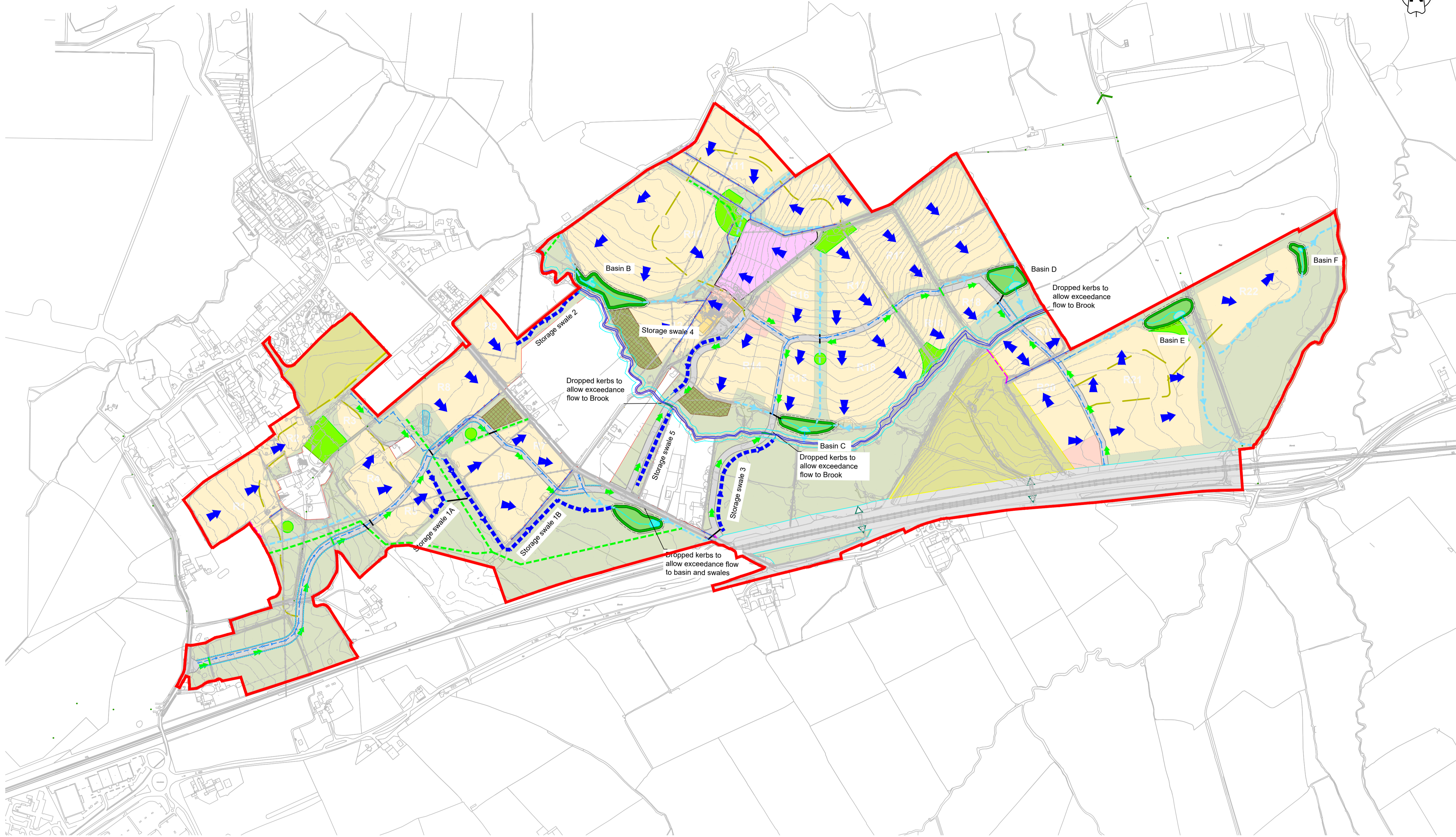


Construction Design and Management (CDM)
Key Residual Risks
 Contractors entering the site should gain permission from the relevant land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the project.

- 1) Overhead and underground services
- 2) Street Lighting Cables
- 3) Working adjacent to water courses and flood plain
- 4) Soft ground conditions
- 5) Working adjacent to live highways and railway line
- 6) Unchartered services
- 7) Existing buildings with potential asbestos hazards

- NOTES:**
1. Do not scale from this drawing.
 2. All dimensions are in metres unless otherwise stated.
 3. Brookbanks Consulting Ltd has prepared this drawing for the sole use of the client. The drawing may not be relied upon by any other party without the express agreement of the client and Brookbanks Consulting Ltd. Where any data supplied by the client or from other sources has been used, it has been assumed that the information is correct. No responsibility can be accepted by Brookbanks Consulting Ltd for inaccuracies in the data supplied by any other party. The drawing has been produced based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.
 4. No part of this drawing may be copied or duplicated without the express permission of Brookbanks Consulting Ltd.



KEY:

- Planning Boundary
- Surface water sewer and manhole
- Conveyance swale
- Storage swale
- Land drainage exceedance channel
- Detention basin with 3.5m maintenance zone
- Watercourse with 8m buffer zone
- Flow direction
- Flood Extents
- Ditch to be abandoned
- Diverted ditch
- Culvert to existing ditch
- Overland surface water flow route
- Surface Water flow control
- Drainage Exceedance Route

Residential
 Retained Development
 Mixed Use Centre
 Primary School

A Drainage Plan amended CDW NJO SM 21.01.22
 First Issue HG NJO SM 12.01.22

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Swindon EDA Consortium

Proposed Development
 Swindon EV Phase 1

Drainage Exceedance Plan

Status		Status Date
Draft		Nov. 2021
Drawn	Checked	Date
HG	NJO	03.11.21
Scale	Number	Rev
1:5000	1335-SK-113	A

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR COMMENCE SITE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT HIS OWN RISK.

Appendix E

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Tertiary Catchment A Basin
 1 in 100 Year + 40% CC



Date 25/06/2020
 File

Designed by Brookbanks
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Micro Drainage

Source Control 2020.1

Cascade Summary of Results for Tertiary Catchment A+40%.SRCX

Upstream Structures Outflow To Overflow To

Storage Swale 1B.SRCX (None) (None)
 Storage Swale 1A.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.487	0.487	44.4	1635.0	O K
30 min Summer	0.624	0.624	44.4	2137.8	O K
60 min Summer	0.757	0.757	44.4	2647.9	O K
120 min Summer	0.881	0.881	44.4	3140.4	O K
180 min Summer	0.944	0.944	44.4	3397.9	O K
240 min Summer	0.981	0.981	44.4	3549.9	O K
360 min Summer	1.023	1.023	44.4	3724.9	O K
480 min Summer	1.043	1.043	44.4	3811.8	O K
600 min Summer	1.051	1.051	44.4	3845.3	O K
720 min Summer	1.051	1.051	44.4	3844.3	O K
960 min Summer	1.040	1.040	44.4	3795.3	O K
1440 min Summer	1.009	1.009	44.4	3668.0	O K
2160 min Summer	0.954	0.954	44.4	3438.5	O K
2880 min Summer	0.892	0.892	44.4	3186.7	O K
4320 min Summer	0.762	0.762	44.4	2669.3	O K
5760 min Summer	0.648	0.648	44.4	2230.0	O K
7200 min Summer	0.549	0.549	44.4	1861.8	O K
8640 min Summer	0.467	0.467	44.4	1564.0	O K
10080 min Summer	0.401	0.401	44.3	1329.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	1921.7	26
30 min Summer	90.705	0.0	2505.6	41
60 min Summer	56.713	0.0	3363.7	70
120 min Summer	34.246	0.0	4058.7	130
180 min Summer	25.149	0.0	4462.8	188
240 min Summer	20.078	0.0	4741.3	248
360 min Summer	14.585	0.0	5143.1	366
480 min Summer	11.622	0.0	5435.2	484
600 min Summer	9.738	0.0	5655.8	602
720 min Summer	8.424	0.0	5824.3	720
960 min Summer	6.697	0.0	6060.8	844
1440 min Summer	4.839	0.0	6254.0	1092
2160 min Summer	3.490	0.0	7597.4	1496
2880 min Summer	2.766	0.0	8017.0	1912
4320 min Summer	1.989	0.0	8616.0	2684
5760 min Summer	1.573	0.0	9189.5	3456
7200 min Summer	1.311	0.0	9563.2	4176
8640 min Summer	1.129	0.0	9868.7	4848
10080 min Summer	0.994	0.0	10111.7	5544

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Tertiary Catchment A Basin
 1 in 100 Year + 40% CC



Date 25/06/2020
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Micro Drainage

Source Control 2020.1

Cascade Summary of Results for Tertiary Catchment A+40%.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	0.542	0.542	44.4	1834.0	O K
30 min Winter	0.693	0.693	44.4	2398.9	O K
60 min Winter	0.840	0.840	44.4	2973.9	O K
120 min Winter	0.976	0.976	44.4	3531.4	O K
180 min Winter	1.046	1.046	44.4	3820.8	O K
240 min Winter	1.087	1.087	44.4	3995.0	O K
360 min Winter	1.135	1.135	44.4	4201.6	O K
480 min Winter	1.160	1.160	44.4	4311.6	O K
600 min Winter	1.172	1.172	44.4	4363.2	O K
720 min Winter	1.175	1.175	44.4	4377.8	O K
960 min Winter	1.166	1.166	44.4	4339.1	O K
1440 min Winter	1.125	1.125	44.4	4160.9	O K
2160 min Winter	1.055	1.055	44.4	3861.0	O K
2880 min Winter	0.973	0.973	44.4	3518.9	O K
4320 min Winter	0.782	0.782	44.4	2744.6	O K
5760 min Winter	0.608	0.608	44.4	2079.3	O K
7200 min Winter	0.467	0.467	44.4	1561.6	O K
8640 min Winter	0.363	0.363	44.0	1195.1	O K
10080 min Winter	0.295	0.295	43.0	959.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	138.153	0.0	2151.7	26
30 min Winter	90.705	0.0	2771.2	40
60 min Winter	56.713	0.0	3766.7	70
120 min Winter	34.246	0.0	4536.0	128
180 min Winter	25.149	0.0	4978.1	186
240 min Winter	20.078	0.0	5277.7	242
360 min Winter	14.585	0.0	5692.8	358
480 min Winter	11.622	0.0	5969.6	474
600 min Winter	9.738	0.0	6176.4	586
720 min Winter	8.424	0.0	6338.1	698
960 min Winter	6.697	0.0	6550.9	914
1440 min Winter	4.839	0.0	6506.4	1148
2160 min Winter	3.490	0.0	8505.7	1608
2880 min Winter	2.766	0.0	8971.3	2076
4320 min Winter	1.989	0.0	9629.8	2900
5760 min Winter	1.573	0.0	10295.3	3640
7200 min Winter	1.311	0.0	10715.4	4320
8640 min Winter	1.129	0.0	11060.1	4928
10080 min Winter	0.994	0.0	11339.3	5456

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Tertiary Catchment A Basin
 1 in 100 Year + 40% CC



Date 25/06/2020
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Micro Drainage

Source Control 2020.1


Cascade Rainfall Details for Tertiary Catchment A+40%.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.430

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 2.143	4	8 2.143	8	12 2.144

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Tertiary Catchment A Basin 1 in 100 Year + 40% CC	
Date 25/06/2020 File	Designed by Brookbanks Checked by	
Micro Drainage	Source Control 2020.1	

Cascade Model Details for Tertiary Catchment A+40%.SRCX

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	3110.0	1.500	4766.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0278-4440-1200-4440
Design Head (m)	1.200
Design Flow (l/s)	44.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	278
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	44.4	Kick-Flo®	0.889	38.5
Flush-Flo™	0.448	44.4	Mean Flow over Head Range	-	36.8

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)	Depth (m)	Flow (l/s)
0.100	8.7	0.800	41.2	2.000	56.8	4.000	79.5	7.000	104.4
0.200	28.6	1.000	40.7	2.200	59.5	4.500	84.2	7.500	108.0
0.300	43.1	1.200	44.4	2.400	62.0	5.000	88.6	8.000	111.4
0.400	44.3	1.400	47.8	2.600	64.5	5.500	92.8	8.500	114.8
0.500	44.3	1.600	51.0	3.000	69.1	6.000	96.8	9.000	118.0
0.600	43.7	1.800	54.0	3.500	74.5	6.500	100.7	9.500	121.2

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin B
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment B+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.661	0.661	41.9	2200.4	O K
30 min Summer	0.833	0.833	41.9	2879.2	O K
60 min Summer	0.995	0.995	41.9	3567.6	O K
120 min Summer	1.143	1.143	41.9	4231.4	O K
180 min Summer	1.216	1.216	41.9	4573.7	O K
240 min Summer	1.259	1.259	41.9	4778.6	O K
360 min Summer	1.309	1.309	41.9	5019.6	O K
480 min Summer	1.334	1.334	41.9	5146.4	O K
600 min Summer	1.346	1.346	41.9	5204.1	O K
720 min Summer	1.349	1.349	41.9	5217.5	O K
960 min Summer	1.337	1.337	41.9	5161.4	O K
1440 min Summer	1.300	1.300	41.9	4976.9	O K
2160 min Summer	1.240	1.240	41.9	4688.1	O K
2880 min Summer	1.179	1.179	41.9	4397.9	O K
4320 min Summer	1.050	1.050	41.9	3806.9	O K
5760 min Summer	0.911	0.911	41.9	3205.8	O K
7200 min Summer	0.787	0.787	41.9	2693.9	O K
8640 min Summer	0.676	0.676	41.9	2254.6	O K
10080 min Summer	0.577	0.577	41.9	1883.0	O K
15 min Winter	0.731	0.731	41.9	2469.2	O K
30 min Winter	0.918	0.918	41.9	3232.2	O K
60 min Winter	1.095	1.095	41.9	4010.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	2079.2	26
30 min Summer	90.705	0.0	2709.2	41
60 min Summer	56.713	0.0	3597.4	70
120 min Summer	34.246	0.0	4339.0	130
180 min Summer	25.149	0.0	4770.6	188
240 min Summer	20.078	0.0	5067.6	248
360 min Summer	14.585	0.0	5494.4	366
480 min Summer	11.622	0.0	5800.3	484
600 min Summer	9.738	0.0	6023.8	604
720 min Summer	8.424	0.0	6181.0	722
960 min Summer	6.697	0.0	6298.8	952
1440 min Summer	4.839	0.0	6028.6	1168
2160 min Summer	3.490	0.0	8093.8	1556
2880 min Summer	2.766	0.0	8538.2	1964
4320 min Summer	1.989	0.0	9164.6	2780
5760 min Summer	1.573	0.0	9785.3	3528
7200 min Summer	1.311	0.0	10184.5	4264
8640 min Summer	1.129	0.0	10512.0	5016
10080 min Summer	0.994	0.0	10775.4	5656
15 min Winter	138.153	0.0	2327.0	26
30 min Winter	90.705	0.0	2998.5	41
60 min Winter	56.713	0.0	4027.7	70

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin B
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment B+40%.SRCX

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Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
120 min Winter	1.255	1.255	41.9	4758.8	O K
180 min Winter	1.336	1.336	41.9	5151.9	O K
240 min Winter	1.383	1.383	41.9	5391.3	O K
360 min Winter	1.441	1.441	41.9	5682.4	O K
480 min Winter	1.472	1.472	41.9	5845.9	O K
600 min Winter	1.489	1.489	41.9	5932.0	O K
720 min Winter	1.496	1.496	41.9	5968.8	O K
960 min Winter	1.492	1.492	41.9	5951.0	O K
1440 min Winter	1.450	1.450	41.9	5729.6	O K
2160 min Winter	1.377	1.377	41.9	5357.5	O K
2880 min Winter	1.297	1.297	41.9	4960.1	O K
4320 min Winter	1.121	1.121	41.9	4130.7	O K
5760 min Winter	0.911	0.911	41.9	3202.9	O K
7200 min Winter	0.721	0.721	41.9	2430.2	O K
8640 min Winter	0.557	0.557	41.9	1809.6	O K
10080 min Winter	0.427	0.427	41.7	1347.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
120 min Winter	34.246	0.0	4850.5	128
180 min Winter	25.149	0.0	5324.1	186
240 min Winter	20.078	0.0	5645.0	244
360 min Winter	14.585	0.0	6087.7	360
480 min Winter	11.622	0.0	6368.6	476
600 min Winter	9.738	0.0	6511.8	590
720 min Winter	8.424	0.0	6521.9	704
960 min Winter	6.697	0.0	6409.3	924
1440 min Winter	4.839	0.0	6145.7	1330
2160 min Winter	3.490	0.0	9061.4	1652
2880 min Winter	2.766	0.0	9554.8	2116
4320 min Winter	1.989	0.0	10218.8	3032
5760 min Winter	1.573	0.0	10961.9	3808
7200 min Winter	1.311	0.0	11410.7	4544
8640 min Winter	1.129	0.0	11779.8	5192
10080 min Winter	0.994	0.0	12081.6	5760

6150 Knights Court
 Solihull Parkway
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Swindon EV
 Basin B
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment B+40%.SRCX

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Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 8.660

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4	2.886	4 8	2.886	8 12	2.888

Brookbanks Consulting		Page 4
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Basin B 1 in 100 Year + 40% CC	
Date 11/01/2022 File Tertiary Catchment B+40%.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.800

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2854.0	1.800	5824.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0267-4190-1500-4190
Design Head (m)	1.500
Design Flow (l/s)	41.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	267
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	41.9	Kick-Flo®	1.054	35.4
Flush-Flo™	0.490	41.9	Mean Flow over Head Range	-	35.6

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)	Depth (m)	Flow (l/s)
0.100	8.5	0.800	40.3	2.000	48.1	4.000	67.3	7.000	88.3
0.200	27.5	1.000	37.2	2.200	50.4	4.500	71.2	7.500	91.3
0.300	40.2	1.200	37.6	2.400	52.5	5.000	75.0	8.000	94.3
0.400	41.6	1.400	40.5	2.600	54.6	5.500	78.5	8.500	97.1
0.500	41.9	1.600	43.2	3.000	58.5	6.000	81.9	9.000	99.8
0.600	41.6	1.800	45.7	3.500	63.1	6.500	85.2	9.500	102.5

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin C
 1 in 100 Year + 40%CC



Date 11/01/2022
 File Tertiary Catchment C+40%.SRCX

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Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.500	0.500	23.6	1245.5	O K
30 min Summer	0.636	0.636	23.6	1629.7	O K
60 min Summer	0.767	0.767	23.6	2019.5	O K
120 min Summer	0.888	0.888	23.6	2397.0	O K
180 min Summer	0.948	0.948	23.6	2592.8	O K
240 min Summer	0.984	0.984	23.6	2710.6	O K
360 min Summer	1.026	1.026	23.6	2850.3	O K
480 min Summer	1.048	1.048	23.6	2925.1	O K
600 min Summer	1.059	1.059	23.6	2960.8	O K
720 min Summer	1.062	1.062	23.6	2971.2	O K
960 min Summer	1.054	1.054	23.6	2944.6	O K
1440 min Summer	1.025	1.025	23.6	2845.4	O K
2160 min Summer	0.977	0.977	23.6	2687.0	O K
2880 min Summer	0.927	0.927	23.6	2524.8	O K
4320 min Summer	0.820	0.820	23.6	2184.3	O K
5760 min Summer	0.711	0.711	23.6	1850.9	O K
7200 min Summer	0.613	0.613	23.6	1564.6	O K
8640 min Summer	0.526	0.526	23.6	1318.0	O K
10080 min Summer	0.450	0.450	23.6	1108.7	O K
15 min Winter	0.555	0.555	23.6	1397.6	O K
30 min Winter	0.704	0.704	23.6	1829.3	O K
60 min Winter	0.848	0.848	23.6	2270.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	1161.2	26
30 min Summer	90.705	0.0	1514.3	41
60 min Summer	56.713	0.0	2026.2	70
120 min Summer	34.246	0.0	2443.8	130
180 min Summer	25.149	0.0	2686.1	188
240 min Summer	20.078	0.0	2852.6	248
360 min Summer	14.585	0.0	3090.8	366
480 min Summer	11.622	0.0	3260.5	486
600 min Summer	9.738	0.0	3383.1	604
720 min Summer	8.424	0.0	3468.3	722
960 min Summer	6.697	0.0	3529.1	958
1440 min Summer	4.839	0.0	3372.4	1174
2160 min Summer	3.490	0.0	4571.3	1560
2880 min Summer	2.766	0.0	4820.9	1968
4320 min Summer	1.989	0.0	5170.9	2776
5760 min Summer	1.573	0.0	5533.8	3528
7200 min Summer	1.311	0.0	5758.9	4264
8640 min Summer	1.129	0.0	5943.0	5016
10080 min Summer	0.994	0.0	6089.3	5656
15 min Winter	138.153	0.0	1300.2	26
30 min Winter	90.705	0.0	1676.6	41
60 min Winter	56.713	0.0	2268.8	70

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin C
 1 in 100 Year + 40%CC



Date 11/01/2022
 File Tertiary Catchment C+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
120 min Winter	0.980	0.980	23.6	2695.6	O K
180 min Winter	1.047	1.047	23.6	2919.6	O K
240 min Winter	1.087	1.087	23.6	3056.5	O K
360 min Winter	1.135	1.135	23.6	3224.0	O K
480 min Winter	1.162	1.162	23.6	3319.2	O K
600 min Winter	1.177	1.177	23.6	3370.5	O K
720 min Winter	1.183	1.183	23.6	3393.8	O K
960 min Winter	1.182	1.182	23.6	3388.3	O K
1440 min Winter	1.148	1.148	23.6	3270.6	O K
2160 min Winter	1.089	1.089	23.6	3065.3	O K
2880 min Winter	1.024	1.024	23.6	2844.8	O K
4320 min Winter	0.881	0.881	23.6	2376.4	O K
5760 min Winter	0.712	0.712	23.6	1852.9	O K
7200 min Winter	0.563	0.563	23.6	1420.8	O K
8640 min Winter	0.436	0.436	23.6	1071.3	O K
10080 min Winter	0.337	0.337	23.5	809.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
120 min Winter	34.246	0.0	2731.2	128
180 min Winter	25.149	0.0	2996.6	186
240 min Winter	20.078	0.0	3175.7	244
360 min Winter	14.585	0.0	3421.3	360
480 min Winter	11.622	0.0	3575.4	476
600 min Winter	9.738	0.0	3653.2	590
720 min Winter	8.424	0.0	3660.0	704
960 min Winter	6.697	0.0	3593.5	926
1440 min Winter	4.839	0.0	3438.9	1334
2160 min Winter	3.490	0.0	5117.5	1664
2880 min Winter	2.766	0.0	5393.9	2132
4320 min Winter	1.989	0.0	5760.1	3032
5760 min Winter	1.573	0.0	6199.4	3808
7200 min Winter	1.311	0.0	6452.8	4544
8640 min Winter	1.129	0.0	6660.4	5192
10080 min Winter	0.994	0.0	6828.6	5840

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin C
 1 in 100 Year + 40%CC



Date 11/01/2022
 File Tertiary Catchment C+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.900

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 1.633	4	8 1.633	8	12 1.634

Brookbanks Consulting		Page 4
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Basin C 1 in 100 Year + 40%CC	
Date 11/01/2022 File Tertiary Catchment C+40%.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2236.0	1.500	3953.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2360-1200-2360
Design Head (m)	1.200
Design Flow (l/s)	23.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	23.6	Kick-Flo®	0.840	19.9
Flush-Flo™	0.387	23.6	Mean Flow over Head Range	-	20.0

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)	Depth (m)	Flow (l/s)
0.100	7.2	0.800	20.9	2.000	30.1	4.000	42.1	7.000	55.2
0.200	20.4	1.000	21.6	2.200	31.5	4.500	44.5	7.500	57.0
0.300	23.3	1.200	23.6	2.400	32.9	5.000	46.9	8.000	58.9
0.400	23.6	1.400	25.4	2.600	34.2	5.500	49.1	8.500	60.6
0.500	23.3	1.600	27.1	3.000	36.6	6.000	51.2	9.000	62.3
0.600	22.9	1.800	28.6	3.500	39.4	6.500	53.2	9.500	64.0

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin D
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment D+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.408	0.408	27.4	1450.8	O K
30 min Summer	0.527	0.527	27.4	1897.7	O K
60 min Summer	0.644	0.644	27.4	2351.8	O K
120 min Summer	0.754	0.754	27.4	2791.2	O K
180 min Summer	0.811	0.811	27.4	3024.1	O K
240 min Summer	0.847	0.847	27.4	3168.9	O K
360 min Summer	0.890	0.890	27.4	3347.5	O K
480 min Summer	0.914	0.914	27.4	3448.8	O K
600 min Summer	0.927	0.927	27.4	3503.0	O K
720 min Summer	0.933	0.933	27.4	3526.8	O K
960 min Summer	0.931	0.931	27.4	3517.4	O K
1440 min Summer	0.907	0.907	27.4	3417.5	O K
2160 min Summer	0.865	0.865	27.4	3243.3	O K
2880 min Summer	0.815	0.815	27.4	3040.6	O K
4320 min Summer	0.718	0.718	27.4	2644.8	O K
5760 min Summer	0.627	0.627	27.4	2286.8	O K
7200 min Summer	0.545	0.545	27.4	1967.9	O K
8640 min Summer	0.473	0.473	27.4	1691.5	O K
10080 min Summer	0.410	0.410	27.4	1458.0	O K
15 min Winter	0.456	0.456	27.4	1627.5	O K
30 min Winter	0.587	0.587	27.4	2129.7	O K
60 min Winter	0.717	0.717	27.4	2641.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	1276.7	26
30 min Summer	90.705	0.0	1676.3	41
60 min Summer	56.713	0.0	2309.0	70
120 min Summer	34.246	0.0	2788.2	130
180 min Summer	25.149	0.0	3064.5	188
240 min Summer	20.078	0.0	3252.5	248
360 min Summer	14.585	0.0	3518.2	366
480 min Summer	11.622	0.0	3705.2	486
600 min Summer	9.738	0.0	3838.8	604
720 min Summer	8.424	0.0	3931.6	722
960 min Summer	6.697	0.0	4008.9	960
1440 min Summer	4.839	0.0	3836.0	1212
2160 min Summer	3.490	0.0	5274.3	1584
2880 min Summer	2.766	0.0	5559.5	1968
4320 min Summer	1.989	0.0	5946.1	2764
5760 min Summer	1.573	0.0	6420.7	3520
7200 min Summer	1.311	0.0	6679.0	4256
8640 min Summer	1.129	0.0	6886.5	5016
10080 min Summer	0.994	0.0	7043.7	5656
15 min Winter	138.153	0.0	1434.1	26
30 min Winter	90.705	0.0	1862.2	41
60 min Winter	56.713	0.0	2588.0	70

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin D
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment D+40%.SRCX

Designed by Brookbanks
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Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
120 min Winter	0.840	0.840	27.4	3142.1	O K
180 min Winter	0.905	0.905	27.4	3410.5	O K
240 min Winter	0.945	0.945	27.4	3576.1	O K
360 min Winter	0.993	0.993	27.4	3782.7	O K
480 min Winter	1.022	1.022	27.4	3904.6	O K
600 min Winter	1.038	1.038	27.4	3974.8	O K
720 min Winter	1.047	1.047	27.4	4012.0	O K
960 min Winter	1.050	1.050	27.4	4024.2	O K
1440 min Winter	1.025	1.025	27.4	3917.5	O K
2160 min Winter	0.971	0.971	27.4	3688.7	O K
2880 min Winter	0.912	0.912	27.4	3440.5	O K
4320 min Winter	0.768	0.768	27.4	2845.8	O K
5760 min Winter	0.628	0.628	27.4	2290.7	O K
7200 min Winter	0.505	0.505	27.4	1814.2	O K
8640 min Winter	0.402	0.402	27.4	1426.1	O K
10080 min Winter	0.322	0.322	27.2	1130.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
120 min Winter	34.246	0.0	3116.2	128
180 min Winter	25.149	0.0	3415.0	186
240 min Winter	20.078	0.0	3615.2	244
360 min Winter	14.585	0.0	3887.0	360
480 min Winter	11.622	0.0	4057.7	476
600 min Winter	9.738	0.0	4150.9	592
720 min Winter	8.424	0.0	4176.4	706
960 min Winter	6.697	0.0	4099.2	930
1440 min Winter	4.839	0.0	3891.7	1350
2160 min Winter	3.490	0.0	5902.0	1684
2880 min Winter	2.766	0.0	6211.4	2140
4320 min Winter	1.989	0.0	6624.7	3024
5760 min Winter	1.573	0.0	7194.5	3800
7200 min Winter	1.311	0.0	7486.0	4536
8640 min Winter	1.129	0.0	7721.3	5192
10080 min Winter	0.994	0.0	7904.2	5848

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin D
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Tertiary Catchment D+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 5.700

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	1.900		1.900		1.900

Brookbanks Consulting		Page 4
6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Basin D 1 in 100 Year + 40% CC	
Date 11/01/2022 File Tertiary Catchment D+40%.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	3380.0	1.500	4736.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0226-2750-1200-2750
Design Head (m)	1.200
Design Flow (l/s)	27.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	226
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	27.5	Kick-Flo®	0.850	23.3
Flush-Flo™	0.398	27.4	Mean Flow over Head Range	-	23.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.800	24.6	2.000	35.1	4.000	49.0	7.000	64.3
0.200	22.4	1.000	25.2	2.200	36.8	4.500	51.9	7.500	66.5
0.300	27.0	1.200	27.5	2.400	38.3	5.000	54.6	8.000	68.7
0.400	27.4	1.400	29.6	2.600	39.8	5.500	57.2	8.500	70.7
0.500	27.2	1.600	31.5	3.000	42.7	6.000	59.7	9.000	72.7
0.600	26.7	1.800	33.4	3.500	46.0	6.500	62.1	9.500	74.6

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin E
 1 in 100 Year +40% CC



Date 11/01/2022
 File Tertiary Catchment E+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.467	0.467	29.3	1556.9	O K
30 min Summer	0.599	0.599	29.3	2036.8	O K
60 min Summer	0.728	0.728	29.3	2524.2	O K
120 min Summer	0.850	0.850	29.3	2997.4	O K
180 min Summer	0.912	0.912	29.3	3247.0	O K
240 min Summer	0.950	0.950	29.3	3398.2	O K
360 min Summer	0.994	0.994	29.3	3579.8	O K
480 min Summer	1.018	1.018	29.3	3679.8	O K
600 min Summer	1.030	1.030	29.3	3730.3	O K
720 min Summer	1.035	1.035	29.3	3748.9	O K
960 min Summer	1.029	1.029	29.3	3726.0	O K
1440 min Summer	1.003	1.003	29.3	3614.8	O K
2160 min Summer	0.957	0.957	29.3	3429.5	O K
2880 min Summer	0.909	0.909	29.3	3232.1	O K
4320 min Summer	0.800	0.800	29.3	2800.0	O K
5760 min Summer	0.696	0.696	29.3	2399.3	O K
7200 min Summer	0.602	0.602	29.3	2049.2	O K
8640 min Summer	0.520	0.520	29.3	1746.5	O K
10080 min Summer	0.448	0.448	29.3	1489.6	O K
15 min Winter	0.520	0.520	29.3	1746.6	O K
30 min Winter	0.666	0.666	29.3	2285.9	O K
60 min Winter	0.809	0.809	29.3	2836.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	1406.1	26
30 min Summer	90.705	0.0	1839.6	41
60 min Summer	56.713	0.0	2502.4	70
120 min Summer	34.246	0.0	3019.5	130
180 min Summer	25.149	0.0	3317.6	190
240 min Summer	20.078	0.0	3521.8	248
360 min Summer	14.585	0.0	3812.4	366
480 min Summer	11.622	0.0	4018.0	486
600 min Summer	9.738	0.0	4165.8	604
720 min Summer	8.424	0.0	4268.6	722
960 min Summer	6.697	0.0	4351.0	960
1440 min Summer	4.839	0.0	4161.4	1182
2160 min Summer	3.490	0.0	5684.2	1560
2880 min Summer	2.766	0.0	5991.1	1968
4320 min Summer	1.989	0.0	6415.8	2772
5760 min Summer	1.573	0.0	6902.1	3528
7200 min Summer	1.311	0.0	7181.2	4264
8640 min Summer	1.129	0.0	7407.2	5016
10080 min Summer	0.994	0.0	7582.1	5656
15 min Winter	138.153	0.0	1576.9	26
30 min Winter	90.705	0.0	2040.0	41
60 min Winter	56.713	0.0	2803.3	70

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin E
 1 in 100 Year +40% CC



Date 11/01/2022
 File Tertiary Catchment E+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
120 min Winter	0.943	0.943	29.3	3372.1	O K
180 min Winter	1.012	1.012	29.3	3655.2	O K
240 min Winter	1.054	1.054	29.3	3829.2	O K
360 min Winter	1.105	1.105	29.3	4044.0	O K
480 min Winter	1.135	1.135	29.3	4168.2	O K
600 min Winter	1.151	1.151	29.3	4237.3	O K
720 min Winter	1.159	1.159	29.3	4271.3	O K
960 min Winter	1.159	1.159	29.3	4273.2	O K
1440 min Winter	1.128	1.128	29.3	4141.4	O K
2160 min Winter	1.071	1.071	29.3	3898.2	O K
2880 min Winter	1.007	1.007	29.3	3631.9	O K
4320 min Winter	0.861	0.861	29.3	3043.7	O K
5760 min Winter	0.697	0.697	29.3	2405.6	O K
7200 min Winter	0.556	0.556	29.3	1879.0	O K
8640 min Winter	0.437	0.437	29.3	1450.8	O K
10080 min Winter	0.344	0.344	29.2	1127.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
120 min Winter	34.246	0.0	3373.6	128
180 min Winter	25.149	0.0	3699.2	186
240 min Winter	20.078	0.0	3918.2	244
360 min Winter	14.585	0.0	4217.2	360
480 min Winter	11.622	0.0	4406.3	476
600 min Winter	9.738	0.0	4509.1	590
720 min Winter	8.424	0.0	4534.1	704
960 min Winter	6.697	0.0	4454.1	926
1440 min Winter	4.839	0.0	4247.7	1338
2160 min Winter	3.490	0.0	6362.6	1664
2880 min Winter	2.766	0.0	6700.6	2132
4320 min Winter	1.989	0.0	7139.4	3036
5760 min Winter	1.573	0.0	7733.1	3808
7200 min Winter	1.311	0.0	8047.8	4544
8640 min Winter	1.129	0.0	8303.4	5192
10080 min Winter	0.994	0.0	8505.9	5848

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Basin E
 1 in 100 Year +40% CC



Date 11/01/2022
 File Tertiary Catchment E+40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.120

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 2.040	4	8 2.040	8	12 2.040

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Basin E 1 in 100 Year +40% CC	
Date 11/01/2022 File Tertiary Catchment E+40%.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	3112.0	1.500	4677.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0232-2950-1200-2950
Design Head (m)	1.200
Design Flow (l/s)	29.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	232
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	29.5	Kick-Flo®	0.855	25.1
Flush-Flo™	0.405	29.3	Mean Flow over Head Range	-	24.8

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)	Depth (m)	Flow (l/s)
0.100	7.7	0.800	26.5	2.000	37.7	4.000	52.6	7.000	69.1
0.200	23.4	1.000	27.0	2.200	39.4	4.500	55.7	7.500	71.4
0.300	28.9	1.200	29.5	2.400	41.1	5.000	58.7	8.000	73.7
0.400	29.3	1.400	31.7	2.600	42.7	5.500	61.4	8.500	75.9
0.500	29.1	1.600	33.8	3.000	45.8	6.000	64.1	9.000	78.1
0.600	28.7	1.800	35.8	3.500	49.3	6.500	66.6	9.500	80.1

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

SWINDON EV Phase 1
 1 in 100year (+40%cc)
 Detention Basin F



Date 11/01/2022
 File Tertiary Catchment F +40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.405	0.405	6.5	344.8	O K
30 min Summer	0.510	0.510	6.5	451.5	O K
60 min Summer	0.611	0.611	6.5	559.9	O K
120 min Summer	0.703	0.703	6.5	665.0	O K
180 min Summer	0.749	0.749	6.5	720.4	O K
240 min Summer	0.777	0.777	6.5	754.6	O K
360 min Summer	0.811	0.811	6.5	796.8	O K
480 min Summer	0.830	0.830	6.5	821.3	O K
600 min Summer	0.841	0.841	6.5	834.8	O K
720 min Summer	0.846	0.846	6.5	841.4	O K
960 min Summer	0.846	0.846	6.5	841.2	O K
1440 min Summer	0.829	0.829	6.5	818.9	O K
2160 min Summer	0.799	0.799	6.5	782.1	O K
2880 min Summer	0.769	0.769	6.5	745.1	O K
4320 min Summer	0.710	0.710	6.5	673.6	O K
5760 min Summer	0.653	0.653	6.5	607.7	O K
7200 min Summer	0.599	0.599	6.5	546.6	O K
8640 min Summer	0.547	0.547	6.5	489.6	O K
10080 min Summer	0.494	0.494	6.5	434.7	O K
15 min Winter	0.447	0.447	6.5	386.7	O K
30 min Winter	0.562	0.562	6.5	506.4	O K
60 min Winter	0.671	0.671	6.5	628.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	138.153	0.0	319.4	27
30 min Summer	90.705	0.0	384.5	41
60 min Summer	56.713	0.0	557.9	70
120 min Summer	34.246	0.0	668.1	130
180 min Summer	25.149	0.0	727.7	190
240 min Summer	20.078	0.0	763.4	248
360 min Summer	14.585	0.0	795.3	368
480 min Summer	11.622	0.0	797.2	486
600 min Summer	9.738	0.0	784.0	604
720 min Summer	8.424	0.0	770.3	724
960 min Summer	6.697	0.0	773.3	962
1440 min Summer	4.839	0.0	773.8	1240
2160 min Summer	3.490	0.0	1258.2	1612
2880 min Summer	2.766	0.0	1323.2	2020
4320 min Summer	1.989	0.0	1356.6	2852
5760 min Summer	1.573	0.0	1525.5	3688
7200 min Summer	1.311	0.0	1588.1	4472
8640 min Summer	1.129	0.0	1639.8	5280
10080 min Summer	0.994	0.0	1681.6	6144
15 min Winter	138.153	0.0	351.0	27
30 min Winter	90.705	0.0	389.8	41
60 min Winter	56.713	0.0	622.6	70

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

SWINDON EV Phase 1
 1 in 100year (+40%cc)
 Detention Basin F



Date 11/01/2022
 File Tertiary Catchment F +40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
120 min Winter	0.771	0.771	6.5	747.3	O K
180 min Winter	0.822	0.822	6.5	811.1	O K
240 min Winter	0.854	0.854	6.5	851.0	O K
360 min Winter	0.893	0.893	6.5	901.4	O K
480 min Winter	0.916	0.916	6.5	932.0	O K
600 min Winter	0.929	0.929	6.5	950.4	O K
720 min Winter	0.937	0.937	6.5	960.9	O K
960 min Winter	0.942	0.942	6.5	967.3	O K
1440 min Winter	0.928	0.928	6.5	948.7	O K
2160 min Winter	0.892	0.892	6.5	900.2	O K
2880 min Winter	0.855	0.855	6.5	852.1	O K
4320 min Winter	0.774	0.774	6.5	750.8	O K
5760 min Winter	0.692	0.692	6.5	652.7	O K
7200 min Winter	0.610	0.610	6.5	558.7	O K
8640 min Winter	0.523	0.523	6.5	464.3	O K
10080 min Winter	0.384	0.384	6.5	324.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
120 min Winter	34.246	0.0	738.9	128
180 min Winter	25.149	0.0	791.0	186
240 min Winter	20.078	0.0	809.7	244
360 min Winter	14.585	0.0	806.9	360
480 min Winter	11.622	0.0	793.6	476
600 min Winter	9.738	0.0	802.1	592
720 min Winter	8.424	0.0	811.0	706
960 min Winter	6.697	0.0	820.8	932
1440 min Winter	4.839	0.0	819.2	1360
2160 min Winter	3.490	0.0	1405.3	1696
2880 min Winter	2.766	0.0	1470.6	2164
4320 min Winter	1.989	0.0	1414.7	3076
5760 min Winter	1.573	0.0	1708.7	3976
7200 min Winter	1.311	0.0	1778.7	4832
8640 min Winter	1.129	0.0	1837.1	5712
10080 min Winter	0.994	0.0	1885.1	6752

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

SWINDON EV Phase 1
 1 in 100year (+40%cc)
 Detention Basin F



Date 11/01/2022
 File Tertiary Catchment F +40%.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.350

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.450		0.450		0.450

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	SWINDON EV Phase 1 1 in 100year (+40%cc) Detention Basin F	
Date 11/01/2022 File Tertiary Catchment F +40%.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	733.0	1.500	1808.0


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-CHE-0111-6500-1200-6500
Design Head (m)	1.200
Design Flow (l/s)	6.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	No
Diameter (mm)	111
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	6.5	Kick-Flo®	0.370	3.7
Flush-Flo™	0.263	6.5	Mean Flow over Head Range	-	4.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	5.3	2.000	8.3	4.000	11.7	7.000	15.4
0.200	5.7	1.000	5.9	2.200	8.7	4.500	12.4	7.500	15.9
0.300	5.6	1.200	6.5	2.400	9.1	5.000	13.1	8.000	16.5
0.400	3.8	1.400	7.0	2.600	9.5	5.500	13.7	8.500	17.0
0.500	4.2	1.600	7.5	3.000	10.2	6.000	14.3	9.000	17.4
0.600	4.6	1.800	7.9	3.500	11.0	6.500	14.9	9.500	17.9

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Storage Swale 1A 1 in 100 Year + 40% CC	
Date 11/01/2022 File Storage Swale 1A.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

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

Half Drain Time : 1224 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.500	0.500	0.0	2.6	2.6	133.8	O K
30 min Summer	0.580	0.580	0.0	2.6	2.6	175.0	O K
60 min Summer	0.652	0.652	0.0	2.6	2.6	216.4	O K
120 min Summer	0.713	0.713	0.0	2.6	2.6	255.1	O K
180 min Summer	0.742	0.742	0.0	2.6	2.6	274.5	O K
240 min Summer	0.759	0.759	0.0	2.6	2.6	285.6	O K
360 min Summer	0.776	0.776	0.0	2.6	2.6	297.7	O K
480 min Summer	0.783	0.783	0.0	2.6	2.6	303.0	O K
600 min Summer	0.785	0.785	0.0	2.6	2.6	304.2	O K
720 min Summer	0.783	0.783	0.0	2.6	2.6	302.8	O K
960 min Summer	0.773	0.773	0.0	2.6	2.6	295.5	O K
1440 min Summer	0.747	0.747	0.0	2.6	2.6	277.4	O K
2160 min Summer	0.714	0.714	0.0	2.6	2.6	255.8	O K
2880 min Summer	0.685	0.685	0.0	2.6	2.6	237.0	O K
4320 min Summer	0.624	0.624	0.0	2.6	2.6	200.2	O K
5760 min Summer	0.555	0.555	0.0	2.6	2.6	161.6	O K
7200 min Summer	0.489	0.489	0.0	2.6	2.6	128.6	O K
8640 min Summer	0.426	0.426	0.0	2.6	2.6	100.6	O K
10080 min Summer	0.368	0.368	0.0	2.6	2.6	77.4	O K
15 min Winter	0.533	0.533	0.0	2.6	2.6	150.4	O K
30 min Winter	0.619	0.619	0.0	2.6	2.6	196.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	137.3	26
30 min Summer	90.705	0.0	180.3	41
60 min Summer	56.713	0.0	225.4	70
120 min Summer	34.246	0.0	272.3	130
180 min Summer	25.149	0.0	299.9	188
240 min Summer	20.078	0.0	319.2	248
360 min Summer	14.585	0.0	347.8	366
480 min Summer	11.622	0.0	369.6	486
600 min Summer	9.738	0.0	387.1	604
720 min Summer	8.424	0.0	400.9	722
960 min Summer	6.697	0.0	401.3	960
1440 min Summer	4.839	0.0	388.5	1200
2160 min Summer	3.490	0.0	499.5	1576
2880 min Summer	2.766	0.0	527.7	1988
4320 min Summer	1.989	0.0	569.4	2812
5760 min Summer	1.573	0.0	600.3	3568
7200 min Summer	1.311	0.0	625.1	4264
8640 min Summer	1.129	0.0	646.0	5016
10080 min Summer	0.994	0.0	663.9	5656
15 min Winter	138.153	0.0	153.8	26
30 min Winter	90.705	0.0	201.8	41

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 1A
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 1A.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	0.695	0.695	0.0	2.6	2.6	243.5	O K
120 min Winter	0.762	0.762	0.0	2.6	2.6	288.0	O K
180 min Winter	0.795	0.795	0.0	2.6	2.6	310.9	O K
240 min Winter	0.813	0.813	0.0	2.6	2.6	324.5	O K
360 min Winter	0.835	0.835	0.0	2.6	2.6	340.3	O K
480 min Winter	0.845	0.845	0.0	2.6	2.6	348.4	O K
600 min Winter	0.850	0.850	0.0	2.6	2.6	351.8	O K
720 min Winter	0.850	0.850	0.0	2.6	2.6	352.3	O K
960 min Winter	0.845	0.845	0.0	2.6	2.6	347.9	O K
1440 min Winter	0.819	0.819	0.0	2.6	2.6	328.6	O K
2160 min Winter	0.778	0.778	0.0	2.6	2.6	299.1	O K
2880 min Winter	0.740	0.740	0.0	2.6	2.6	273.1	O K
4320 min Winter	0.658	0.658	0.0	2.6	2.6	220.0	O K
5760 min Winter	0.552	0.552	0.0	2.6	2.6	160.1	O K
7200 min Winter	0.449	0.449	0.0	2.6	2.6	110.3	O K
8640 min Winter	0.352	0.352	0.0	2.6	2.6	71.5	O K
10080 min Winter	0.267	0.267	0.0	2.6	2.6	43.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	252.5	70
120 min Winter	34.246	0.0	304.9	128
180 min Winter	25.149	0.0	335.9	186
240 min Winter	20.078	0.0	357.6	244
360 min Winter	14.585	0.0	389.6	360
480 min Winter	11.622	0.0	405.4	476
600 min Winter	9.738	0.0	404.4	592
720 min Winter	8.424	0.0	402.2	706
960 min Winter	6.697	0.0	397.7	930
1440 min Winter	4.839	0.0	388.6	1350
2160 min Winter	3.490	0.0	559.4	1676
2880 min Winter	2.766	0.0	591.0	2140
4320 min Winter	1.989	0.0	637.7	3068
5760 min Winter	1.573	0.0	672.4	3816
7200 min Winter	1.311	0.0	700.2	4536
8640 min Winter	1.129	0.0	723.5	5184
10080 min Winter	0.994	0.0	743.6	5752

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 1A
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 1A.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.530

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.176		0.176		0.178

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6150 Knights Court	Swindon EV	
Solihull Parkway	Storage Swale 1A	
Birmingham B37 7WY	1 in 100 Year + 40% CC	
Date 11/01/2022	Designed by Brookbanks	
File Storage Swale 1A.SRCX	Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	134.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	1000.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0077-2600-1000-2600
Design Head (m)	1.000
Design Flow (l/s)	2.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	77
Invert Level (m)	0.000
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)	1.000	2.6	Kick-Flo®	0.622	2.1
Flush-Flo™	0.300	2.6	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)	Depth (m)	Flow (l/s)
0.100	2.2	0.800	2.3	2.000	3.6	4.000	4.9	7.000	6.4
0.200	2.5	1.000	2.6	2.200	3.7	4.500	5.2	7.500	6.6
0.300	2.6	1.200	2.8	2.400	3.9	5.000	5.5	8.000	6.8
0.400	2.6	1.400	3.0	2.600	4.0	5.500	5.7	8.500	7.0
0.500	2.5	1.600	3.2	3.000	4.3	6.000	6.0	9.000	7.2
0.600	2.2	1.800	3.4	3.500	4.6	6.500	6.2	9.500	7.4

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 1B
 1 in 100 Year + 40% CC



Date 11/01/2022
 File

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

Cascade Summary of Results for Storage Swale 1B.SRCX

Upstream Structures **Outflow To** **Overflow To**

Storage Swale 1A.SRCX (None) (None)

Half Drain Time : 833 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.536	0.536	0.0	8.3	8.3	297.3	O K
30 min Summer	0.595	0.595	0.0	8.3	8.3	388.4	O K
60 min Summer	0.648	0.648	0.0	8.3	8.3	479.7	O K
120 min Summer	0.692	0.692	0.0	8.3	8.3	566.2	O K
180 min Summer	0.714	0.714	0.0	8.3	8.3	609.5	O K
240 min Summer	0.725	0.725	0.0	8.3	8.3	634.2	O K
360 min Summer	0.738	0.738	0.0	8.3	8.3	661.2	O K
480 min Summer	0.743	0.743	0.0	8.3	8.3	673.1	O K
600 min Summer	0.745	0.745	0.0	8.3	8.3	675.8	O K
720 min Summer	0.743	0.743	0.0	8.3	8.3	672.7	O K
960 min Summer	0.736	0.736	0.0	8.3	8.3	656.3	O K
1440 min Summer	0.716	0.716	0.0	8.3	8.3	614.2	O K
2160 min Summer	0.692	0.692	0.0	8.3	8.3	564.7	O K
2880 min Summer	0.669	0.669	0.0	8.3	8.3	520.0	O K
4320 min Summer	0.620	0.620	0.0	8.3	8.3	430.3	O K
5760 min Summer	0.574	0.574	0.0	8.3	8.3	353.2	O K
7200 min Summer	0.525	0.525	0.0	8.3	8.3	283.2	O K
8640 min Summer	0.476	0.476	0.0	8.3	8.3	221.2	O K
10080 min Summer	0.425	0.425	0.0	8.3	8.3	167.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	442.2	26
30 min Summer	90.705	0.0	580.6	41
60 min Summer	56.713	0.0	726.1	70
120 min Summer	34.246	0.0	876.9	130
180 min Summer	25.149	0.0	965.9	190
240 min Summer	20.078	0.0	1028.2	248
360 min Summer	14.585	0.0	1120.3	366
480 min Summer	11.622	0.0	1190.4	486
600 min Summer	9.738	0.0	1246.8	604
720 min Summer	8.424	0.0	1291.1	724
960 min Summer	6.697	0.0	1290.1	960
1440 min Summer	4.839	0.0	1251.6	1228
2160 min Summer	3.490	0.0	1608.7	1600
2880 min Summer	2.766	0.0	1699.5	1996
4320 min Summer	1.989	0.0	1833.8	2768
5760 min Summer	1.573	0.0	1933.5	3528
7200 min Summer	1.311	0.0	2013.4	4320
8640 min Summer	1.129	0.0	2080.5	5016
10080 min Summer	0.994	0.0	2138.4	5664

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 1B
 1 in 100 Year + 40% CC



Date 11/01/2022
 File

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Micro Drainage

Source Control 2020.1

Cascade Summary of Results for Storage Swale 1B.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	0.561	0.561	0.0	8.3	8.3	333.9	O K
30 min Winter	0.624	0.624	0.0	8.3	8.3	436.6	O K
60 min Winter	0.680	0.680	0.0	8.3	8.3	540.6	O K
120 min Winter	0.728	0.728	0.0	8.3	8.3	639.7	O K
180 min Winter	0.751	0.751	0.0	8.3	8.3	690.9	O K
240 min Winter	0.765	0.765	0.0	8.3	8.3	721.2	O K
360 min Winter	0.780	0.780	0.0	8.3	8.3	756.7	O K
480 min Winter	0.788	0.788	0.0	8.3	8.3	775.2	O K
600 min Winter	0.792	0.792	0.0	8.3	8.3	783.2	O K
720 min Winter	0.792	0.792	0.0	8.3	8.3	784.6	O K
960 min Winter	0.788	0.788	0.0	8.3	8.3	775.0	O K
1440 min Winter	0.769	0.769	0.0	8.3	8.3	731.4	O K
2160 min Winter	0.739	0.739	0.0	8.3	8.3	663.7	O K
2880 min Winter	0.711	0.711	0.0	8.3	8.3	604.1	O K
4320 min Winter	0.644	0.644	0.0	8.3	8.3	472.4	O K
5760 min Winter	0.572	0.572	0.0	8.3	8.3	350.4	O K
7200 min Winter	0.495	0.495	0.0	8.3	8.3	244.1	O K
8640 min Winter	0.411	0.411	0.0	8.3	8.3	154.0	O K
10080 min Winter	0.320	0.320	0.0	8.3	8.3	84.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	138.153	0.0	495.2	26
30 min Winter	90.705	0.0	650.0	41
60 min Winter	56.713	0.0	813.2	70
120 min Winter	34.246	0.0	982.1	128
180 min Winter	25.149	0.0	1081.8	186
240 min Winter	20.078	0.0	1151.6	244
360 min Winter	14.585	0.0	1254.8	360
480 min Winter	11.622	0.0	1296.6	476
600 min Winter	9.738	0.0	1288.9	592
720 min Winter	8.424	0.0	1281.9	706
960 min Winter	6.697	0.0	1269.9	932
1440 min Winter	4.839	0.0	1246.5	1362
2160 min Winter	3.490	0.0	1801.8	1700
2880 min Winter	2.766	0.0	1903.5	2164
4320 min Winter	1.989	0.0	2053.8	3032
5760 min Winter	1.573	0.0	2165.5	3808
7200 min Winter	1.311	0.0	2255.1	4544
8640 min Winter	1.129	0.0	2330.1	5192
10080 min Winter	0.994	0.0	2395.0	5760

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 1B
 1 in 100 Year + 40% CC



Date 11/01/2022
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Micro Drainage

Source Control 2020.1


Cascade Rainfall Details for Storage Swale 1B.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.177

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.392		0.392		0.393

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Micro Drainage	Source Control 2020.1	

Cascade Model Details for Storage Swale 1B.SRCX

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	596.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	1000.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0134-8300-1000-8300
Design Head (m)	1.000
Design Flow (l/s)	8.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	134
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.3	Kick-Flo®	0.664	6.9
Flush-Flo™	0.300	8.3	Mean Flow over Head Range	-	7.1

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)	Depth (m)	Flow (l/s)
0.100	4.8	0.800	7.5	2.000	11.5	4.000	16.0	7.000	20.9
0.200	8.1	1.000	8.3	2.200	12.0	4.500	16.9	7.500	21.6
0.300	8.3	1.200	9.0	2.400	12.5	5.000	17.8	8.000	22.3
0.400	8.2	1.400	9.7	2.600	13.0	5.500	18.6	8.500	23.0
0.500	8.0	1.600	10.4	3.000	13.9	6.000	19.4	9.000	23.6
0.600	7.5	1.800	10.9	3.500	15.0	6.500	20.2	9.500	24.2

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 2
 1 in 100 Year + 40% CC



Date 11/01/2022
 File STORAGE SWALE 2.SRCX

Designed by Brookbanks
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Micro Drainage

Source Control 2020.1

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

Half Drain Time : 1276 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.542	0.542	0.0	4.1	4.1	214.5	O K
30 min Summer	0.623	0.623	0.0	4.1	4.1	280.5	O K
60 min Summer	0.696	0.696	0.0	4.1	4.1	346.6	O K
120 min Summer	0.758	0.758	0.0	4.1	4.1	408.5	O K
180 min Summer	0.788	0.788	0.0	4.1	4.1	439.5	O K
240 min Summer	0.804	0.804	0.0	4.1	4.1	457.2	O K
360 min Summer	0.822	0.822	0.0	4.1	4.1	476.4	O K
480 min Summer	0.829	0.829	0.0	4.1	4.1	484.6	O K
600 min Summer	0.831	0.831	0.0	4.1	4.1	486.3	O K
720 min Summer	0.828	0.828	0.0	4.1	4.1	483.8	O K
960 min Summer	0.817	0.817	0.0	4.1	4.1	471.5	O K
1440 min Summer	0.791	0.791	0.0	4.1	4.1	442.5	O K
2160 min Summer	0.759	0.759	0.0	4.1	4.1	408.9	O K
2880 min Summer	0.730	0.730	0.0	4.1	4.1	379.7	O K
4320 min Summer	0.672	0.672	0.0	4.1	4.1	324.2	O K
5760 min Summer	0.606	0.606	0.0	4.1	4.1	265.7	O K
7200 min Summer	0.537	0.537	0.0	4.1	4.1	210.2	O K
8640 min Summer	0.471	0.471	0.0	4.1	4.1	163.6	O K
10080 min Summer	0.409	0.409	0.0	4.1	4.1	124.5	O K
15 min Winter	0.576	0.576	0.0	4.1	4.1	240.9	O K
30 min Winter	0.663	0.663	0.0	4.1	4.1	315.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	219.9	26
30 min Summer	90.705	0.0	288.8	41
60 min Summer	56.713	0.0	361.1	70
120 min Summer	34.246	0.0	436.1	130
180 min Summer	25.149	0.0	480.4	188
240 min Summer	20.078	0.0	511.4	248
360 min Summer	14.585	0.0	557.2	366
480 min Summer	11.622	0.0	592.0	486
600 min Summer	9.738	0.0	620.1	604
720 min Summer	8.424	0.0	639.7	722
960 min Summer	6.697	0.0	636.0	960
1440 min Summer	4.839	0.0	616.9	1194
2160 min Summer	3.490	0.0	800.1	1564
2880 min Summer	2.766	0.0	845.3	1972
4320 min Summer	1.989	0.0	912.0	2812
5760 min Summer	1.573	0.0	961.6	3584
7200 min Summer	1.311	0.0	1001.4	4328
8640 min Summer	1.129	0.0	1034.8	5016
10080 min Summer	0.994	0.0	1063.6	5664
15 min Winter	138.153	0.0	246.3	26
30 min Winter	90.705	0.0	322.4	41

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 2
 1 in 100 Year + 40% CC



Date 11/01/2022
 File STORAGE SWALE 2.SRCX

Designed by Brookbanks
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Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	0.740	0.740	0.0	4.1	4.1	390.1	O K
120 min Winter	0.808	0.808	0.0	4.1	4.1	461.4	O K
180 min Winter	0.841	0.841	0.0	4.1	4.1	498.0	O K
240 min Winter	0.860	0.860	0.0	4.1	4.1	519.7	O K
360 min Winter	0.881	0.881	0.0	4.1	4.1	544.9	O K
480 min Winter	0.892	0.892	0.0	4.1	4.1	557.7	O K
600 min Winter	0.896	0.896	0.0	4.1	4.1	563.1	O K
720 min Winter	0.897	0.897	0.0	4.1	4.1	563.8	O K
960 min Winter	0.891	0.891	0.0	4.1	4.1	556.5	O K
1440 min Winter	0.864	0.864	0.0	4.1	4.1	524.8	O K
2160 min Winter	0.824	0.824	0.0	4.1	4.1	478.6	O K
2880 min Winter	0.787	0.787	0.0	4.1	4.1	438.0	O K
4320 min Winter	0.706	0.706	0.0	4.1	4.1	356.2	O K
5760 min Winter	0.608	0.608	0.0	4.1	4.1	267.3	O K
7200 min Winter	0.497	0.497	0.0	4.1	4.1	181.7	O K
8640 min Winter	0.395	0.395	0.0	4.1	4.1	116.0	O K
10080 min Winter	0.300	0.300	0.0	4.1	4.1	67.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	404.5	70
120 min Winter	34.246	0.0	488.5	128
180 min Winter	25.149	0.0	538.1	186
240 min Winter	20.078	0.0	572.8	244
360 min Winter	14.585	0.0	624.1	360
480 min Winter	11.622	0.0	642.7	476
600 min Winter	9.738	0.0	640.1	592
720 min Winter	8.424	0.0	637.2	706
960 min Winter	6.697	0.0	631.5	928
1440 min Winter	4.839	0.0	620.2	1348
2160 min Winter	3.490	0.0	896.1	1672
2880 min Winter	2.766	0.0	946.7	2136
4320 min Winter	1.989	0.0	1021.5	3036
5760 min Winter	1.573	0.0	1077.0	3912
7200 min Winter	1.311	0.0	1121.6	4552
8640 min Winter	1.129	0.0	1158.9	5192
10080 min Winter	0.994	0.0	1191.2	5760

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 2
 1 in 100 Year + 40% CC



Date 11/01/2022
 File STORAGE SWALE 2.SRCX

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Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.849

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

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File STORAGE SWALE 2.SRCX	Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	210.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	1000.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0096-4100-1000-4100
Design Head (m)	1.000
Design Flow (l/s)	4.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.1	Kick-Flo®	0.629	3.3
Flush-Flo™	0.294	4.1	Mean Flow over Head Range	-	3.6

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)	Depth (m)	Flow (l/s)
0.100	3.1	0.800	3.7	2.000	5.7	4.000	7.8	7.000	10.2
0.200	4.0	1.000	4.1	2.200	5.9	4.500	8.3	7.500	10.6
0.300	4.1	1.200	4.5	2.400	6.2	5.000	8.7	8.000	10.9
0.400	4.0	1.400	4.8	2.600	6.4	5.500	9.1	8.500	11.2
0.500	3.9	1.600	5.1	3.000	6.8	6.000	9.5	9.000	11.5
0.600	3.5	1.800	5.4	3.500	7.4	6.500	9.9	9.500	11.8

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Date 11/01/2022 File Cascade Swale 1A to 1B to Basin...	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Cascade Summary of Results for Storage Swale 3.SRCX

Upstream Structures Outflow To Overflow To

Tertiary Catchment A+40%.SRCX (None) (None)
Storage Swale 1B.SRCX
Storage Swale 1A.SRCX

Half Drain Time : 60 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.491	0.491	0.0	46.9	46.9	119.4	O K
30 min Summer	0.546	0.546	0.0	46.9	46.9	155.7	O K
60 min Summer	0.587	0.587	0.0	46.9	46.9	187.2	O K
120 min Summer	0.616	0.616	0.0	46.9	46.9	211.3	O K
180 min Summer	0.627	0.627	0.0	46.9	46.9	220.5	O K
240 min Summer	0.633	0.633	0.0	46.9	46.9	226.4	O K
360 min Summer	0.642	0.642	0.0	46.9	46.9	233.9	O K
480 min Summer	0.645	0.645	0.0	46.9	46.9	237.1	O K
600 min Summer	0.644	0.644	0.0	46.9	46.9	236.4	O K
720 min Summer	0.642	0.642	0.0	46.9	46.9	234.0	O K
960 min Summer	0.634	0.634	0.0	46.9	46.9	227.4	O K
1440 min Summer	0.615	0.615	0.0	46.9	46.9	210.5	O K
2160 min Summer	0.592	0.592	0.0	46.9	46.9	191.2	O K
2880 min Summer	0.578	0.578	0.0	46.9	46.9	180.1	O K
4320 min Summer	0.551	0.551	0.0	46.9	46.9	159.9	O K
5760 min Summer	0.524	0.524	0.0	46.9	46.9	140.7	O K
7200 min Summer	0.494	0.494	0.0	46.9	46.9	121.5	O K
8640 min Summer	0.457	0.457	0.0	46.9	46.9	99.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	2052.8	26
30 min Summer	90.705	0.0	2677.1	41
60 min Summer	56.713	0.0	3580.4	70
120 min Summer	34.246	0.0	4320.2	126
180 min Summer	25.149	0.0	4750.8	184
240 min Summer	20.078	0.0	5047.8	244
360 min Summer	14.585	0.0	5476.7	362
480 min Summer	11.622	0.0	5789.2	482
600 min Summer	9.738	0.0	6025.8	582
720 min Summer	8.424	0.0	6207.5	612
960 min Summer	6.697	0.0	6465.9	700
1440 min Summer	4.839	0.0	6686.3	930
2160 min Summer	3.490	0.0	8077.9	1268
2880 min Summer	2.766	0.0	8524.5	1680
4320 min Summer	1.989	0.0	9163.5	2516
5760 min Summer	1.573	0.0	9767.2	3360
7200 min Summer	1.311	0.0	10164.7	4192
8640 min Summer	1.129	0.0	10490.2	5008

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 3
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Cascade Swale 1A to 1B to Basin...

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Micro Drainage

Source Control 2020.1

Cascade Summary of Results for Storage Swale 3.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	0.410	0.410	0.0	46.9	46.9	76.4	O K
15 min Winter	0.516	0.516	0.0	46.9	46.9	135.6	O K
30 min Winter	0.574	0.574	0.0	46.9	46.9	176.5	O K
60 min Winter	0.617	0.617	0.0	46.9	46.9	212.7	O K
120 min Winter	0.651	0.651	0.0	46.9	46.9	242.7	O K
180 min Winter	0.671	0.671	0.0	46.9	46.9	261.4	O K
240 min Winter	0.685	0.685	0.0	46.9	46.9	274.4	O K
360 min Winter	0.704	0.704	0.0	46.9	46.9	293.8	O K
480 min Winter	0.719	0.719	0.0	46.9	46.9	308.8	O K
600 min Winter	0.730	0.730	0.0	46.9	46.9	320.9	O K
720 min Winter	0.739	0.739	0.0	46.9	46.9	329.6	O K
960 min Winter	0.741	0.741	0.0	46.9	46.9	332.6	O K
1440 min Winter	0.698	0.698	0.0	46.9	46.9	287.9	O K
2160 min Winter	0.608	0.608	0.0	46.9	46.9	204.5	O K
2880 min Winter	0.581	0.581	0.0	46.9	46.9	182.8	O K
4320 min Winter	0.555	0.555	0.0	46.9	46.9	162.4	O K
5760 min Winter	0.523	0.523	0.0	46.9	46.9	140.1	O K
7200 min Winter	0.469	0.469	0.0	46.9	46.9	106.5	O K
8640 min Winter	0.379	0.379	0.0	46.7	46.7	63.3	O K
10080 min Winter	0.306	0.306	0.0	45.8	45.8	37.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.994	0.0	10750.4	5648
15 min Winter	138.153	0.0	2298.4	26
30 min Winter	90.705	0.0	2962.2	40
60 min Winter	56.713	0.0	4009.3	68
120 min Winter	34.246	0.0	4828.8	126
180 min Winter	25.149	0.0	5300.4	184
240 min Winter	20.078	0.0	5620.5	244
360 min Winter	14.585	0.0	6065.2	366
480 min Winter	11.622	0.0	6364.3	494
600 min Winter	9.738	0.0	6589.4	670
720 min Winter	8.424	0.0	6766.2	820
960 min Winter	6.697	0.0	7001.6	1042
1440 min Winter	4.839	0.0	6976.2	1404
2160 min Winter	3.490	0.0	9043.8	1492
2880 min Winter	2.766	0.0	9539.7	1708
4320 min Winter	1.989	0.0	10242.7	2640
5760 min Winter	1.573	0.0	10942.3	3632
7200 min Winter	1.311	0.0	11389.1	4536
8640 min Winter	1.129	0.0	11756.2	5024
10080 min Winter	0.994	0.0	12054.7	5544

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 3
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Cascade Swale 1A to 1B to Basin...

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Cascade Rainfall Details for Storage Swale 3.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.510

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.170		0.170		0.170

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File Cascade Swale 1A to 1B to Basin...	Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Cascade Model Details for Storage Swale 3.SRCX

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	290.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0286-4690-1000-4690
Design Head (m)	1.000
Design Flow (l/s)	46.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	286
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	46.9	Kick-Flo®	0.778	41.6
Flush-Flo™	0.434	46.9	Mean Flow over Head Range	-	37.8

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)	Depth (m)	Flow (l/s)
0.100	8.9	0.800	42.1	2.000	65.5	4.000	91.7	7.000	120.6
0.200	29.5	1.000	46.9	2.200	68.6	4.500	97.2	7.500	124.7
0.300	45.6	1.200	51.2	2.400	71.6	5.000	102.3	8.000	128.7
0.400	46.8	1.400	55.1	2.600	74.4	5.500	107.2	8.500	132.6
0.500	46.7	1.600	58.8	3.000	79.8	6.000	111.8	9.000	136.3
0.600	45.8	1.800	62.3	3.500	86.0	6.500	116.3	9.500	140.0

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Date 11/01/2022 File Storage Swale 4.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

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

Half Drain Time : 1239 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.468	0.468	0.0	1.9	1.9	103.5	O K
30 min Summer	0.528	0.528	0.0	1.9	1.9	135.3	O K
60 min Summer	0.581	0.581	0.0	1.9	1.9	167.2	O K
120 min Summer	0.627	0.627	0.0	1.9	1.9	197.5	O K
180 min Summer	0.649	0.649	0.0	1.9	1.9	212.7	O K
240 min Summer	0.661	0.661	0.0	1.9	1.9	221.4	O K
360 min Summer	0.675	0.675	0.0	1.9	1.9	231.1	O K
480 min Summer	0.681	0.681	0.0	1.9	1.9	235.6	O K
600 min Summer	0.682	0.682	0.0	1.9	1.9	236.8	O K
720 min Summer	0.681	0.681	0.0	1.9	1.9	236.0	O K
960 min Summer	0.674	0.674	0.0	1.9	1.9	230.8	O K
1440 min Summer	0.654	0.654	0.0	1.9	1.9	216.3	O K
2160 min Summer	0.629	0.629	0.0	1.9	1.9	199.1	O K
2880 min Summer	0.607	0.607	0.0	1.9	1.9	184.0	O K
4320 min Summer	0.559	0.559	0.0	1.9	1.9	153.5	O K
5760 min Summer	0.511	0.511	0.0	1.9	1.9	125.8	O K
7200 min Summer	0.464	0.464	0.0	1.9	1.9	101.2	O K
8640 min Summer	0.418	0.418	0.0	1.9	1.9	79.8	O K
10080 min Summer	0.375	0.375	0.0	1.9	1.9	61.5	O K
15 min Winter	0.493	0.493	0.0	1.9	1.9	116.3	O K
30 min Winter	0.556	0.556	0.0	1.9	1.9	152.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	106.2	26
30 min Summer	90.705	0.0	139.5	41
60 min Summer	56.713	0.0	174.4	70
120 min Summer	34.246	0.0	210.6	130
180 min Summer	25.149	0.0	232.0	190
240 min Summer	20.078	0.0	247.0	248
360 min Summer	14.585	0.0	269.1	368
480 min Summer	11.622	0.0	285.9	486
600 min Summer	9.738	0.0	299.5	604
720 min Summer	8.424	0.0	305.0	724
960 min Summer	6.697	0.0	302.3	962
1440 min Summer	4.839	0.0	293.6	1240
2160 min Summer	3.490	0.0	386.4	1608
2880 min Summer	2.766	0.0	408.2	2016
4320 min Summer	1.989	0.0	440.4	2776
5760 min Summer	1.573	0.0	464.4	3568
7200 min Summer	1.311	0.0	483.6	4320
8640 min Summer	1.129	0.0	499.7	5016
10080 min Summer	0.994	0.0	513.6	5744
15 min Winter	138.153	0.0	118.9	26
30 min Winter	90.705	0.0	156.2	41

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 4
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 4.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	0.614	0.614	0.0	1.9	1.9	188.4	O K
120 min Winter	0.664	0.664	0.0	1.9	1.9	223.0	O K
180 min Winter	0.688	0.688	0.0	1.9	1.9	240.9	O K
240 min Winter	0.702	0.702	0.0	1.9	1.9	251.6	O K
360 min Winter	0.718	0.718	0.0	1.9	1.9	264.2	O K
480 min Winter	0.727	0.727	0.0	1.9	1.9	270.8	O K
600 min Winter	0.731	0.731	0.0	1.9	1.9	273.9	O K
720 min Winter	0.731	0.731	0.0	1.9	1.9	274.6	O K
960 min Winter	0.728	0.728	0.0	1.9	1.9	271.8	O K
1440 min Winter	0.710	0.710	0.0	1.9	1.9	257.7	O K
2160 min Winter	0.678	0.678	0.0	1.9	1.9	233.8	O K
2880 min Winter	0.651	0.651	0.0	1.9	1.9	213.8	O K
4320 min Winter	0.586	0.586	0.0	1.9	1.9	170.3	O K
5760 min Winter	0.511	0.511	0.0	1.9	1.9	126.1	O K
7200 min Winter	0.438	0.438	0.0	1.9	1.9	88.7	O K
8640 min Winter	0.367	0.367	0.0	1.9	1.9	58.3	O K
10080 min Winter	0.296	0.296	0.0	1.9	1.9	34.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	195.3	70
120 min Winter	34.246	0.0	235.9	128
180 min Winter	25.149	0.0	259.8	186
240 min Winter	20.078	0.0	276.6	244
360 min Winter	14.585	0.0	301.3	360
480 min Winter	11.622	0.0	303.6	476
600 min Winter	9.738	0.0	301.7	592
720 min Winter	8.424	0.0	300.0	708
960 min Winter	6.697	0.0	296.9	932
1440 min Winter	4.839	0.0	291.1	1362
2160 min Winter	3.490	0.0	432.8	1712
2880 min Winter	2.766	0.0	457.2	2168
4320 min Winter	1.989	0.0	493.3	3072
5760 min Winter	1.573	0.0	520.1	3856
7200 min Winter	1.311	0.0	541.6	4544
8640 min Winter	1.129	0.0	559.7	5200
10080 min Winter	0.994	0.0	575.2	5848

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 4
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 4.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.410

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.136		0.136		0.138

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6150 Knights Court	Swindon EV	
Solihull Parkway	Storage Swale 4	
Birmingham B37 7WY	1 in 100 Year + 40% CC	
Date 11/01/2022	Designed by Brookbanks	
File Storage Swale 4.SRCX	Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	187.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		


Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	0.000
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)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	0.800	1.8	2.000	2.7	4.000	3.8	7.000	4.9
0.200	1.9	1.000	2.0	2.200	2.9	4.500	4.0	7.500	5.1
0.300	1.9	1.200	2.2	2.400	3.0	5.000	4.2	8.000	5.2
0.400	1.9	1.400	2.3	2.600	3.1	5.500	4.4	8.500	5.4
0.500	1.8	1.600	2.5	3.000	3.3	6.000	4.6	9.000	5.5
0.600	1.6	1.800	2.6	3.500	3.5	6.500	4.7	9.500	5.7

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6150 Knights Court Solihull Parkway Birmingham B37 7WY	Swindon EV Storage Swale 5 1 in 100 Year + 40% CC	
Date 11/01/2022 File Storage Swale 5.SRCX	Designed by Brookbanks Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

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

Half Drain Time : 1290 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.421	0.421	0.0	1.5	1.5	80.9	O K
30 min Summer	0.472	0.472	0.0	1.5	1.5	105.7	O K
60 min Summer	0.519	0.519	0.0	1.5	1.5	130.7	O K
120 min Summer	0.560	0.560	0.0	1.5	1.5	154.4	O K
180 min Summer	0.579	0.579	0.0	1.5	1.5	166.4	O K
240 min Summer	0.590	0.590	0.0	1.5	1.5	173.4	O K
360 min Summer	0.602	0.602	0.0	1.5	1.5	181.3	O K
480 min Summer	0.608	0.608	0.0	1.5	1.5	185.0	O K
600 min Summer	0.610	0.610	0.0	1.5	1.5	186.2	O K
720 min Summer	0.609	0.609	0.0	1.5	1.5	185.8	O K
960 min Summer	0.604	0.604	0.0	1.5	1.5	182.2	O K
1440 min Summer	0.586	0.586	0.0	1.5	1.5	171.1	O K
2160 min Summer	0.565	0.565	0.0	1.5	1.5	157.9	O K
2880 min Summer	0.547	0.547	0.0	1.5	1.5	146.5	O K
4320 min Summer	0.506	0.506	0.0	1.5	1.5	123.6	O K
5760 min Summer	0.466	0.466	0.0	1.5	1.5	102.3	O K
7200 min Summer	0.426	0.426	0.0	1.5	1.5	83.3	O K
8640 min Summer	0.387	0.387	0.0	1.5	1.5	66.5	O K
10080 min Summer	0.350	0.350	0.0	1.5	1.5	52.1	O K
15 min Winter	0.442	0.442	0.0	1.5	1.5	90.8	O K
30 min Winter	0.497	0.497	0.0	1.5	1.5	118.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	82.9	26
30 min Summer	90.705	0.0	108.8	41
60 min Summer	56.713	0.0	136.1	70
120 min Summer	34.246	0.0	164.4	130
180 min Summer	25.149	0.0	181.1	190
240 min Summer	20.078	0.0	192.8	248
360 min Summer	14.585	0.0	210.0	366
480 min Summer	11.622	0.0	223.2	486
600 min Summer	9.738	0.0	231.0	604
720 min Summer	8.424	0.0	230.4	724
960 min Summer	6.697	0.0	228.1	962
1440 min Summer	4.839	0.0	222.0	1252
2160 min Summer	3.490	0.0	301.6	1624
2880 min Summer	2.766	0.0	318.6	2020
4320 min Summer	1.989	0.0	343.8	2812
5760 min Summer	1.573	0.0	362.5	3576
7200 min Summer	1.311	0.0	377.4	4328
8640 min Summer	1.129	0.0	390.0	5024
10080 min Summer	0.994	0.0	400.9	5752
15 min Winter	138.153	0.0	92.8	26
30 min Winter	90.705	0.0	121.1	41

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 5
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 5.SRCX

Designed by Brookbanks
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Micro Drainage

Source Control 2020.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	0.548	0.548	0.0	1.5	1.5	147.2	O K
120 min Winter	0.592	0.592	0.0	1.5	1.5	174.4	O K
180 min Winter	0.613	0.613	0.0	1.5	1.5	188.5	O K
240 min Winter	0.626	0.626	0.0	1.5	1.5	197.0	O K
360 min Winter	0.640	0.640	0.0	1.5	1.5	207.0	O K
480 min Winter	0.648	0.648	0.0	1.5	1.5	212.5	O K
600 min Winter	0.652	0.652	0.0	1.5	1.5	215.1	O K
720 min Winter	0.653	0.653	0.0	1.5	1.5	216.0	O K
960 min Winter	0.651	0.651	0.0	1.5	1.5	214.3	O K
1440 min Winter	0.636	0.636	0.0	1.5	1.5	204.0	O K
2160 min Winter	0.609	0.609	0.0	1.5	1.5	185.6	O K
2880 min Winter	0.585	0.585	0.0	1.5	1.5	170.5	O K
4320 min Winter	0.533	0.533	0.0	1.5	1.5	138.6	O K
5760 min Winter	0.470	0.470	0.0	1.5	1.5	104.4	O K
7200 min Winter	0.408	0.408	0.0	1.5	1.5	75.2	O K
8640 min Winter	0.347	0.347	0.0	1.5	1.5	50.9	O K
10080 min Winter	0.284	0.284	0.0	1.5	1.5	31.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	152.4	70
120 min Winter	34.246	0.0	184.1	128
180 min Winter	25.149	0.0	202.8	186
240 min Winter	20.078	0.0	215.9	244
360 min Winter	14.585	0.0	230.6	360
480 min Winter	11.622	0.0	229.2	478
600 min Winter	9.738	0.0	227.7	592
720 min Winter	8.424	0.0	226.4	708
960 min Winter	6.697	0.0	224.3	934
1440 min Winter	4.839	0.0	220.4	1368
2160 min Winter	3.490	0.0	337.8	1716
2880 min Winter	2.766	0.0	356.8	2172
4320 min Winter	1.989	0.0	385.0	3108
5760 min Winter	1.573	0.0	406.0	3872
7200 min Winter	1.311	0.0	422.7	4616
8640 min Winter	1.129	0.0	436.8	5280
10080 min Winter	0.994	0.0	449.0	5864

6150 Knights Court
 Solihull Parkway
 Birmingham B37 7WY

Swindon EV
 Storage Swale 5
 1 in 100 Year + 40% CC



Date 11/01/2022
 File Storage Swale 5.SRCX

Designed by Brookbanks
 Checked by N.J.Onions

Micro Drainage

Source Control 2020.1


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.320

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.110	4	8	0.110	8	12	0.100

Brookbanks Consulting		Page 4
6150 Knights Court	Swindon EV	
Solihull Parkway	Storage Swale 5	
Birmingham B37 7WY	1 in 100 Year + 40% CC	
Date 11/01/2022	Designed by Brookbanks	
File Storage Swale 5.SRCX	Checked by N.J.Onions	
Micro Drainage	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 1.200

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	188.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	1.0		

Hydro-Brake® Optimum Outflow Control

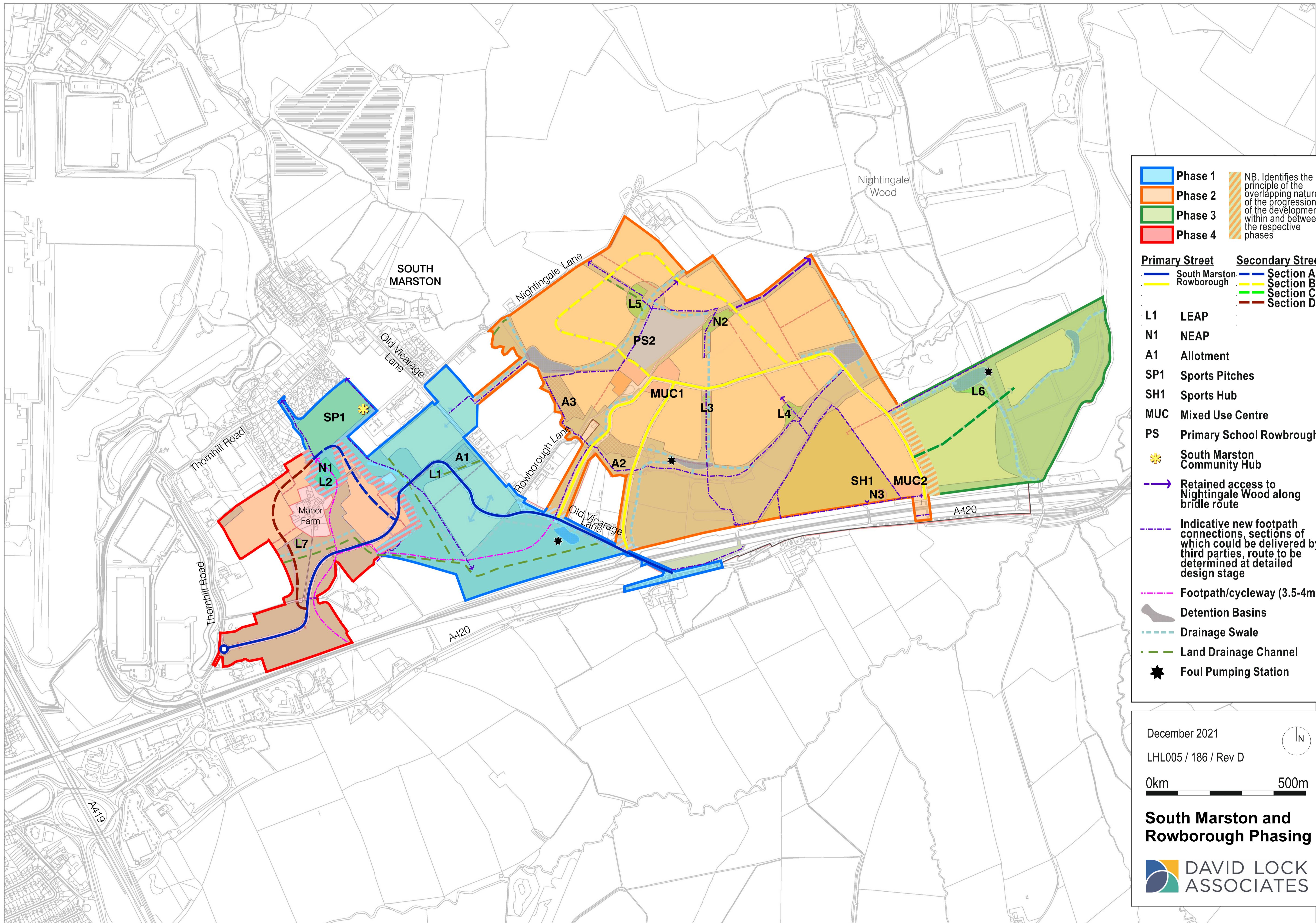
Unit Reference	MD-SHE-0060-1600-1000-1600
Design Head (m)	1.000
Design Flow (l/s)	1.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	60
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.6	Kick-Flo®	0.531	1.2
Flush-Flo™	0.262	1.5	Mean Flow over Head Range	-	1.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	0.800	1.4	2.000	2.2	4.000	3.0	7.000	3.9
0.200	1.5	1.000	1.6	2.200	2.3	4.500	3.2	7.500	4.0
0.300	1.5	1.200	1.7	2.400	2.4	5.000	3.3	8.000	4.2
0.400	1.4	1.400	1.9	2.600	2.5	5.500	3.5	8.500	4.3
0.500	1.3	1.600	2.0	3.000	2.6	6.000	3.6	9.000	4.4
0.600	1.3	1.800	2.1	3.500	2.8	6.500	3.8	9.500	4.5

Appendix F



Phase 1	NB. Identifies the principle of the overlapping nature of the progression of the development within and between the respective phases
Phase 2	
Phase 3	
Phase 4	

Primary Street		Secondary Street	
South Marston	Section A	Section B	Section C
Rowborough	Section B	Section C	Section D

L1	LEAP
N1	NEAP
A1	Allotment
SP1	Sports Pitches
SH1	Sports Hub
MUC	Mixed Use Centre
PS	Primary School Rowborough
	South Marston Community Hub
	Retained access to Nightingale Wood along bridle route
	Indicative new footpath connections, sections of which could be delivered by third parties, route to be determined at detailed design stage
	Footpath/cycleway (3.5-4m)
	Detention Basins
	Drainage Swale
	Land Drainage Channel
	Foul Pumping Station

December 2021

LHL005 / 186 / Rev D

0km 500m

South Marston and Rowborough Phasing

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