2140
2880 min Winter	3.120	0.0	778.4	2832
4320 min Winter	2.209	0.0	752.2	4204
5760 min Winter	1.744	0.0	1526.7	5584
7200 min Winter	1.465	0.0	1514.4	6912
8640 min Winter	1.279	0.0	1495.7	8136
10080 min Winter	1.148	0.0	1471.2	9376

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.930

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.643	4	8	0.643	8	12	0.643

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Model Details

Storage is Online Cover Level (m) 66.900

Tank or Pond Structure

Invert Level (m) 65.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2043.0	1.200	3003.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	65.700
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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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	65.731	0.381	1.8	323.2	O K
30 min Summer	65.829	0.479	1.8	417.7	O K
60 min Summer	65.923	0.573	1.8	513.0	O K
120 min Summer	66.047	0.697	1.8	645.4	O K
180 min Summer	66.123	0.773	1.8	729.4	O K
240 min Summer	66.175	0.825	1.8	790.0	O K
360 min Summer	66.244	0.894	1.8	872.6	O K
480 min Summer	66.288	0.938	1.8	925.1	Flood Risk
600 min Summer	66.316	0.966	1.8	960.3	Flood Risk
720 min Summer	66.336	0.986	1.8	984.9	Flood Risk
960 min Summer	66.359	1.009	1.8	1013.9	Flood Risk
1440 min Summer	66.374	1.024	1.9	1034.1	Flood Risk
2160 min Summer	66.369	1.019	1.9	1027.8	Flood Risk
2880 min Summer	66.354	1.004	1.8	1008.6	Flood Risk
4320 min Summer	66.317	0.967	1.8	961.5	Flood Risk
5760 min Summer	66.288	0.938	1.8	925.6	Flood Risk
7200 min Summer	66.269	0.919	1.8	902.8	Flood Risk
8640 min Summer	66.258	0.908	1.8	888.8	Flood Risk
10080 min Summer	66.252	0.902	1.8	882.0	Flood Risk
15 min Winter	65.731	0.381	1.8	323.1	O K
30 min Winter	65.829	0.479	1.8	417.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	150.7	27
30 min Summer	98.988	0.0	146.9	42
60 min Summer	60.966	0.0	285.3	72
120 min Summer	38.559	0.0	263.1	132
180 min Summer	29.209	0.0	262.2	192
240 min Summer	23.847	0.0	269.5	250
360 min Summer	17.733	0.0	280.1	370
480 min Summer	14.237	0.0	285.9	490
600 min Summer	11.936	0.0	289.1	610
720 min Summer	10.299	0.0	290.9	730
960 min Summer	8.103	0.0	291.6	968
1440 min Summer	5.720	0.0	288.1	1446
2160 min Summer	4.009	0.0	569.7	2164
2880 min Summer	3.120	0.0	563.3	2884
4320 min Summer	2.209	0.0	542.7	4108
5760 min Summer	1.744	0.0	1069.3	4728
7200 min Summer	1.465	0.0	1041.5	5480
8640 min Summer	1.279	0.0	1021.5	6240
10080 min Summer	1.148	0.0	998.9	7064
15 min Winter	152.992	0.0	150.8	27
30 min Winter	98.988	0.0	146.9	41

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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	65.923	0.573	1.8	513.0	O K
120 min Winter	66.048	0.698	1.8	645.5	O K
180 min Winter	66.123	0.773	1.8	729.7	O K
240 min Winter	66.175	0.825	1.8	790.4	O K
360 min Winter	66.245	0.895	1.8	873.2	O K
480 min Winter	66.288	0.938	1.8	926.0	Flood Risk
600 min Winter	66.317	0.967	1.8	961.5	Flood Risk
720 min Winter	66.337	0.987	1.8	986.4	Flood Risk
960 min Winter	66.360	1.010	1.8	1016.1	Flood Risk
1440 min Winter	66.377	1.027	1.9	1037.5	Flood Risk
2160 min Winter	66.374	1.024	1.9	1033.3	Flood Risk
2880 min Winter	66.361	1.011	1.8	1016.4	Flood Risk
4320 min Winter	66.327	0.977	1.8	974.0	Flood Risk
5760 min Winter	66.292	0.942	1.8	930.4	Flood Risk
7200 min Winter	66.269	0.919	1.8	902.8	Flood Risk
8640 min Winter	66.253	0.903	1.8	883.3	Flood Risk
10080 min Winter	66.242	0.892	1.8	869.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	60.966	0.0	285.3	72
120 min Winter	38.559	0.0	263.2	130
180 min Winter	29.209	0.0	262.1	188
240 min Winter	23.847	0.0	269.5	248
360 min Winter	17.733	0.0	279.9	366
480 min Winter	14.237	0.0	285.5	484
600 min Winter	11.936	0.0	288.5	602
720 min Winter	10.299	0.0	290.1	720
960 min Winter	8.103	0.0	290.6	954
1440 min Winter	5.720	0.0	286.5	1422
2160 min Winter	4.009	0.0	567.7	2120
2880 min Winter	3.120	0.0	560.8	2796
4320 min Winter	2.209	0.0	539.9	4108
5760 min Winter	1.744	0.0	1067.1	5248
7200 min Winter	1.465	0.0	1040.9	5632
8640 min Winter	1.279	0.0	1022.8	6576
10080 min Winter	1.148	0.0	1002.7	7560

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.850

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.283	4	8	0.283	8	12	0.283

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Model Details

Storage is Online Cover Level (m) 66.550

Tank or Pond Structure

Invert Level (m) 65.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	761.0	1.200	1383.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	65.350
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0
Flush-Flo™	0.282	1.8
Kick-Flo®	0.573	1.4
Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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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	75.711	0.311	1.8	181.7	O K
30 min Summer	75.792	0.392	1.8	234.6	O K
60 min Summer	75.868	0.468	1.8	287.3	O K
120 min Summer	75.968	0.568	1.8	360.3	O K
180 min Summer	76.028	0.628	1.8	406.2	O K
240 min Summer	76.070	0.670	1.8	438.5	O K
360 min Summer	76.123	0.723	1.8	481.2	O K
480 min Summer	76.154	0.754	1.8	506.9	O K
600 min Summer	76.173	0.773	1.8	522.9	O K
720 min Summer	76.185	0.785	1.8	532.9	O K
960 min Summer	76.195	0.795	1.8	541.5	O K
1440 min Summer	76.191	0.791	1.8	538.1	O K
2160 min Summer	76.162	0.762	1.8	513.9	O K
2880 min Summer	76.130	0.730	1.8	487.0	O K
4320 min Summer	76.082	0.682	1.8	448.2	O K
5760 min Summer	76.046	0.646	1.8	419.7	O K
7200 min Summer	76.018	0.618	1.8	398.2	O K
8640 min Summer	75.995	0.595	1.8	380.8	O K
10080 min Summer	75.976	0.576	1.8	366.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	143.1	27
30 min Summer	98.988	0.0	149.3	42
60 min Summer	60.966	0.0	271.9	72
120 min Summer	38.559	0.0	287.7	130
180 min Summer	29.209	0.0	278.0	190
240 min Summer	23.847	0.0	271.3	250
360 min Summer	17.733	0.0	264.1	370
480 min Summer	14.237	0.0	260.7	488
600 min Summer	11.936	0.0	259.2	608
720 min Summer	10.299	0.0	258.6	728
960 min Summer	8.103	0.0	258.4	966
1440 min Summer	5.720	0.0	256.1	1444
2160 min Summer	4.009	0.0	524.5	2160
2880 min Summer	3.120	0.0	507.0	2512
4320 min Summer	2.209	0.0	469.3	3248
5760 min Summer	1.744	0.0	799.3	4040
7200 min Summer	1.465	0.0	837.3	4904
8640 min Summer	1.279	0.0	872.5	5712
10080 min Summer	1.148	0.0	887.7	6560

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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 Winter	75.711	0.311	1.8	181.7	O K
30 min Winter	75.792	0.392	1.8	234.6	O K
60 min Winter	75.868	0.468	1.8	287.4	O K
120 min Winter	75.968	0.568	1.8	360.4	O K
180 min Winter	76.028	0.628	1.8	406.3	O K
240 min Winter	76.070	0.670	1.8	438.7	O K
360 min Winter	76.123	0.723	1.8	481.6	O K
480 min Winter	76.155	0.755	1.8	507.5	O K
600 min Winter	76.174	0.774	1.8	523.7	O K
720 min Winter	76.186	0.786	1.8	533.9	O K
960 min Winter	76.197	0.797	1.8	543.0	O K
1440 min Winter	76.194	0.794	1.8	540.4	O K
2160 min Winter	76.167	0.767	1.8	517.8	O K
2880 min Winter	76.134	0.734	1.8	490.2	O K
4320 min Winter	76.075	0.675	1.8	443.1	O K
5760 min Winter	76.027	0.627	1.8	405.5	O K
7200 min Winter	75.984	0.584	1.8	372.0	O K
8640 min Winter	75.939	0.539	1.8	338.5	O K
10080 min Winter	75.901	0.501	1.8	310.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	152.992	0.0	143.1	27
30 min Winter	98.988	0.0	149.3	41
60 min Winter	60.966	0.0	271.9	70
120 min Winter	38.559	0.0	287.7	130
180 min Winter	29.209	0.0	278.1	188
240 min Winter	23.847	0.0	271.4	246
360 min Winter	17.733	0.0	264.1	364
480 min Winter	14.237	0.0	260.7	482
600 min Winter	11.936	0.0	259.1	598
720 min Winter	10.299	0.0	258.4	716
960 min Winter	8.103	0.0	258.1	948
1440 min Winter	5.720	0.0	255.8	1406
2160 min Winter	4.009	0.0	524.5	2076
2880 min Winter	3.120	0.0	508.0	2712
4320 min Winter	2.209	0.0	473.9	3376
5760 min Winter	1.744	0.0	799.5	4320
7200 min Winter	1.465	0.0	838.0	5256
8640 min Winter	1.279	0.0	876.0	6056
10080 min Winter	1.148	0.0	909.3	6864

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.480

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.160	4	8	0.160	8	12	0.160

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Model Details

Storage is Online Cover Level (m) 76.600

Tank or Pond Structure

Invert Level (m) 75.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	526.0	1.200	1.043.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0064-2000-1200-2000
Design Head (m)	1.200
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	75.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.0	Kick-Flo®	0.573	1.4
Flush-Flo™	0.282	1.8	Mean Flow over Head Range	-	1.6

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	5.0
0.500	1.6	2.000	2.5	5.000	3.9	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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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	58.329	0.329	2.2	651.7	O K
30 min Summer	58.418	0.418	2.2	842.6	O K
60 min Summer	58.506	0.506	2.2	1035.9	O K
120 min Summer	58.625	0.625	2.2	1306.5	O K
180 min Summer	58.699	0.699	2.2	1480.4	O K
240 min Summer	58.752	0.752	2.2	1607.0	O K
360 min Summer	58.823	0.823	2.2	1782.5	O K
480 min Summer	58.869	0.869	2.2	1897.5	O K
600 min Summer	58.901	0.901	2.2	1977.9	Flood Risk
720 min Summer	58.924	0.924	2.2	2036.8	Flood Risk
960 min Summer	58.954	0.954	2.2	2114.0	Flood Risk
1440 min Summer	58.984	0.984	2.2	2191.5	Flood Risk
2160 min Summer	59.000	1.000	2.2	2232.5	Flood Risk
2880 min Summer	59.005	1.005	2.2	2245.5	Flood Risk
4320 min Summer	59.005	1.005	2.2	2246.0	Flood Risk
5760 min Summer	58.999	0.999	2.2	2231.1	Flood Risk
7200 min Summer	58.994	0.994	2.2	2216.5	Flood Risk
8640 min Summer	58.991	0.991	2.2	2208.8	Flood Risk
10080 min Summer	58.994	0.994	2.2	2216.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	189.2	27
30 min Summer	98.988	0.0	187.9	42
60 min Summer	60.966	0.0	371.5	72
120 min Summer	38.559	0.0	341.7	132
180 min Summer	29.209	0.0	318.1	192
240 min Summer	23.847	0.0	318.1	252
360 min Summer	17.733	0.0	330.5	372
480 min Summer	14.237	0.0	337.4	490
600 min Summer	11.936	0.0	341.4	610
720 min Summer	10.299	0.0	343.6	730
960 min Summer	8.103	0.0	344.7	970
1440 min Summer	5.720	0.0	340.9	1448
2160 min Summer	4.009	0.0	690.8	2168
2880 min Summer	3.120	0.0	683.2	2888
4320 min Summer	2.209	0.0	660.6	4324
5760 min Summer	1.744	0.0	1340.4	5760
7200 min Summer	1.465	0.0	1329.2	7200
8640 min Summer	1.279	0.0	1312.3	7872
10080 min Summer	1.148	0.0	1289.9	8576

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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 Winter	58.329	0.329	2.2	651.7	O K
30 min Winter	58.418	0.418	2.2	842.6	O K
60 min Winter	58.506	0.506	2.2	1035.9	O K
120 min Winter	58.625	0.625	2.2	1306.5	O K
180 min Winter	58.699	0.699	2.2	1480.5	O K
240 min Winter	58.752	0.752	2.2	1607.1	O K
360 min Winter	58.824	0.824	2.2	1782.8	O K
480 min Winter	58.870	0.870	2.2	1898.1	O K
600 min Winter	58.902	0.902	2.2	1978.7	Flood Risk
720 min Winter	58.925	0.925	2.2	2037.9	Flood Risk
960 min Winter	58.955	0.955	2.2	2115.6	Flood Risk
1440 min Winter	58.985	0.985	2.2	2194.1	Flood Risk
2160 min Winter	59.002	1.002	2.2	2236.8	Flood Risk
2880 min Winter	59.007	1.007	2.2	2251.8	Flood Risk
4320 min Winter	59.009	1.009	2.2	2256.8	Flood Risk
5760 min Winter	59.006	1.006	2.2	2247.5	Flood Risk
7200 min Winter	59.003	1.003	2.2	2239.4	Flood Risk
8640 min Winter	59.001	1.001	2.2	2234.1	Flood Risk
10080 min Winter	59.001	1.001	2.2	2234.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	152.992	0.0	189.2	27
30 min Winter	98.988	0.0	188.0	42
60 min Winter	60.966	0.0	371.6	72
120 min Winter	38.559	0.0	341.8	130
180 min Winter	29.209	0.0	318.3	190
240 min Winter	23.847	0.0	318.2	248
360 min Winter	17.733	0.0	330.5	368
480 min Winter	14.237	0.0	337.3	486
600 min Winter	11.936	0.0	341.2	604
720 min Winter	10.299	0.0	343.2	722
960 min Winter	8.103	0.0	344.1	960
1440 min Winter	5.720	0.0	339.8	1432
2160 min Winter	4.009	0.0	689.1	2140
2880 min Winter	3.120	0.0	681.0	2832
4320 min Winter	2.209	0.0	657.3	4204
5760 min Winter	1.744	0.0	1337.1	5584
7200 min Winter	1.465	0.0	1325.6	6912
8640 min Winter	1.279	0.0	1308.5	8144
10080 min Winter	1.148	0.0	1286.4	9384

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.710

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.570	4	8	0.570	8	12	0.570

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Model Details

Storage is Online Cover Level (m) 59.200

Tank or Pond Structure

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2400-1200-2400
Design Head (m)	1.200
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	58.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.4	Kick-Flo®	0.631	1.8
Flush-Flo™	0.312	2.2	Mean Flow over Head Range	-	2.0

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	1.8	1.200	2.4	3.000	3.7	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	6.0
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.2		

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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	62.583	0.483	1.5	526.2	O K
30 min Summer	62.706	0.606	1.5	680.6	O K
60 min Summer	62.824	0.724	1.5	836.7	O K
120 min Summer	62.980	0.880	1.5	1054.9	O K
180 min Summer	63.075	0.975	1.6	1195.0	O K
240 min Summer	63.141	1.041	1.6	1297.1	O K
360 min Summer	63.231	1.131	1.7	1438.8	O K
480 min Summer	63.288	1.188	1.7	1531.8	O K
600 min Summer	63.327	1.227	1.7	1596.8	Flood Risk
720 min Summer	63.356	1.256	1.7	1644.6	Flood Risk
960 min Summer	63.393	1.293	1.8	1707.2	Flood Risk
1440 min Summer	63.429	1.329	1.8	1770.5	Flood Risk
2160 min Summer	63.449	1.349	1.8	1804.8	Flood Risk
2880 min Summer	63.456	1.356	1.8	1816.4	Flood Risk
4320 min Summer	63.457	1.357	1.8	1818.6	Flood Risk
5760 min Summer	63.451	1.351	1.8	1808.2	Flood Risk
7200 min Summer	63.445	1.345	1.8	1797.8	Flood Risk
8640 min Summer	63.443	1.343	1.8	1794.1	Flood Risk
10080 min Summer	63.448	1.348	1.8	1802.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	117.2	27
30 min Summer	98.988	0.0	105.0	42
60 min Summer	60.966	0.0	222.1	72
120 min Summer	38.559	0.0	243.8	132
180 min Summer	29.209	0.0	255.7	192
240 min Summer	23.847	0.0	263.3	252
360 min Summer	17.733	0.0	272.4	372
480 min Summer	14.237	0.0	277.2	490
600 min Summer	11.936	0.0	279.6	610
720 min Summer	10.299	0.0	280.7	730
960 min Summer	8.103	0.0	280.5	970
1440 min Summer	5.720	0.0	275.6	1448
2160 min Summer	4.009	0.0	561.1	2168
2880 min Summer	3.120	0.0	552.4	2888
4320 min Summer	2.209	0.0	529.5	4324
5760 min Summer	1.744	0.0	1086.3	5760
7200 min Summer	1.465	0.0	1072.6	7144
8640 min Summer	1.279	0.0	1054.5	7864
10080 min Summer	1.148	0.0	1032.4	8568

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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 Winter	62.583	0.483	1.5	526.2	O K
30 min Winter	62.706	0.606	1.5	680.5	O K
60 min Winter	62.824	0.724	1.5	836.7	O K
120 min Winter	62.980	0.880	1.5	1055.1	O K
180 min Winter	63.075	0.975	1.6	1195.3	O K
240 min Winter	63.142	1.042	1.6	1297.6	O K
360 min Winter	63.231	1.131	1.7	1439.5	O K
480 min Winter	63.289	1.189	1.7	1532.8	O K
600 min Winter	63.328	1.228	1.7	1598.2	Flood Risk
720 min Winter	63.357	1.257	1.7	1646.2	Flood Risk
960 min Winter	63.394	1.294	1.8	1709.4	Flood Risk
1440 min Winter	63.431	1.331	1.8	1774.0	Flood Risk
2160 min Winter	63.452	1.352	1.8	1810.1	Flood Risk
2880 min Winter	63.460	1.360	1.8	1823.8	Flood Risk
4320 min Winter	63.464	1.364	1.8	1831.0	Flood Risk
5760 min Winter	63.461	1.361	1.8	1826.4	Flood Risk
7200 min Winter	63.459	1.359	1.8	1822.6	Flood Risk
8640 min Winter	63.458	1.358	1.8	1821.1	Flood Risk
10080 min Winter	63.460	1.360	1.8	1824.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	152.992	0.0	117.3	27
30 min Winter	98.988	0.0	105.0	42
60 min Winter	60.966	0.0	222.1	72
120 min Winter	38.559	0.0	243.7	130
180 min Winter	29.209	0.0	255.5	190
240 min Winter	23.847	0.0	263.0	248
360 min Winter	17.733	0.0	272.0	368
480 min Winter	14.237	0.0	276.5	486
600 min Winter	11.936	0.0	278.8	604
720 min Winter	10.299	0.0	279.7	722
960 min Winter	8.103	0.0	279.1	960
1440 min Winter	5.720	0.0	273.4	1432
2160 min Winter	4.009	0.0	558.1	2140
2880 min Winter	3.120	0.0	548.4	2832
4320 min Winter	2.209	0.0	523.5	4200
5760 min Winter	1.744	0.0	1079.5	5584
7200 min Winter	1.465	0.0	1064.4	6912
8640 min Winter	1.279	0.0	1045.0	8136
10080 min Winter	1.148	0.0	1021.8	9376

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 1.380

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.460	4	8	0.460	8	12	0.460

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Model Details

Storage is Online Cover Level (m) 63.600

Tank or Pond Structure

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1.853.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	62.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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

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	63.446	0.346	0.7	282.2	O K
30 min Summer	63.537	0.437	0.7	365.0	O K
60 min Summer	63.624	0.524	0.7	448.8	O K
120 min Summer	63.740	0.640	0.8	566.0	O K
180 min Summer	63.811	0.711	0.8	641.2	O K
240 min Summer	63.862	0.762	0.8	696.1	O K
360 min Summer	63.930	0.830	0.8	772.4	O K
480 min Summer	63.974	0.874	0.9	822.6	O K
600 min Summer	64.004	0.904	0.9	857.8	Flood Risk
720 min Summer	64.026	0.926	0.9	883.7	Flood Risk
960 min Summer	64.054	0.954	0.9	917.9	Flood Risk
1440 min Summer	64.083	0.983	0.9	953.0	Flood Risk
2160 min Summer	64.099	0.999	0.9	973.1	Flood Risk
2880 min Summer	64.106	1.006	0.9	981.0	Flood Risk
4320 min Summer	64.110	1.010	0.9	985.6	Flood Risk
5760 min Summer	64.108	1.008	0.9	983.3	Flood Risk
7200 min Summer	64.106	1.006	0.9	980.8	Flood Risk
8640 min Summer	64.105	1.005	0.9	980.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	61.3	27
30 min Summer	98.988	0.0	54.2	42
60 min Summer	60.966	0.0	113.3	72
120 min Summer	38.559	0.0	124.3	132
180 min Summer	29.209	0.0	130.3	192
240 min Summer	23.847	0.0	134.2	252
360 min Summer	17.733	0.0	138.8	372
480 min Summer	14.237	0.0	141.2	490
600 min Summer	11.936	0.0	142.5	610
720 min Summer	10.299	0.0	143.0	730
960 min Summer	8.103	0.0	142.9	970
1440 min Summer	5.720	0.0	140.3	1450
2160 min Summer	4.009	0.0	286.3	2168
2880 min Summer	3.120	0.0	281.7	2888
4320 min Summer	2.209	0.0	269.8	4324
5760 min Summer	1.744	0.0	555.8	5760
7200 min Summer	1.465	0.0	548.5	7200
8640 min Summer	1.279	0.0	539.1	8048

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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
10080 min Summer	64.110	1.010	0.9	985.7	Flood Risk
15 min Winter	63.446	0.346	0.7	282.2	O K
30 min Winter	63.537	0.437	0.7	365.0	O K
60 min Winter	63.624	0.524	0.7	448.8	O K
120 min Winter	63.740	0.640	0.8	566.1	O K
180 min Winter	63.811	0.711	0.8	641.4	O K
240 min Winter	63.862	0.762	0.8	696.4	O K
360 min Winter	63.930	0.830	0.8	772.8	O K
480 min Winter	63.974	0.874	0.9	823.1	O K
600 min Winter	64.004	0.904	0.9	858.4	Flood Risk
720 min Winter	64.026	0.926	0.9	884.4	Flood Risk
960 min Winter	64.055	0.955	0.9	918.9	Flood Risk
1440 min Winter	64.084	0.984	0.9	954.7	Flood Risk
2160 min Winter	64.102	1.002	0.9	975.7	Flood Risk
2880 min Winter	64.109	1.009	0.9	984.7	Flood Risk
4320 min Winter	64.114	1.014	0.9	991.6	Flood Risk
5760 min Winter	64.115	1.015	0.9	992.1	Flood Risk
7200 min Winter	64.115	1.015	0.9	992.9	Flood Risk
8640 min Winter	64.117	1.017	0.9	994.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.148	0.0	527.7	8680
15 min Winter	152.992	0.0	61.3	27
30 min Winter	98.988	0.0	54.2	42
60 min Winter	60.966	0.0	113.3	72
120 min Winter	38.559	0.0	124.3	130
180 min Winter	29.209	0.0	130.2	190
240 min Winter	23.847	0.0	134.1	248
360 min Winter	17.733	0.0	138.6	368
480 min Winter	14.237	0.0	140.9	486
600 min Winter	11.936	0.0	142.1	604
720 min Winter	10.299	0.0	142.6	722
960 min Winter	8.103	0.0	142.2	960
1440 min Winter	5.720	0.0	139.3	1432
2160 min Winter	4.009	0.0	284.8	2140
2880 min Winter	3.120	0.0	279.8	2832
4320 min Winter	2.209	0.0	266.9	4232
5760 min Winter	1.744	0.0	552.5	5584
7200 min Winter	1.465	0.0	544.5	6912
8640 min Winter	1.279	0.0	534.4	8208

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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
10080 min Winter	64.120	1.020	0.9	998.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.148	0.0	522.4	9392

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.740

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.247	4	8	0.247	8	12	0.247

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Model Details

Storage is Online Cover Level (m) 64.300

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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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	63.599	0.499	1.0	373.7	O K
30 min Summer	63.722	0.622	1.0	483.3	O K
60 min Summer	63.839	0.739	1.0	594.1	O K
120 min Summer	63.992	0.892	1.1	748.9	O K
180 min Summer	64.084	0.984	1.2	848.3	O K
240 min Summer	64.148	1.048	1.2	920.7	O K
360 min Summer	64.235	1.135	1.2	1021.1	O K
480 min Summer	64.290	1.190	1.3	1087.0	O K
600 min Summer	64.327	1.227	1.3	1133.0	Flood Risk
720 min Summer	64.354	1.254	1.3	1166.7	Flood Risk
960 min Summer	64.389	1.289	1.3	1210.8	Flood Risk
1440 min Summer	64.424	1.324	1.3	1255.1	Flood Risk
2160 min Summer	64.442	1.342	1.3	1278.3	Flood Risk
2880 min Summer	64.447	1.347	1.3	1285.4	Flood Risk
4320 min Summer	64.447	1.347	1.3	1284.8	Flood Risk
5760 min Summer	64.439	1.339	1.3	1275.2	Flood Risk
7200 min Summer	64.432	1.332	1.3	1265.9	Flood Risk
8640 min Summer	64.430	1.330	1.3	1263.4	Flood Risk
10080 min Summer	64.435	1.335	1.3	1269.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	152.992	0.0	73.0	27
30 min Summer	98.988	0.0	78.6	42
60 min Summer	60.966	0.0	165.7	72
120 min Summer	38.559	0.0	181.3	132
180 min Summer	29.209	0.0	189.8	192
240 min Summer	23.847	0.0	195.1	252
360 min Summer	17.733	0.0	201.4	372
480 min Summer	14.237	0.0	204.6	490
600 min Summer	11.936	0.0	206.2	610
720 min Summer	10.299	0.0	206.8	730
960 min Summer	8.103	0.0	206.3	970
1440 min Summer	5.720	0.0	202.1	1448
2160 min Summer	4.009	0.0	411.9	2168
2880 min Summer	3.120	0.0	404.8	2888
4320 min Summer	2.209	0.0	386.7	4324
5760 min Summer	1.744	0.0	795.4	5760
7200 min Summer	1.465	0.0	784.1	6992
8640 min Summer	1.279	0.0	769.6	7536
10080 min Summer	1.148	0.0	752.3	8376

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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 Winter	63.599	0.499	1.0	373.7	O K
30 min Winter	63.722	0.622	1.0	483.2	O K
60 min Winter	63.839	0.739	1.0	594.1	O K
120 min Winter	63.992	0.892	1.1	749.1	O K
180 min Winter	64.084	0.984	1.2	848.6	O K
240 min Winter	64.149	1.049	1.2	921.1	O K
360 min Winter	64.235	1.135	1.2	1021.7	O K
480 min Winter	64.290	1.190	1.3	1087.8	O K
600 min Winter	64.328	1.228	1.3	1134.0	Flood Risk
720 min Winter	64.355	1.255	1.3	1167.9	Flood Risk
960 min Winter	64.391	1.291	1.3	1212.4	Flood Risk
1440 min Winter	64.426	1.326	1.3	1257.5	Flood Risk
2160 min Winter	64.445	1.345	1.3	1282.1	Flood Risk
2880 min Winter	64.451	1.351	1.3	1290.8	Flood Risk
4320 min Winter	64.454	1.354	1.3	1293.9	Flood Risk
5760 min Winter	64.450	1.350	1.3	1288.7	Flood Risk
7200 min Winter	64.446	1.346	1.3	1284.3	Flood Risk
8640 min Winter	64.444	1.344	1.3	1281.5	Flood Risk
10080 min Winter	64.445	1.345	1.3	1282.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	152.992	0.0	73.0	27
30 min Winter	98.988	0.0	78.6	42
60 min Winter	60.966	0.0	165.7	72
120 min Winter	38.559	0.0	181.3	130
180 min Winter	29.209	0.0	189.6	190
240 min Winter	23.847	0.0	194.9	248
360 min Winter	17.733	0.0	201.1	366
480 min Winter	14.237	0.0	204.2	486
600 min Winter	11.936	0.0	205.6	604
720 min Winter	10.299	0.0	206.1	722
960 min Winter	8.103	0.0	205.3	960
1440 min Winter	5.720	0.0	200.6	1432
2160 min Winter	4.009	0.0	409.8	2140
2880 min Winter	3.120	0.0	402.0	2832
4320 min Winter	2.209	0.0	382.5	4200
5760 min Winter	1.744	0.0	790.6	5544
7200 min Winter	1.465	0.0	778.2	6848
8640 min Winter	1.279	0.0	762.8	8128
10080 min Winter	1.148	0.0	744.6	9272

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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) 0.980

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.327	4	8	0.327	8	12	0.327

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Model Details

Storage is Online Cover Level (m) 64.600

Tank or Pond Structure

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	63.100
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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Microdrainage – Surcharged Outfall

1 in 100 year return period plus 20% climate change allowance

- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

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 580266 189203 TQ 80266 89203	
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

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	59.733	1.600	37.3	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
1.001	49.365	2.300	21.5	0.285	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.002	100.900	3.000	33.6	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
2.000	63.690	0.378	168.5	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
2.001	46.224	1.622	28.5	0.285	0.00	0.0	0.600	o	500	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	5.28	70.200	0.285	0.0	0.0	0.0	3.56	699.7	38.6
1.001	50.00	5.45	68.600	0.570	0.0	0.0	0.0	4.70	923.7	77.2
1.002	50.00	5.90	66.300	0.570	0.0	0.0	0.0	3.76	737.4	77.2
2.000	50.00	5.64	65.300	0.285	0.0	0.0	0.0	1.67	328.0	38.6
2.001	50.00	5.82	64.922	0.570	0.0	0.0	0.0	4.08	801.3	77.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.003	68.651	2.296	29.9	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	111.123	3.011	36.9	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
3.000	65.386	0.385	169.8	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
3.001	128.140	3.815	33.6	0.285	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.005	34.614	0.836	41.4	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.006	27.535	0.665	41.4	0.000	0.00	0.0	0.600	o	500	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)
1.003	50.00	6.19	63.300	1.140	0.0	0.0	0.0	3.98	782.2	154.4
1.004	50.00	6.71	61.004	1.140	0.0	0.0	0.0	3.58	703.9	154.4
3.000	50.00	5.65	62.200	0.285	0.0	0.0	0.0	1.66	326.7	38.6
3.001	50.00	6.22	61.815	0.570	0.0	0.0	0.0	3.76	737.9	77.2
1.005	50.00	6.88	58.000	1.710	0.0	0.0	0.0	3.38	664.3	231.6
1.006	50.00	7.01	57.164	1.710	0.0	0.0	0.0	3.38	664.4	231.6

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.285	0.285	0.285
1.001	-	-	100	0.285	0.285	0.285
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.285	0.285	0.285
2.001	-	-	100	0.285	0.285	0.285
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.285	0.285	0.285
3.001	-	-	100	0.285	0.285	0.285
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.710	1.710	1.710

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		57.000	56.499	0.000	0	0

Datum (m) 56.500 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 11, DS/PN: 1.006, Volume (m³): 10.1

Unit Reference	MD-SHE-0064-2400-1800-2400
Design Head (m)	1.800
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	57.164
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	2.4	Kick-Flo®	0.575	1.4
Flush-Flo™	0.281	1.8	Mean Flow over Head Range	-	1.8

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	4.9
0.500	1.6	2.000	2.5	5.000	3.8	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Storage Structures for Storm

Tank or Pond Manhole: 10, DS/PN: 1.005

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

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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 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 580266 189203 TQ 80266 89203
Data Type Point
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 20

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 Summer	100	+20%					70.400
1.001	2	15 Summer	100	+20%					68.865
1.002	3	15 Summer	100	+20%					66.595
2.000	4	15 Summer	100	+20%					65.614
2.001	5	15 Summer	100	+20%					65.211
1.003	6	15 Summer	100	+20%	100/15 Summer				64.817
1.004	7	15 Summer	100	+20%	100/15 Summer				62.307
3.000	8	15 Summer	100	+20%					62.515
3.001	9	15 Summer	100	+20%					62.105
1.005	10	2160 Winter	100	+20%	100/120 Summer				58.848
1.006	11	2160 Winter	100	+20%	100/15 Summer				58.857

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.300	0.000	0.33			212.1	OK	
1.001	2	-0.235	0.000	0.54			449.7	OK	
1.002	3	-0.205	0.000	0.63			437.1	OK	
2.000	4	-0.186	0.000	0.70			209.1	OK	
2.001	5	-0.211	0.000	0.61			435.5	OK	
1.003	6	1.017	0.000	1.06			766.9	SURCHARGED	
1.004	7	0.803	0.000	1.12			749.9	SURCHARGED	
3.000	8	-0.185	0.000	0.70			209.1	OK	
3.001	9	-0.210	0.000	0.60			425.8	OK	
1.005	10	0.348	0.000	0.01			3.7	SURCHARGED	
1.006	11	1.193	0.000	0.00			2.3	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)	2
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	53.906	2.898	18.6	0.276	5.00	0.0	0.600	o	375	Pipe/Conduit	
1.001	40.522	2.598	15.6	0.276	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	77.191	3.271	23.6	0.276	0.00	0.0	0.600	o	500	Pipe/Conduit	
2.000	71.553	4.310	16.6	0.276	5.00	0.0	0.600	o	375	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	5.21	71.000	0.276	0.0	0.0	0.0	4.22	465.9	37.4
1.001	50.00	5.36	68.102	0.552	0.0	0.0	0.0	4.61	508.9	74.7
1.002	50.00	5.65	65.379	0.828	0.0	0.0	0.0	4.49	880.8	112.1
2.000	50.00	5.27	70.800	0.276	0.0	0.0	0.0	4.47	493.2	37.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.001	100.805	4.253	23.7	0.276	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.003	28.212	0.282	100.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	37.133	1.118	33.2	0.000	0.00	0.0	0.600	o	100	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)
2.001	50.00	5.64	66.365	0.552	0.0	0.0	0.0	4.48	878.9	74.7
1.003	50.00	5.86	62.100	1.380	0.0	0.0	0.0	2.17	426.5	186.9
1.004	50.00	6.32	61.818	1.380	0.0	0.0	0.0	1.34	10.6«	186.9

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.276	0.276	0.276
1.001	-	-	100	0.276	0.276	0.276
1.002	-	-	100	0.276	0.276	0.276
2.000	-	-	100	0.276	0.276	0.276
2.001	-	-	100	0.276	0.276	0.276
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.380	1.380	1.380

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		61.200	60.700	0.000	0	0

Datum (m) 60.700 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.004, Volume (m³): 8.4

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	61.818
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Storage Structures for Storm

Tank or Pond Manhole: 6, DS/PN: 1.003

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1853.0

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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	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	20

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 Summer	100	+20%					71.183
1.001	2	15 Summer	100	+20%					68.391
1.002	3	15 Summer	100	+20%					65.726
2.000	4	15 Summer	100	+20%					70.975
2.001	5	15 Summer	100	+20%					66.624
1.003	6	2160 Winter	100	+20%	100/30 Summer				63.263
1.004	7	2160 Winter	100	+20%	100/15 Summer				63.270

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.192	0.000	0.48			206.9	OK	
1.001	2	-0.086	0.000	0.94			437.1	OK	
1.002	3	-0.153	0.000	0.81			665.0	OK	
2.000	4	-0.200	0.000	0.44			205.5	OK	
2.001	5	-0.241	0.000	0.52			431.3	OK	
1.003	6	0.663	0.000	0.01			2.3	SURCHARGED	
1.004	7	1.352	0.000	0.18			1.9	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)	2
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	47.952	1.998	24.0	0.246	5.00	0.0	0.600	o	500	Pipe/Conduit	
1.001	47.969	3.286	14.6	0.247	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.002	30.303	2.119	14.3	0.247	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.003	16.020	0.320	50.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	42.495	1.079	39.4	0.000	0.00	0.0	0.600	o	100	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	5.18	70.500	0.246	0.0	0.0	0.0	4.45	873.4	33.3
1.001	50.00	5.32	68.502	0.493	0.0	0.0	0.0	5.71	1120.6	66.8
1.002	50.00	5.41	65.216	0.740	0.0	0.0	0.0	5.77	1132.2	100.2
1.003	50.00	5.49	63.100	0.740	0.0	0.0	0.0	3.08	604.3	100.2
1.004	50.00	6.07	62.780	0.740	0.0	0.0	0.0	1.23	9.7«	100.2

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.246	0.246	0.246
1.001	-	-	100	0.247	0.247	0.247
1.002	-	-	100	0.247	0.247	0.247
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.740	0.740	0.740

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		62.200	61.701	61.700	0	0

Datum (m) 61.700 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 5.5

Unit Reference	MD-SHE-0045-1000-1200-1000
Design Head (m)	1.200
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	45
Invert Level (m)	62.780
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

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	0.7	1.200	1.0	3.000	1.5	7.000	2.2
0.200	0.7	1.400	1.1	3.500	1.6	7.500	2.3
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.4
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.3	5.000	1.9	9.000	2.5
0.600	0.7	2.200	1.3	5.500	2.0	9.500	2.6
0.800	0.8	2.400	1.4	6.000	2.1		
1.000	0.9	2.600	1.4	6.500	2.2		

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Storage Structures for Storm

Tank or Pond Manhole: 4, DS/PN: 1.003

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	738.0	1.200	1344.0

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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	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	20

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 Summer	100	+20%					70.665
1.001	2	15 Summer	100	+20%					68.719
1.002	3	15 Summer	100	+20%					65.504
1.003	4	2880 Winter	100	+20%	100/120 Summer				63.957
1.004	5	2880 Winter	100	+20%	100/15 Summer				63.976

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.335	0.000	0.24			184.4	OK	
1.001	2	-0.283	0.000	0.39			390.6	OK	
1.002	3	-0.212	0.000	0.62			597.1	OK	
1.003	4	0.357	0.000	0.00			1.6	SURCHARGED	
1.004	5	1.096	0.000	0.10			1.0	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)	2
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	66.057	3.003	22.0	0.326	5.00	0.0	0.600	o	500	Pipe/Conduit	
1.001	58.257	3.003	19.4	0.327	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.002	36.373	2.393	15.2	0.327	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.003	11.269	0.113	100.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	81.286	3.889	20.9	0.000	0.00	0.0	0.600	o	100	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	5.24	71.500	0.326	0.0	0.0	0.0	4.65	912.4	44.1
1.001	50.00	5.43	68.497	0.653	0.0	0.0	0.0	4.95	971.7	88.4
1.002	50.00	5.54	65.494	0.980	0.0	0.0	0.0	5.59	1098.1	132.7
1.003	50.00	5.63	63.100	0.980	0.0	0.0	0.0	2.17	426.6	132.7
1.004	50.00	6.43	62.900	0.980	0.0	0.0	0.0	1.70	13.3«	132.7

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.326	0.326	0.326
1.001	-	-	100	0.327	0.327	0.327
1.002	-	-	100	0.327	0.327	0.327
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.980	0.980	0.980

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		59.500	59.011	59.000	0	0

Datum (m) 59.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 4.9

Unit Reference	MD-SHE-0051-1400-1500-1400
Design Head (m)	1.500
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	62.900
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.4	Kick-Flo®	0.452	0.8
Flush-Flo™	0.224	1.0	Mean Flow over Head Range	-	1.1

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	0.9	1.200	1.3	3.000	1.9	7.000	2.8
0.200	1.0	1.400	1.4	3.500	2.1	7.500	2.9
0.300	1.0	1.600	1.4	4.000	2.2	8.000	3.0
0.400	0.9	1.800	1.5	4.500	2.3	8.500	3.1
0.500	0.9	2.000	1.6	5.000	2.4	9.000	3.2
0.600	0.9	2.200	1.7	5.500	2.5	9.500	3.3
0.800	1.1	2.400	1.7	6.000	2.6		
1.000	1.2	2.600	1.8	6.500	2.7		

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Storage Structures for Storm

Tank or Pond Manhole: 4, DS/PN: 1.003

Invert Level (m) 63.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	642.0	1.500	1395.0

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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	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	20

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 Summer	100	+20%					71.684
1.001	2	15 Summer	100	+20%					68.774
1.002	3	15 Summer	100	+20%					65.846
1.003	4	2160 Winter	100	+20%	100/30 Summer				64.270
1.004	5	2160 Winter	100	+20%	100/15 Summer				64.293

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.316	0.000	0.29			244.3	OK	
1.001	2	-0.223	0.000	0.59			517.2	OK	
1.002	3	-0.148	0.000	0.83			790.6	OK	
1.003	4	0.670	0.000	0.01			1.8	SURCHARGED	
1.004	5	1.293	0.000	0.10			1.3	SURCHARGED	

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1 in 100 year return period plus 25% climate change allowance – sensitivity check

- Catchment 4a
- Catchment 4b
- Catchment 5a
- Catchment 5b

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 580266 189203 TQ 80266 89203	
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

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	59.733	1.600	37.3	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
1.001	49.365	2.300	21.5	0.285	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.002	100.900	3.000	33.6	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
2.000	63.690	0.378	168.5	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
2.001	46.224	1.622	28.5	0.285	0.00	0.0	0.600	o	500	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	5.28	70.200	0.285	0.0	0.0	0.0	3.56	699.7	38.6
1.001	50.00	5.45	68.600	0.570	0.0	0.0	0.0	4.70	923.7	77.2
1.002	50.00	5.90	66.300	0.570	0.0	0.0	0.0	3.76	737.4	77.2
2.000	50.00	5.64	65.300	0.285	0.0	0.0	0.0	1.67	328.0	38.6
2.001	50.00	5.82	64.922	0.570	0.0	0.0	0.0	4.08	801.3	77.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.003	68.651	2.296	29.9	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	111.123	3.011	36.9	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
3.000	65.386	0.385	169.8	0.285	5.00	0.0	0.600	o	500	Pipe/Conduit	
3.001	128.140	3.815	33.6	0.285	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.005	34.614	0.836	41.4	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.006	27.535	0.665	41.4	0.000	0.00	0.0	0.600	o	500	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)
1.003	50.00	6.19	63.300	1.140	0.0	0.0	0.0	3.98	782.2	154.4
1.004	50.00	6.71	61.004	1.140	0.0	0.0	0.0	3.58	703.9	154.4
3.000	50.00	5.65	62.200	0.285	0.0	0.0	0.0	1.66	326.7	38.6
3.001	50.00	6.22	61.815	0.570	0.0	0.0	0.0	3.76	737.9	77.2
1.005	50.00	6.88	58.000	1.710	0.0	0.0	0.0	3.38	664.3	231.6
1.006	50.00	7.01	57.164	1.710	0.0	0.0	0.0	3.38	664.4	231.6

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.285	0.285	0.285
1.001	-	-	100	0.285	0.285	0.285
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.285	0.285	0.285
2.001	-	-	100	0.285	0.285	0.285
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.285	0.285	0.285
3.001	-	-	100	0.285	0.285	0.285
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.710	1.710	1.710

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		57.000	56.499	0.000	0	0

Datum (m) 56.500 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 11, DS/PN: 1.006, Volume (m³): 10.1

Unit Reference	MD-SHE-0064-2400-1800-2400
Design Head (m)	1.800
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	64
Invert Level (m)	57.164
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	2.4	Kick-Flo®	0.575	1.4
Flush-Flo™	0.281	1.8	Mean Flow over Head Range	-	1.8

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	1.5	1.200	2.0	3.000	3.0	7.000	4.5
0.200	1.7	1.400	2.1	3.500	3.3	7.500	4.7
0.300	1.8	1.600	2.3	4.000	3.5	8.000	4.8
0.400	1.7	1.800	2.4	4.500	3.7	8.500	4.9
0.500	1.6	2.000	2.5	5.000	3.8	9.000	5.1
0.600	1.5	2.200	2.6	5.500	4.0	9.500	5.2
0.800	1.7	2.400	2.7	6.000	4.2		
1.000	1.8	2.600	2.8	6.500	4.4		

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Storage Structures for Storm

Tank or Pond Manhole: 10, DS/PN: 1.005

Invert Level (m) 58.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1866.0	1.200	2787.0

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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 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 580266 189203 TQ 80266 89203
Data Type Point
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 25

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 Summer	100	+25%					70.404
1.001	2	15 Summer	100	+25%					68.872
1.002	3	15 Summer	100	+25%					66.603
2.000	4	15 Summer	100	+25%					65.623
2.001	5	15 Summer	100	+25%					65.303
1.003	6	15 Summer	100	+25%	100/15 Summer				64.967
1.004	7	15 Summer	100	+25%	100/15 Summer				62.387
3.000	8	15 Summer	100	+25%					62.524
3.001	9	15 Summer	100	+25%					62.112
1.005	10	2160 Winter	100	+25%	100/120 Summer				58.882
1.006	11	2160 Winter	100	+25%	100/15 Summer				58.891

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.296	0.000	0.35			221.0	OK	
1.001	2	-0.228	0.000	0.57			468.5	OK	
1.002	3	-0.197	0.000	0.65			455.4	OK	
2.000	4	-0.177	0.000	0.72			217.8	OK	
2.001	5	-0.119	0.000	0.64			452.8	OK	
1.003	6	1.167	0.000	1.08			780.9	SURCHARGED	
1.004	7	0.883	0.000	1.14			758.9	SURCHARGED	
3.000	8	-0.176	0.000	0.73			217.8	OK	
3.001	9	-0.203	0.000	0.63			443.5	OK	
1.005	10	0.382	0.000	0.01			3.8	SURCHARGED	
1.006	11	1.227	0.000	0.00			2.3	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)	2
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
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

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	53.906	2.898	18.6	0.276	5.00	0.0	0.600	o	375	Pipe/Conduit	
1.001	40.522	2.598	15.6	0.276	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	77.191	3.271	23.6	0.276	0.00	0.0	0.600	o	500	Pipe/Conduit	
2.000	71.553	4.310	16.6	0.276	5.00	0.0	0.600	o	375	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	5.21	71.000	0.276	0.0	0.0	0.0	4.22	465.9	37.4
1.001	50.00	5.36	68.102	0.552	0.0	0.0	0.0	4.61	508.9	74.7
1.002	50.00	5.65	65.379	0.828	0.0	0.0	0.0	4.49	880.8	112.1
2.000	50.00	5.27	70.800	0.276	0.0	0.0	0.0	4.47	493.2	37.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.001	100.805	4.253	23.7	0.276	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.003	28.212	0.282	100.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
1.004	37.133	1.118	33.2	0.000	0.00	0.0	0.600	o	100	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)
2.001	50.00	5.64	66.365	0.552	0.0	0.0	0.0	4.48	878.9	74.7
1.003	50.00	5.86	62.100	1.380	0.0	0.0	0.0	2.17	426.5	186.9
1.004	50.00	6.32	61.818	1.380	0.0	0.0	0.0	1.34	10.6«	186.9

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.276	0.276	0.276
1.001	-	-	100	0.276	0.276	0.276
1.002	-	-	100	0.276	0.276	0.276
2.000	-	-	100	0.276	0.276	0.276
2.001	-	-	100	0.276	0.276	0.276
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.380	1.380	1.380

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		61.200	60.700	0.000	0	0

Datum (m) 60.700 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
288	0.375	864	0.375	1440	0.375	2016	0.375	2592	0.375
576	0.375	1152	0.375	1728	0.375	2304	0.375	2880	0.375

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.004, Volume (m³): 8.4

Unit Reference	MD-SHE-0059-1900-1500-1900
Design Head (m)	1.500
Design Flow (l/s)	1.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	59
Invert Level (m)	61.818
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.9	Kick-Flo®	0.529	1.2
Flush-Flo™	0.260	1.5	Mean Flow over Head Range	-	1.5

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	1.3	1.200	1.7	3.000	2.6	7.000	3.9
0.200	1.4	1.400	1.8	3.500	2.8	7.500	4.0
0.300	1.4	1.600	2.0	4.000	3.0	8.000	4.1
0.400	1.4	1.800	2.1	4.500	3.1	8.500	4.2
0.500	1.3	2.000	2.2	5.000	3.3	9.000	4.3
0.600	1.3	2.200	2.3	5.500	3.4	9.500	4.5
0.800	1.4	2.400	2.3	6.000	3.6		
1.000	1.6	2.600	2.4	6.500	3.7		

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Storage Structures for Storm

Tank or Pond Manhole: 6, DS/PN: 1.003

Invert Level (m) 62.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	964.0	1.500	1853.0

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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	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 580266 189203 TQ 80266 89203
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	25

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 Summer	100	+25%					71.188
1.001	2	15 Summer	100	+25%					68.400
1.002	3	15 Summer	100	+25%					65.736
2.000	4	15 Summer	100	+25%					70.980
2.001	5	15 Summer	100	+25%					66.631
1.003	6	2880 Winter	100	+25%	100/30 Summer				63.306
1.004	7	2880 Winter	100	+25%	100/15 Summer				63.312

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