DIXON HURST
CONSULTING CIVIL & STRUCTURAL ENGINEERS

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FEH Surface Water Drainage Calculations

For
20 Homefield Road,
Worthing,
West Sussex

Date: August 2024
Project No: 62192 Rev03

18-20 HOMEFIELD ROAD, WORTHING, BN11 2HZ

AS EXISTING





N LOCATION PLAN

0m 10 20 30 40 50

1:1250 Scale Bar

N BLOCK PLAN

0m 10 20 30 40 50

1:500 Scale Bar

PRINT DRAWING AT A1

N.B. UNLESS OTHERWISE NOTED THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

IF INDICATED AS FEASIBILITY THIS DRAWING IS SUBJECT TO A DETAILED SITE INVESTIGATION, INCLUDING GROUND CONDITIONS/ CONTAMINATES, DRAINAGE DESIGN AND PLANNING / DENSITY NEGOTIATIONS. THE LAYOUT MAY BE BASED UPON AN ENLARGEMENT OF AN OS SHEET OR OTHER SMALL SCALE PLANS AND ITS ACCURACY NEEDS TO BE VERIFIED BY SURVEY. CDM REGULATIONS HAVE NOT BEEN FULLY CONSIDERED.

REV	DATE	COMMENT	BY

LANDÍVAR ARCHITECTS

Landivar Architects ltd
The Workshop
Unit 3, 29-42 Windsor Street
Brighton
BN1 1RJ

Office: 01273 739590

info@landivar-architects.com
www.landivar-architects.com

18-20 HOMEFIELD ROAD

CLIENT:		IW LEISURE LIMITED	
DRAWING STATUS:		PLANNING	
DRAWING:		OS AND BLOCK PLAN	
DRAWN:	PO	SCALE:	1:500/1:1250 @ A1
DATE:	05/ 23	REV.	-
JOB NO:	1686	DRG. NO.	1.001

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Below Ground Solutions Ltd
Unit C The Orchards, Taunton, Somerset TA2 8QN
www.belowgroundsolutions.co.uk
Tel: 08708630123

TP1 1/100 yr

		Revision	
Job No:	22668	Page:	C/01
Section:	18 Homefield Rd BN11 2HZ	Prepared By:	DJ	Date:	03/01/2024

ALTERNATIVE SOAKAWAY SIZES

	trench soakaways		
width of trench *[mm]*:	450	600	900
required trench length *[m]*:	9.04	7.07	5.00
	ring soakaways		
diameter of ring *[mm]*:	1050	1350	1500
required pit diameter *[m]*:	1.63	1.61	1.60

** Based on effective depth and number of pits as in Soakaway Data table*

SUMMARY OF CALCULATIONS

critical design rainfall duration 't_{crit}' =	600	*min*
required storage volume 'V_{req}' =	6.63	m^3
provided storage volume 'V_{prov}' =	6.79	m^3
utilisation factor =	**0.98**	***.OK***
required time to discharge 50% 't_{50}' =	18.33	*hours*
utilisation factor =	**0.76**	***.OK***

GENERAL DATA

site location:	**England and Wales**
soakaway type:	**geocellular units**
impermeable area drained to soakaway 'A' *[m^2]* =	**100**
60 min rainfall depth of 5 year return period 'R' *[mm]* =	**20**
M5-60 to M5-2d rainfall ratio 'r' =	**0.50**
allowance for climate change:	**30%**

SOAKAWAY DATA

soakaway width 'W' [m] =	**2.20**
soakaway length 'L' [m] =	**2.20**
total depth from ground level 'D_b' *[m]* =	**2.00**
depth to drain invert level 'D_d' *[m]* =	**0.35**
soakaway effective depth 'D_{eff}' *[m]* =	1.65
free volume in infill aggregate *[%]* =	**85**

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base:	**30%**
available on-site infiltration test results:	● Yes ○ No
use soakage trial pit table below	
internal surface area of trial pit 'a_{p50}' [m^2] =	5.12
storage volume between 75-25% 'V_p' [m^3] =	0.72
time for water to fall from 75-25% 't_p' [min] =	397.06
soil infiltration rate 'f' [m/s] =	5.90E-06

SOAKAGE TRIAL PIT DATA

soakage trial pit width 'W_t' *[m]* =	**0.40**
soakage trial pit length 'L_t' *[m]* =	**2.00**
total depth from ground level 'D_{tb}' *[m]* =	**1.80**
depth to pipe invert level 'D_{tp}' *[m]* =	**0.00**
soakage trial pit effective depth 'D_{teff}' *[m]* =	1.80
free volume in infill aggregate *[%]* =	**100**

NOTE: faces of excavation assumed to be verti

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

rainfall duration *[min]*	rainfall factor Z1	M5-D rainfalls *[mm]*	M1-D Z2	M1-D rainfalls *[mm]*	M1-D inflow *[m^3]*	M100-D Z2	M100-D rainfalls *[mm]*	M100-D inflow *[m^3]*	ignore Z2	ignore rainfalls *[mm]*	ignore inflow *[m^3]*	outflow from soakaway *[m^3]*	required storage *[m^3]*
5	0.39	7.80	0.61	6.23	0.62	1.86	18.83	1.88				0.02	1.87
10	0.54	10.80	0.61	8.59	0.86	1.92	27.00	2.70				0.03	2.67
15	0.65	13.00	0.62	10.41	1.04	1.96	33.09	3.31				0.05	3.26
30	0.82	16.40	0.63	13.34	1.33	2.00	42.67	4.27				0.09	4.17
60	1.00	20.00	0.64	16.64	1.66	2.03	52.78	5.28				0.19	5.09
120	1.19	23.80	0.66	20.27	2.03	2.01	62.34	6.23				0.37	5.86
240	1.38	27.60	0.67	24.05	2.41	1.99	71.37	7.14				0.74	6.40
360	1.51	30.20	0.68	26.71	2.67	1.97	77.28	7.73				1.11	6.62
600	1.68	33.60	0.69	30.02	3.00	1.94	84.79	8.48				1.85	**6.63**
1440	2.03	40.60	0.70	37.01	3.70	1.89	99.50	9.95				4.44	5.51

** Z2 is growth factor from M5 rainfalls*

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS

	water level measurement N °:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Soakage Trial 1	time *[min]* =	0	45	180	225	450	578													
	depth to water *[m]* =	0.00	0.10	0.32	0.41	0.90	1.62													
Soakage Trial 2	time *[min]* =	0	45	200	260	520	600													
	depth to water *[m]* =	0.00	0.10	0.40	0.50	1.32	1.72													
Soakage Trial 3	time *[min]* =	0	45	180	225	675														
	depth to water *[m]* =	0.00	0.10	0.32	0.41	1.43														

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Project:	18 Homefield Road, Worthing			**By:**
Calculation:	Soakaway Design			JS
	Infiltration Rate - Test			**Approved:**
Sheet Number:	1	**Date:**	Jan-24	JS

Infiltration Test (BRE 365)

Trial Pit Details

Total Pit Depth	1.62	m
Total Pit Length	2	m
Total Pit Width	0.4	m

Test Results

	Time (Mins)	Water Level (From Base)
1	0	1.62
2	45	1.52
3	180	1.30
4	225	1.20
5	450	0.72
6	578	0.00
7		
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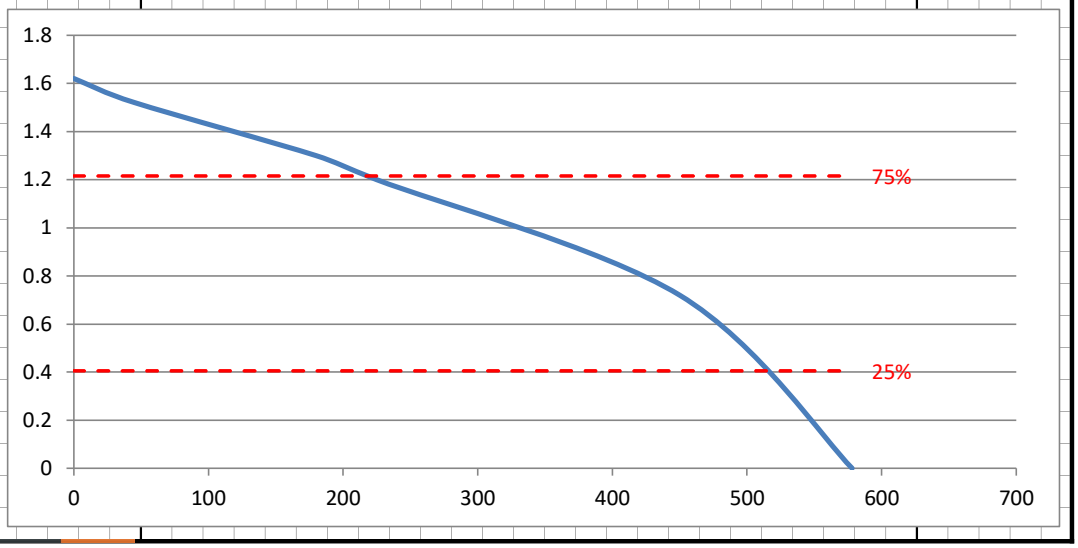

DIXON HURST Consulting Civil & Structural Engineers	**Project:**	18 Homefield Road, Worthing			**By:**
	Calculation:	Soakaway Design			JS
		Infiltration Rate - Test 1			**Approved:**
	Sheet Number:	2	**Date:**	Oct-21	JS

Results

Time to reach 75% depth:	218.3	mins
Time to reach 25% depth:	506.0	mins
Soil Infiltration Rate:	**8.0061E-06**	m/s
	0.028821947	m/hr

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CONSULTING CIVIL & STRUCTURAL ENGINEERS

Project:	18 Homefield Road, Worthing			**By:**
Calculation:	Soakaway Design			JS
	Infiltration Rate - Test 2			**Approved:**
Sheet Number:	1	**Date:**	Jan-24	JS

Infiltration Test (BRE 365)

Trial Pit Details

Total Pit Depth	1.72	m
Total Pit Length	2	m
Total Pit Width	0.4	m

Test Results

	Time (Mins)	Water Level (From Base)
1	0	1.72
2	45	1.62
3	200	1.22
4	260	1.12
5	520	0.30
6	600	0.00
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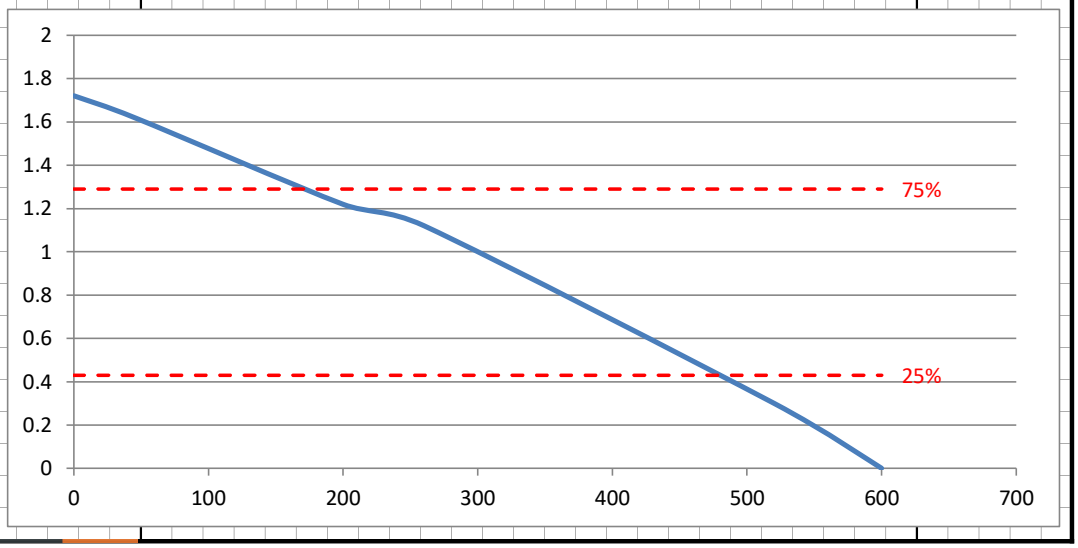

DIXON HURST CONSULTING CIVIL & STRUCTURAL ENGINEERS	**Project:**	18 Homefield Road, Worthing			**By:**
	Calculation:	Soakaway Design			JS
		Infiltration Rate - Test 2			**Approved:**
	Sheet Number:	2	**Date:**	Mar-21	JS

Results

Time to reach 75% depth:	172.9	mins
Time to reach 25% depth:	478.8	mins
Soil Infiltration Rate:	**7.6064E-06**	m/s
	0.027383044	m/hr

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DIXON HURST	Project:	18 Homefield Road, Worthing		By:
Consulting Civil & Structural Engineers	Calculation:	Soakaway Design		JS
		Infiltration Rate - Test 3		Approved:
	Sheet Number:	1	Date: Jan-24	JS

Infiltration Test (BRE 365)

Trial Pit Details

Total Pit Depth	1.43	m
Total Pit Length	2	m
Total Pit Width	0.4	m

Test Results

	Time (Mins)	Water Level (From Base)
1	0	1.43
2	45	1.33
3	180	1.11
4	225	1.02
5	675	0.00
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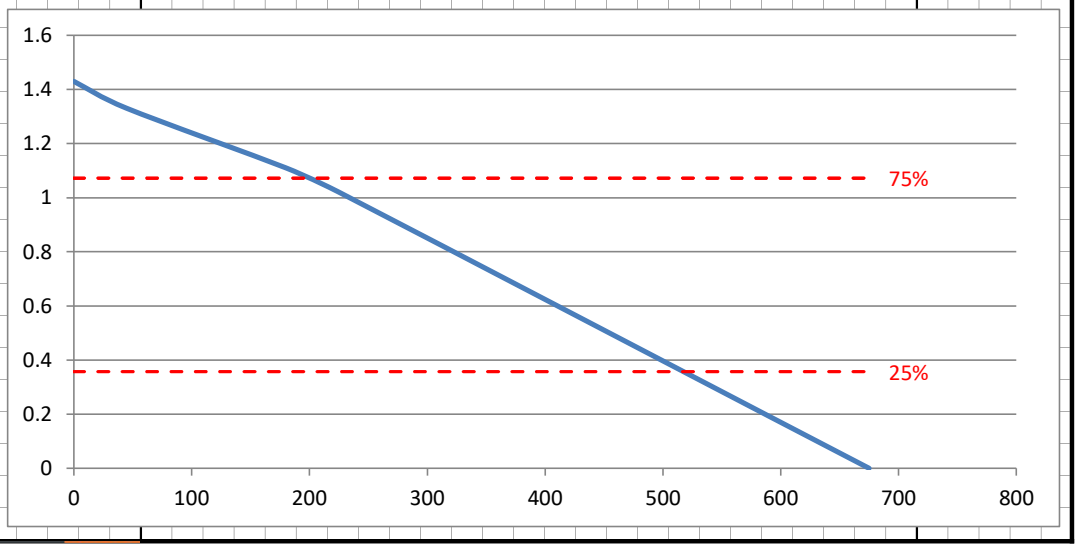

DIXON HURST Consulting Civil & Structural Engineers	**Project:**	18 Homefield Road, Worthing	**By:**
	Calculation:	Soakaway Design	JS
		Infiltration Rate - Test 3	**Approved:**
	Sheet Number:	2 **Date:**	JS

Results

Time to reach 75% depth:	198.8	mins
Time to reach 25% depth:	517.3	mins
Soil Infiltration Rate:	**7.07212E-06**	m/s
	0.02545963	m/hr

Summary of Results for 1 year Return Period (+45%)

Half Drain Time : 1413 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.235	0.035	0.0	0.5	O K
30 min Summer	4.246	0.046	0.0	0.7	O K
60 min Summer	4.260	0.060	0.0	0.9	O K
120 min Summer	4.278	0.078	0.0	1.2	O K
180 min Summer	4.290	0.090	0.0	1.4	O K
240 min Summer	4.299	0.099	0.0	1.5	O K
360 min Summer	4.313	0.113	0.0	1.7	O K
480 min Summer	4.323	0.123	0.0	1.9	O K
600 min Summer	4.331	0.131	0.0	2.0	O K
720 min Summer	4.337	0.137	0.0	2.1	O K
960 min Summer	4.343	0.143	0.0	2.2	O K
1440 min Summer	4.351	0.151	0.0	2.3	O K
2160 min Summer	4.359	0.159	0.0	2.4	O K
2880 min Summer	4.363	0.163	0.0	2.5	O K
4320 min Summer	4.368	0.168	0.0	2.6	O K
5760 min Summer	4.368	0.168	0.0	2.6	O K
7200 min Summer	4.367	0.167	0.0	2.5	O K
8640 min Summer	4.364	0.164	0.0	2.5	O K
10080 min Summer	4.361	0.161	0.0	2.5	O K
15 min Winter	4.235	0.035	0.0	0.5	O K
30 min Winter	4.246	0.046	0.0	0.7	O K
60 min Winter	4.260	0.060	0.0	0.9	O K
120 min Winter	4.278	0.078	0.0	1.2	O K
180 min Winter	4.290	0.090	0.0	1.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	35.669	27
30 min Summer	23.451	41
60 min Summer	15.418	70
120 min Summer	10.137	130
180 min Summer	7.932	188
240 min Summer	6.665	248
360 min Summer	5.215	366
480 min Summer	4.382	484
600 min Summer	3.829	602
720 min Summer	3.429	722
960 min Summer	2.828	878
1440 min Summer	2.155	1110
2160 min Summer	1.642	1496
2880 min Summer	1.354	1908
4320 min Summer	1.049	2728
5760 min Summer	0.875	3528
7200 min Summer	0.760	4328
8640 min Summer	0.677	5104
10080 min Summer	0.614	5864
15 min Winter	35.669	27
30 min Winter	23.451	41
60 min Winter	15.418	70
120 min Winter	10.137	128
180 min Winter	7.932	186

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Summary of Results for 1 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	4.299	0.099	0.0	1.5	O K
360 min Winter	4.314	0.114	0.0	1.7	O K
480 min Winter	4.324	0.124	0.0	1.9	O K
600 min Winter	4.332	0.132	0.0	2.0	O K
720 min Winter	4.338	0.138	0.0	2.1	O K
960 min Winter	4.344	0.144	0.0	2.2	O K
1440 min Winter	4.352	0.152	0.0	2.3	O K
2160 min Winter	4.358	0.158	0.0	2.4	O K
2880 min Winter	4.360	0.160	0.0	2.4	O K
4320 min Winter	4.361	0.161	0.0	2.4	O K
5760 min Winter	4.358	0.158	0.0	2.4	O K
7200 min Winter	4.353	0.153	0.0	2.3	O K
8640 min Winter	4.348	0.148	0.0	2.3	O K
10080 min Winter	4.343	0.143	0.0	2.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	6.665	244
360 min Winter	5.215	360
480 min Winter	4.382	474
600 min Winter	3.829	588
720 min Winter	3.429	698
960 min Winter	2.828	912
1440 min Winter	2.155	1138
2160 min Winter	1.642	1600
2880 min Winter	1.354	2052
4320 min Winter	1.049	2936
5760 min Winter	0.875	3760
7200 min Winter	0.760	4608
8640 min Winter	0.677	5376
10080 min Winter	0.614	6168

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.006

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.002	4-8	0.002	8-12	0.002

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Model Details

Storage is Online Cover Level (m) 5.270

Cellular Storage Structure

Invert Level (m) 4.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02550

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	16.0	16.0	0.800	0.0	39.8
0.700	16.0	39.8			

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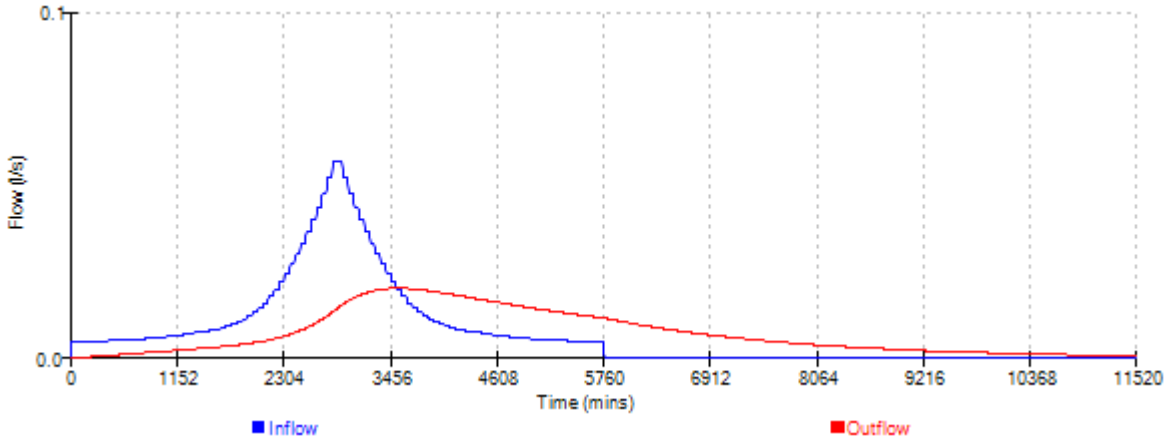
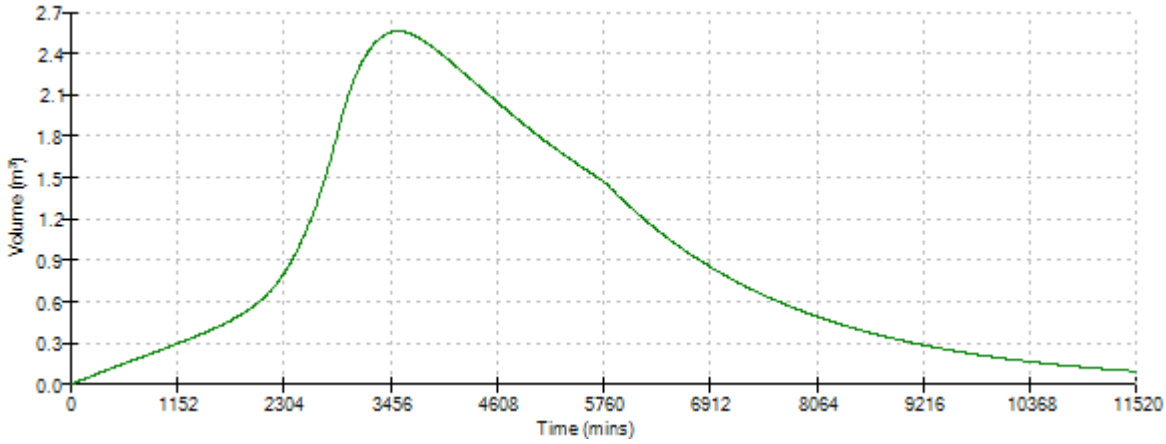
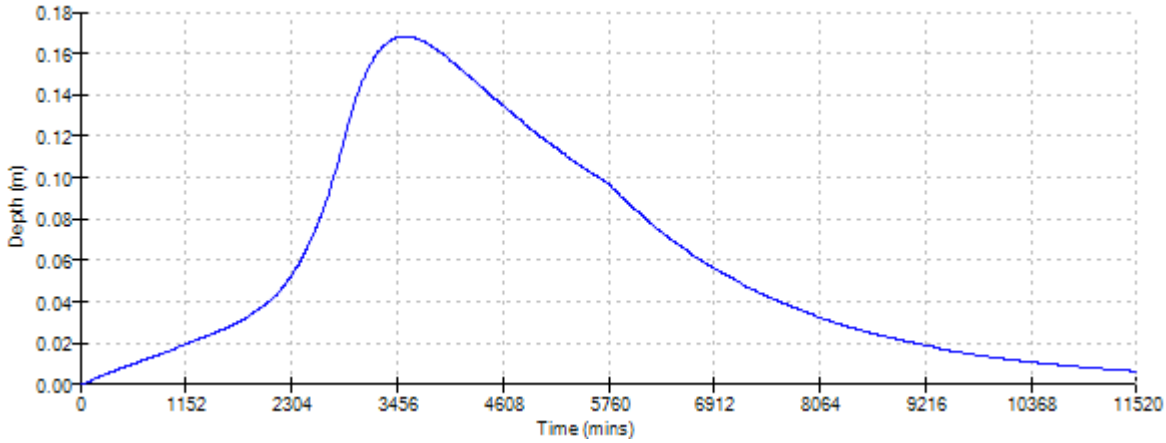
Event: 5760 min Summer







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Summary of Results for 30 year Return Period (+45%)

Half Drain Time : 1404 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.315	0.115	0.0	1.7	O K
30 min Summer	4.341	0.141	0.0	2.1	O K
60 min Summer	4.373	0.173	0.0	2.6	O K
120 min Summer	4.411	0.211	0.0	3.2	O K
180 min Summer	4.435	0.235	0.0	3.6	O K
240 min Summer	4.453	0.253	0.0	3.8	O K
360 min Summer	4.478	0.278	0.0	4.2	O K
480 min Summer	4.495	0.295	0.0	4.5	O K
600 min Summer	4.508	0.308	0.0	4.7	O K
720 min Summer	4.516	0.316	0.0	4.8	O K
960 min Summer	4.521	0.321	0.0	4.9	O K
1440 min Summer	4.528	0.328	0.0	5.0	O K
2160 min Summer	4.532	0.332	0.0	5.0	O K
2880 min Summer	4.531	0.331	0.0	5.0	O K
4320 min Summer	4.529	0.329	0.0	5.0	O K
5760 min Summer	4.521	0.321	0.0	4.9	O K
7200 min Summer	4.512	0.312	0.0	4.7	O K
8640 min Summer	4.502	0.302	0.0	4.6	O K
10080 min Summer	4.492	0.292	0.0	4.4	O K
15 min Winter	4.315	0.115	0.0	1.7	O K
30 min Winter	4.341	0.141	0.0	2.1	O K
60 min Winter	4.373	0.173	0.0	2.6	O K
120 min Winter	4.411	0.211	0.0	3.2	O K
180 min Winter	4.435	0.235	0.0	3.6	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	117.169	27
30 min Summer	72.307	41
60 min Summer	44.622	70
120 min Summer	27.537	130
180 min Summer	20.763	188
240 min Summer	16.994	248
360 min Summer	12.813	366
480 min Summer	10.487	484
600 min Summer	8.978	602
720 min Summer	7.907	722
960 min Summer	6.352	880
1440 min Summer	4.665	1110
2160 min Summer	3.426	1496
2880 min Summer	2.752	1908
4320 min Summer	2.053	2728
5760 min Summer	1.668	3528
7200 min Summer	1.420	4328
8640 min Summer	1.244	5104
10080 min Summer	1.113	5864
15 min Winter	117.169	27
30 min Winter	72.307	41
60 min Winter	44.622	70
120 min Winter	27.537	128
180 min Winter	20.763	186

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Summary of Results for 30 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	4.453	0.253	0.0	3.9	O K
360 min Winter	4.479	0.279	0.0	4.2	O K
480 min Winter	4.497	0.297	0.0	4.5	O K
600 min Winter	4.509	0.309	0.0	4.7	O K
720 min Winter	4.518	0.318	0.0	4.8	O K
960 min Winter	4.524	0.324	0.0	4.9	O K
1440 min Winter	4.528	0.328	0.0	5.0	O K
2160 min Winter	4.529	0.329	0.0	5.0	O K
2880 min Winter	4.524	0.324	0.0	4.9	O K
4320 min Winter	4.514	0.314	0.0	4.8	O K
5760 min Winter	4.501	0.301	0.0	4.6	O K
7200 min Winter	4.486	0.286	0.0	4.4	O K
8640 min Winter	4.473	0.273	0.0	4.1	O K
10080 min Winter	4.460	0.260	0.0	3.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	16.994	244
360 min Winter	12.813	360
480 min Winter	10.487	474
600 min Winter	8.978	588
720 min Winter	7.907	698
960 min Winter	6.352	912
1440 min Winter	4.665	1138
2160 min Winter	3.426	1600
2880 min Winter	2.752	2052
4320 min Winter	2.053	2936
5760 min Winter	1.668	3760
7200 min Winter	1.420	4608
8640 min Winter	1.244	5376
10080 min Winter	1.113	6168

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.006

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.002	4-8	0.002	8-12	0.002

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Model Details

Storage is Online Cover Level (m) 5.270

Cellular Storage Structure

Invert Level (m) 4.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02550

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	16.0	16.0	0.800	0.0	39.8
0.700	16.0	39.8			

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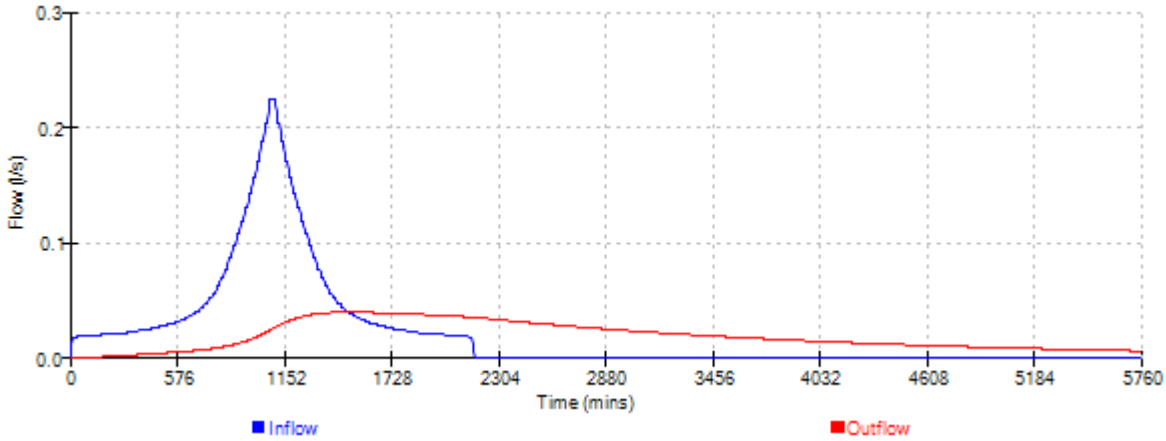
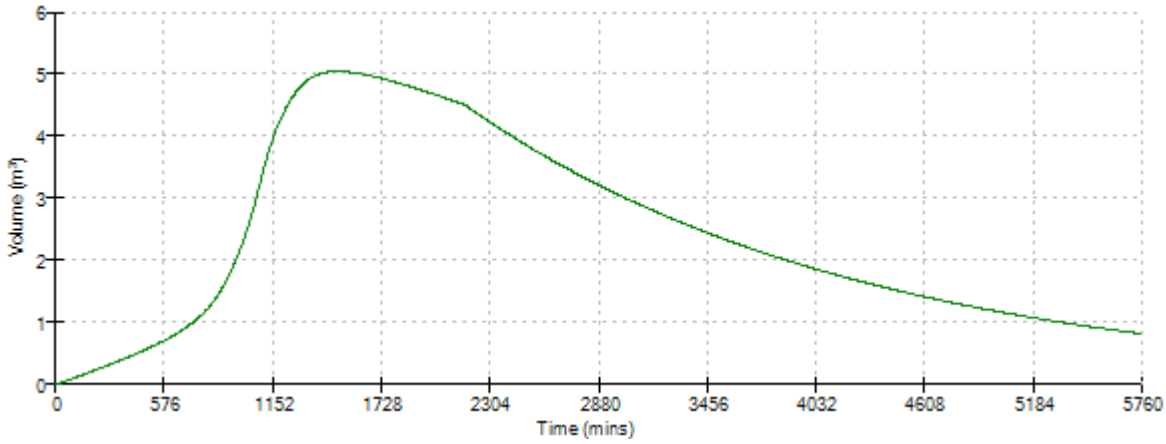
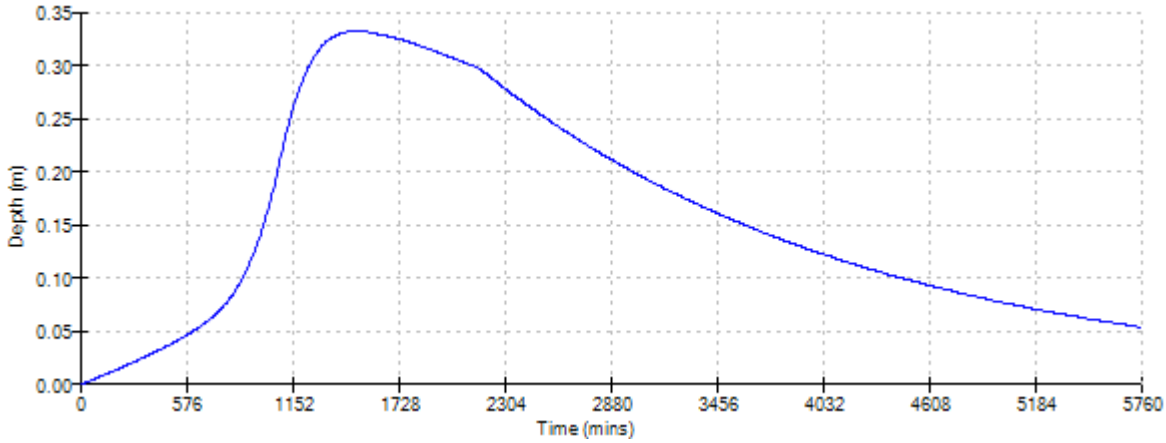
Event: 2160 min Summer







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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 1417 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.376	0.176	0.0	2.7	O K
30 min Summer	4.412	0.212	0.0	3.2	O K
60 min Summer	4.454	0.254	0.0	3.9	O K
120 min Summer	4.502	0.302	0.0	4.6	O K
180 min Summer	4.532	0.332	0.0	5.0	O K
240 min Summer	4.554	0.354	0.0	5.4	O K
360 min Summer	4.584	0.384	0.0	5.8	O K
480 min Summer	4.604	0.404	0.0	6.1	O K
600 min Summer	4.618	0.418	0.1	6.3	O K
720 min Summer	4.627	0.427	0.1	6.5	O K
960 min Summer	4.630	0.430	0.1	6.5	O K
1440 min Summer	4.633	0.433	0.1	6.6	O K
2160 min Summer	4.632	0.432	0.1	6.6	O K
2880 min Summer	4.627	0.427	0.1	6.5	O K
4320 min Summer	4.619	0.419	0.1	6.4	O K
5760 min Summer	4.605	0.405	0.0	6.2	O K
7200 min Summer	4.590	0.390	0.0	5.9	O K
8640 min Summer	4.576	0.376	0.0	5.7	O K
10080 min Summer	4.562	0.362	0.0	5.5	O K
15 min Winter	4.376	0.176	0.0	2.7	O K
30 min Winter	4.412	0.212	0.0	3.2	O K
60 min Winter	4.454	0.254	0.0	3.9	O K
120 min Winter	4.502	0.302	0.0	4.6	O K
180 min Winter	4.533	0.333	0.0	5.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	179.630	27
30 min Summer	108.360	41
60 min Summer	65.367	70
120 min Summer	39.431	130
180 min Summer	29.338	188
240 min Summer	23.787	248
360 min Summer	17.698	366
480 min Summer	14.349	484
600 min Summer	12.194	602
720 min Summer	10.676	722
960 min Summer	8.495	880
1440 min Summer	6.156	1110
2160 min Summer	4.461	1496
2880 min Summer	3.550	1908
4320 min Summer	2.614	2728
5760 min Summer	2.103	3528
7200 min Summer	1.777	4328
8640 min Summer	1.549	5104
10080 min Summer	1.378	5864
15 min Winter	179.630	27
30 min Winter	108.360	41
60 min Winter	65.367	70
120 min Winter	39.431	128
180 min Winter	29.338	186

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	4.555	0.355	0.0	5.4	O K
360 min Winter	4.585	0.385	0.0	5.9	O K
480 min Winter	4.606	0.406	0.0	6.2	O K
600 min Winter	4.620	0.420	0.1	6.4	O K
720 min Winter	4.630	0.430	0.1	6.5	O K
960 min Winter	4.633	0.433	0.1	6.6	O K
1440 min Winter	4.633	0.433	0.1	6.6	O K
2160 min Winter	4.628	0.428	0.1	6.5	O K
2880 min Winter	4.618	0.418	0.1	6.4	O K
4320 min Winter	4.600	0.400	0.0	6.1	O K
5760 min Winter	4.579	0.379	0.0	5.8	O K
7200 min Winter	4.559	0.359	0.0	5.4	O K
8640 min Winter	4.539	0.339	0.0	5.2	O K
10080 min Winter	4.522	0.322	0.0	4.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	23.787	244
360 min Winter	17.698	360
480 min Winter	14.349	474
600 min Winter	12.194	588
720 min Winter	10.676	698
960 min Winter	8.495	912
1440 min Winter	6.156	1138
2160 min Winter	4.461	1600
2880 min Winter	3.550	2052
4320 min Winter	2.614	2936
5760 min Winter	2.103	3760
7200 min Winter	1.777	4608
8640 min Winter	1.549	5376
10080 min Winter	1.378	6168

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.006

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.002	4-8	0.002	8-12	0.002

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Model Details

Storage is Online Cover Level (m) 5.270

Cellular Storage Structure

Invert Level (m) 4.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02550

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	16.0	16.0	0.800	0.0	39.8
0.700	16.0	39.8			

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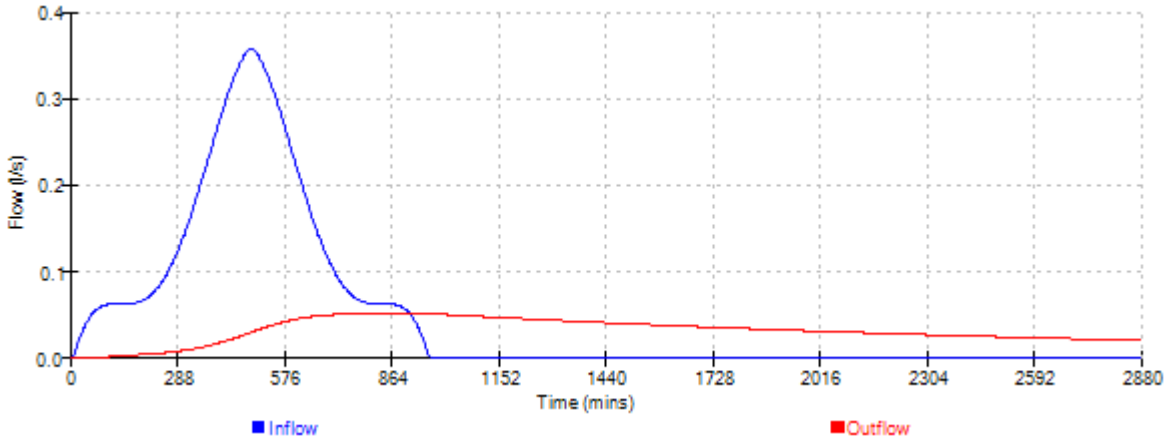
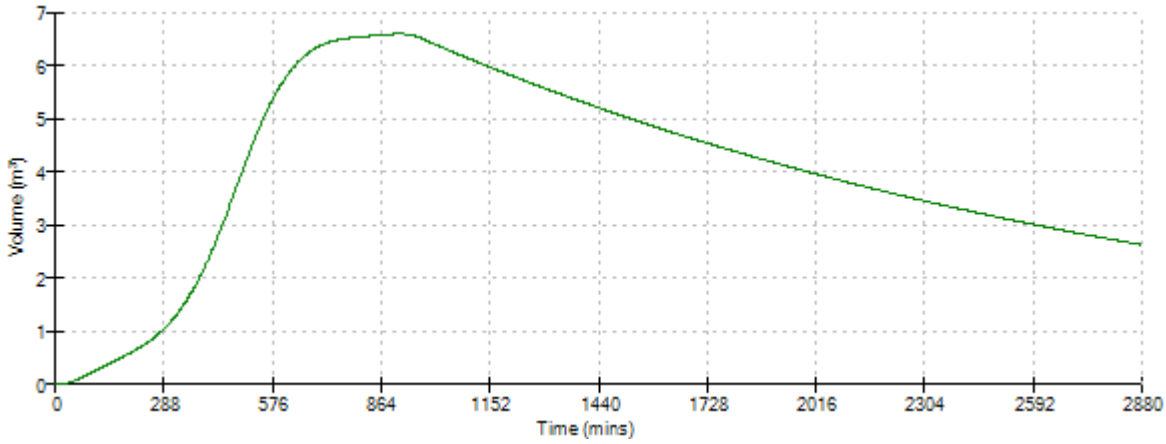
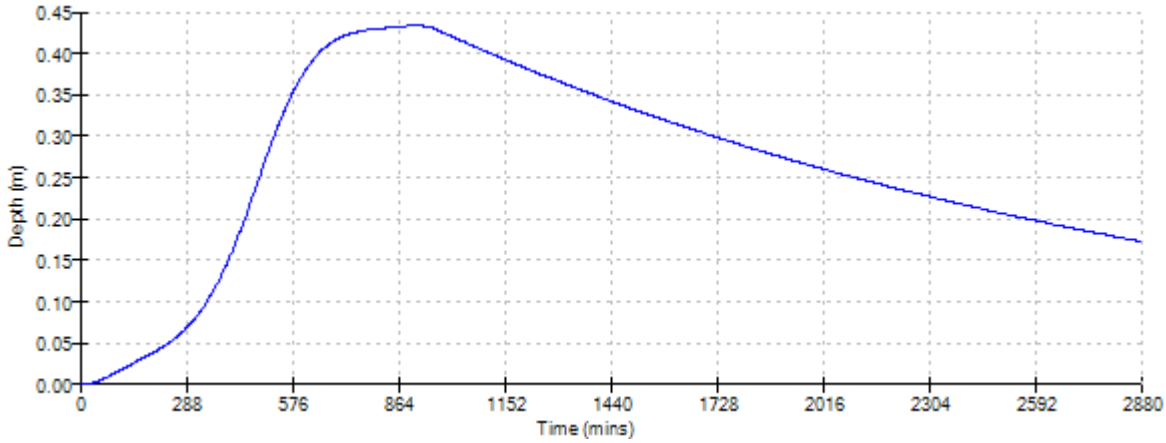
Event: 960 min Winter







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Summary of Results for 1 year Return Period (+45%)

Half Drain Time : 59 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.645	0.045	0.2	0.6	O K
30 min Summer	4.657	0.057	0.2	0.9	O K
60 min Summer	4.669	0.069	0.2	1.1	O K
120 min Summer	4.681	0.081	0.2	1.3	O K
180 min Summer	4.686	0.086	0.2	1.4	O K
240 min Summer	4.689	0.089	0.2	1.5	O K
360 min Summer	4.688	0.088	0.2	1.5	O K
480 min Summer	4.685	0.085	0.2	1.4	O K
600 min Summer	4.681	0.081	0.2	1.3	O K
720 min Summer	4.676	0.076	0.2	1.2	O K
960 min Summer	4.666	0.066	0.2	1.0	O K
1440 min Summer	4.651	0.051	0.2	0.7	O K
2160 min Summer	4.642	0.042	0.2	0.6	O K
2880 min Summer	4.636	0.036	0.2	0.5	O K
4320 min Summer	4.629	0.029	0.1	0.3	O K
5760 min Summer	4.625	0.025	0.1	0.3	O K
7200 min Summer	4.622	0.022	0.1	0.2	O K
8640 min Summer	4.621	0.021	0.1	0.2	O K
10080 min Summer	4.620	0.020	0.1	0.2	O K
15 min Winter	4.645	0.045	0.2	0.6	O K
30 min Winter	4.657	0.057	0.2	0.9	O K
60 min Winter	4.669	0.069	0.2	1.1	O K
120 min Winter	4.679	0.079	0.2	1.3	O K
180 min Winter	4.682	0.082	0.2	1.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	35.669	22
30 min Summer	23.451	34
60 min Summer	15.418	56
120 min Summer	10.137	90
180 min Summer	7.932	126
240 min Summer	6.665	160
360 min Summer	5.215	230
480 min Summer	4.382	296
600 min Summer	3.829	360
720 min Summer	3.429	424
960 min Summer	2.828	544
1440 min Summer	2.155	770
2160 min Summer	1.642	1128
2880 min Summer	1.354	1484
4320 min Summer	1.049	2208
5760 min Summer	0.875	2936
7200 min Summer	0.760	3608
8640 min Summer	0.677	4408
10080 min Summer	0.614	5136
15 min Winter	35.669	23
30 min Winter	23.451	34
60 min Winter	15.418	58
120 min Winter	10.137	96
180 min Winter	7.932	134

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Summary of Results for 1 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	4.682	0.082	0.2	1.3	O K
360 min Winter	4.677	0.077	0.2	1.2	O K
480 min Winter	4.670	0.070	0.2	1.1	O K
600 min Winter	4.663	0.063	0.2	1.0	O K
720 min Winter	4.656	0.056	0.2	0.8	O K
960 min Winter	4.647	0.047	0.2	0.7	O K
1440 min Winter	4.638	0.038	0.2	0.5	O K
2160 min Winter	4.629	0.029	0.1	0.3	O K
2880 min Winter	4.625	0.025	0.1	0.3	O K
4320 min Winter	4.621	0.021	0.1	0.2	O K
5760 min Winter	4.619	0.019	0.1	0.2	O K
7200 min Winter	4.618	0.018	0.1	0.1	O K
8640 min Winter	4.617	0.017	0.1	0.1	O K
10080 min Winter	4.616	0.016	0.0	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	6.665	172
360 min Winter	5.215	242
480 min Winter	4.382	308
600 min Winter	3.829	370
720 min Winter	3.429	428
960 min Winter	2.828	540
1440 min Winter	2.155	780
2160 min Winter	1.642	1148
2880 min Winter	1.354	1484
4320 min Winter	1.049	2212
5760 min Winter	0.875	2928
7200 min Winter	0.760	3576
8640 min Winter	0.677	4408
10080 min Winter	0.614	5152

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.012

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.004	4-8	0.004	8-12	0.004

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Model Details

Storage is Online Cover Level (m) 5.200

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.02550	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	17.5	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	4.600	Cap Volume Depth (m)	0.000

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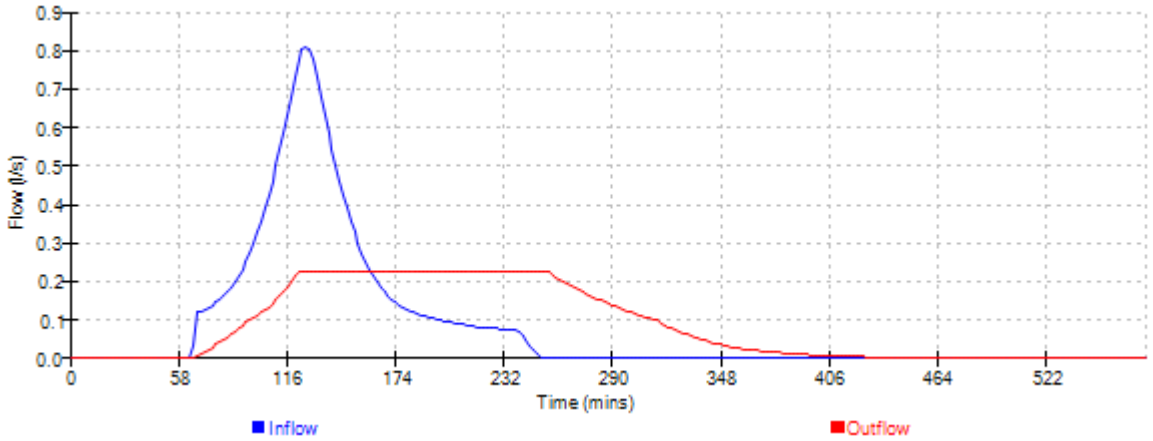
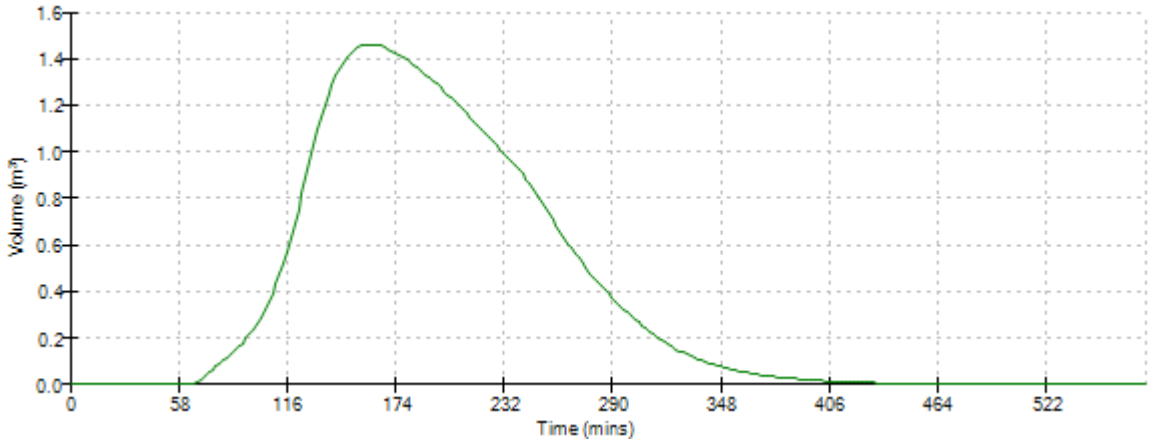
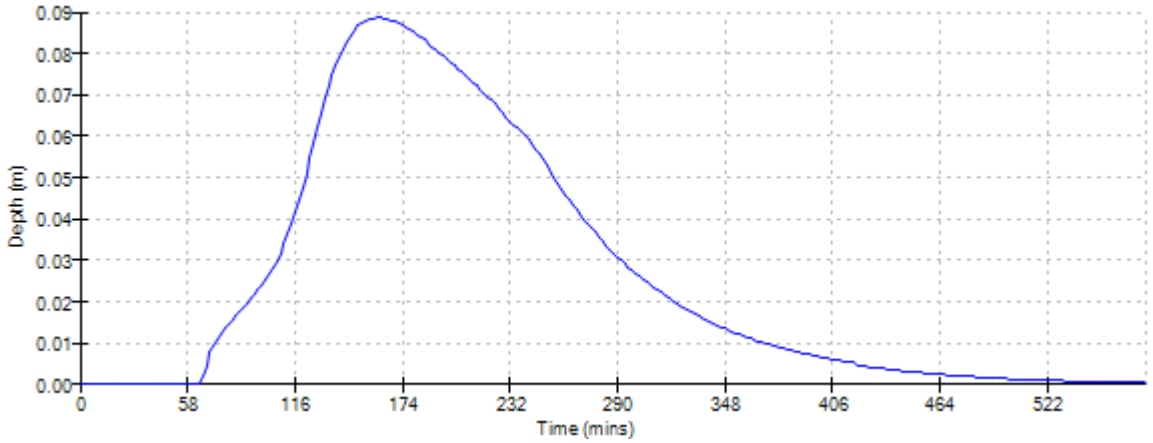
Event: 240 min Summer







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Summary of Results for 30 year Return Period (+45%)

Half Drain Time : 209 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.768	0.168	0.2	3.0	O K
30 min Summer	4.805	0.205	0.2	3.7	O K
60 min Summer	4.844	0.244	0.2	4.4	O K
120 min Summer	4.878	0.278	0.2	5.0	O K
180 min Summer	4.891	0.291	0.2	5.3	O K
240 min Summer	4.896	0.296	0.2	5.4	O K
360 min Summer	4.898	0.298	0.2	5.4	O K
480 min Summer	4.896	0.296	0.2	5.4	O K
600 min Summer	4.891	0.291	0.2	5.3	O K
720 min Summer	4.885	0.285	0.2	5.2	O K
960 min Summer	4.862	0.262	0.2	4.7	O K
1440 min Summer	4.819	0.219	0.2	3.9	O K
2160 min Summer	4.762	0.162	0.2	2.8	O K
2880 min Summer	4.717	0.117	0.2	2.0	O K
4320 min Summer	4.664	0.064	0.2	1.0	O K
5760 min Summer	4.647	0.047	0.2	0.7	O K
7200 min Summer	4.640	0.040	0.2	0.5	O K
8640 min Summer	4.636	0.036	0.2	0.5	O K
10080 min Summer	4.632	0.032	0.1	0.4	O K
15 min Winter	4.768	0.168	0.2	3.0	O K
30 min Winter	4.805	0.205	0.2	3.7	O K
60 min Winter	4.844	0.244	0.2	4.4	O K
120 min Winter	4.879	0.279	0.2	5.1	O K
180 min Winter	4.892	0.292	0.2	5.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	117.169	25
30 min Summer	72.307	39
60 min Summer	44.622	66
120 min Summer	27.537	124
180 min Summer	20.763	180
240 min Summer	16.994	212
360 min Summer	12.813	276
480 min Summer	10.487	344
600 min Summer	8.978	414
720 min Summer	7.907	484
960 min Summer	6.352	618
1440 min Summer	4.665	884
2160 min Summer	3.426	1260
2880 min Summer	2.752	1616
4320 min Summer	2.053	2260
5760 min Summer	1.668	2944
7200 min Summer	1.420	3672
8640 min Summer	1.244	4400
10080 min Summer	1.113	5136
15 min Winter	117.169	25
30 min Winter	72.307	39
60 min Winter	44.622	66
120 min Winter	27.537	122
180 min Winter	20.763	176

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Summary of Results for 30 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	4.896	0.296	0.2	5.4	O K
360 min Winter	4.895	0.295	0.2	5.4	O K
480 min Winter	4.889	0.289	0.2	5.2	O K
600 min Winter	4.879	0.279	0.2	5.1	O K
720 min Winter	4.867	0.267	0.2	4.8	O K
960 min Winter	4.832	0.232	0.2	4.2	O K
1440 min Winter	4.767	0.167	0.2	2.9	O K
2160 min Winter	4.691	0.091	0.2	1.5	O K
2880 min Winter	4.650	0.050	0.2	0.7	O K
4320 min Winter	4.638	0.038	0.2	0.5	O K
5760 min Winter	4.631	0.031	0.1	0.4	O K
7200 min Winter	4.626	0.026	0.1	0.3	O K
8640 min Winter	4.623	0.023	0.1	0.2	O K
10080 min Winter	4.622	0.022	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	16.994	230
360 min Winter	12.813	286
480 min Winter	10.487	364
600 min Winter	8.978	442
720 min Winter	7.907	516
960 min Winter	6.352	660
1440 min Winter	4.665	926
2160 min Winter	3.426	1272
2880 min Winter	2.752	1508
4320 min Winter	2.053	2244
5760 min Winter	1.668	2944
7200 min Winter	1.420	3672
8640 min Winter	1.244	4400
10080 min Winter	1.113	5152

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.012

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.004	4-8	0.004	8-12	0.004

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Model Details

Storage is Online Cover Level (m) 5.200

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.02550	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	17.5	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	4.600	Cap Volume Depth (m)	0.000

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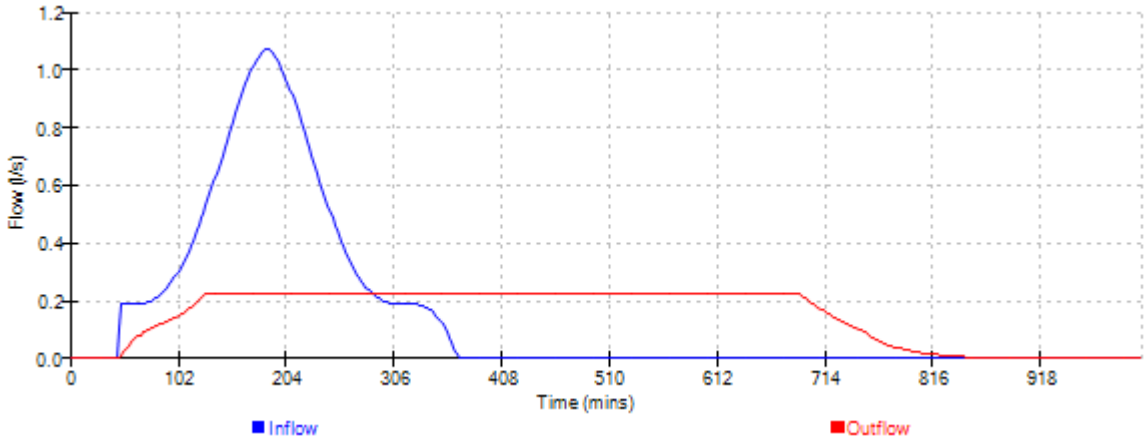
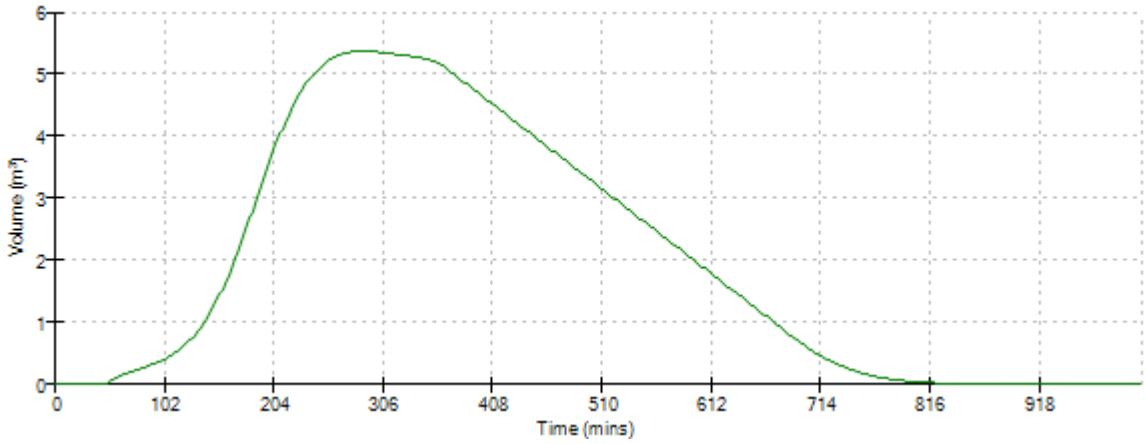
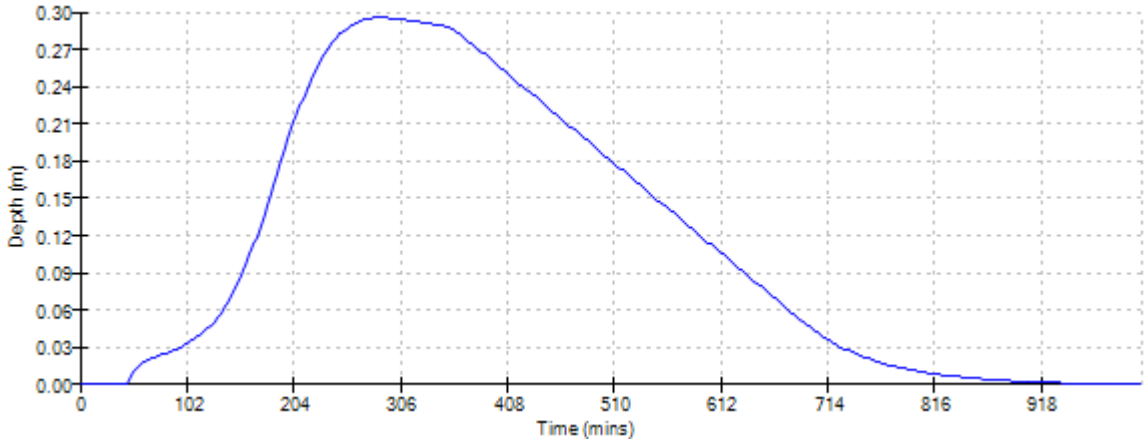
Event: 360 min Winter







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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 326 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	4.867	0.267	0.2	4.8	O K
30 min Summer	4.918	0.318	0.2	5.8	O K
60 min Summer	4.972	0.372	0.2	6.8	O K
120 min Summer	5.023	0.423	0.2	7.8	O K
180 min Summer	5.046	0.446	0.2	8.2	O K
240 min Summer	5.056	0.456	0.2	8.4	O K
360 min Summer	5.057	0.457	0.2	8.4	O K
480 min Summer	5.053	0.453	0.2	8.4	O K
600 min Summer	5.047	0.447	0.2	8.2	O K
720 min Summer	5.039	0.439	0.2	8.1	O K
960 min Summer	5.011	0.411	0.2	7.5	O K
1440 min Summer	4.957	0.357	0.2	6.5	O K
2160 min Summer	4.884	0.284	0.2	5.2	O K
2880 min Summer	4.821	0.221	0.2	4.0	O K
4320 min Summer	4.732	0.132	0.2	2.3	O K
5760 min Summer	4.676	0.076	0.2	1.2	O K
7200 min Summer	4.651	0.051	0.2	0.7	O K
8640 min Summer	4.644	0.044	0.2	0.6	O K
10080 min Summer	4.640	0.040	0.2	0.5	O K
15 min Winter	4.867	0.267	0.2	4.8	O K
30 min Winter	4.918	0.318	0.2	5.8	O K
60 min Winter	4.973	0.373	0.2	6.8	O K
120 min Winter	5.025	0.425	0.2	7.8	O K
180 min Winter	5.048	0.448	0.2	8.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	179.630	26
30 min Summer	108.360	40
60 min Summer	65.367	68
120 min Summer	39.431	126
180 min Summer	29.338	184
240 min Summer	23.787	242
360 min Summer	17.698	322
480 min Summer	14.349	384
600 min Summer	12.194	448
720 min Summer	10.676	516
960 min Summer	8.495	652
1440 min Summer	6.156	922
2160 min Summer	4.461	1316
2880 min Summer	3.550	1680
4320 min Summer	2.614	2384
5760 min Summer	2.103	3056
7200 min Summer	1.777	3680
8640 min Summer	1.549	4408
10080 min Summer	1.378	5136
15 min Winter	179.630	26
30 min Winter	108.360	39
60 min Winter	65.367	68
120 min Winter	39.431	124
180 min Winter	29.338	180

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
240 min Winter	5.059	0.459	0.2	8.5	O K
360 min Winter	5.061	0.461	0.2	8.5	O K
480 min Winter	5.052	0.452	0.2	8.3	O K
600 min Winter	5.042	0.442	0.2	8.2	O K
720 min Winter	5.030	0.430	0.2	7.9	O K
960 min Winter	4.989	0.389	0.2	7.1	O K
1440 min Winter	4.910	0.310	0.2	5.6	O K
2160 min Winter	4.805	0.205	0.2	3.7	O K
2880 min Winter	4.722	0.122	0.2	2.1	O K
4320 min Winter	4.648	0.048	0.2	0.7	O K
5760 min Winter	4.639	0.039	0.2	0.5	O K
7200 min Winter	4.633	0.033	0.1	0.4	O K
8640 min Winter	4.629	0.029	0.1	0.3	O K
10080 min Winter	4.626	0.026	0.1	0.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
240 min Winter	23.787	236
360 min Winter	17.698	344
480 min Winter	14.349	394
600 min Winter	12.194	468
720 min Winter	10.676	544
960 min Winter	8.495	694
1440 min Winter	6.156	982
2160 min Winter	4.461	1368
2880 min Winter	3.550	1708
4320 min Winter	2.614	2216
5760 min Winter	2.103	2936
7200 min Winter	1.777	3672
8640 min Winter	1.549	4400
10080 min Winter	1.378	5120

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 513750 103250 TQ 13750 03250
C (1km)	-0.027
D1 (1km)	0.395
D2 (1km)	0.330
D3 (1km)	0.369
E (1km)	0.314
F (1km)	2.364
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time / Area Diagram

Total Area (ha) 0.012

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.004	4-8	0.004	8-12	0.004

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Model Details

Storage is Online Cover Level (m) 5.200

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.02550	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	17.5	Slope (1:X)	400.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	4.600	Cap Volume Depth (m)	0.000

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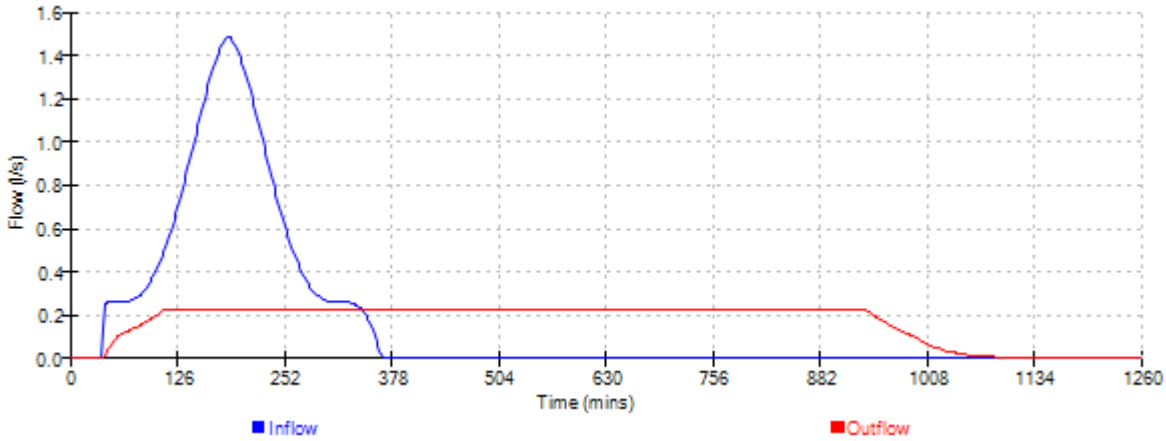
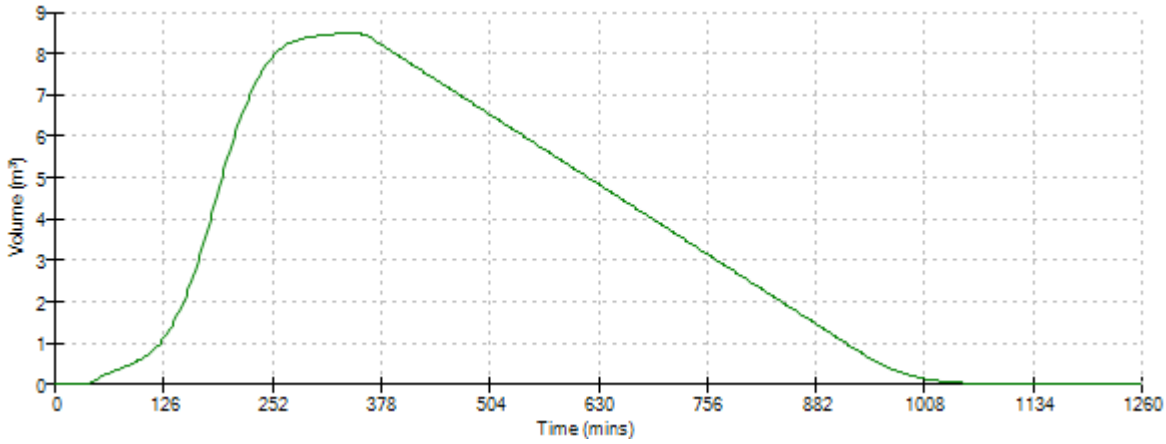
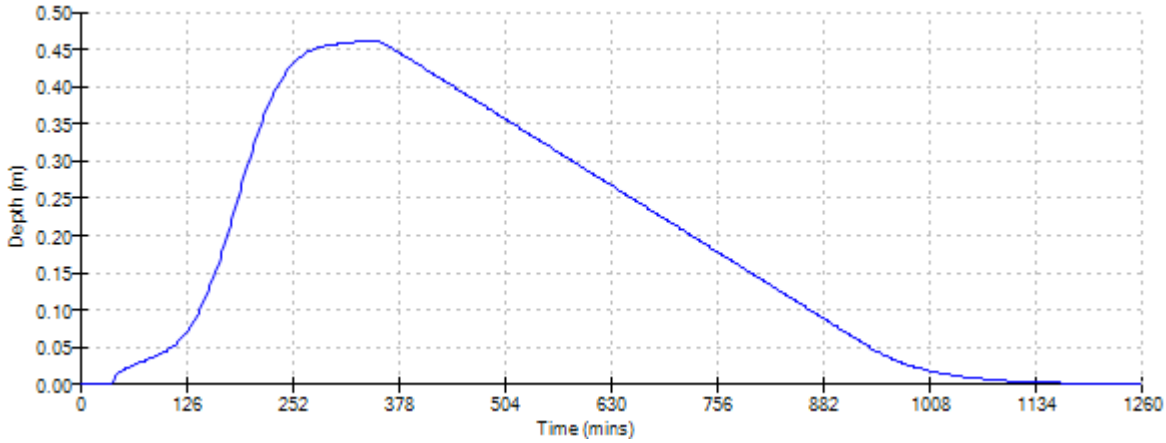
Event: 360 min Winter







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