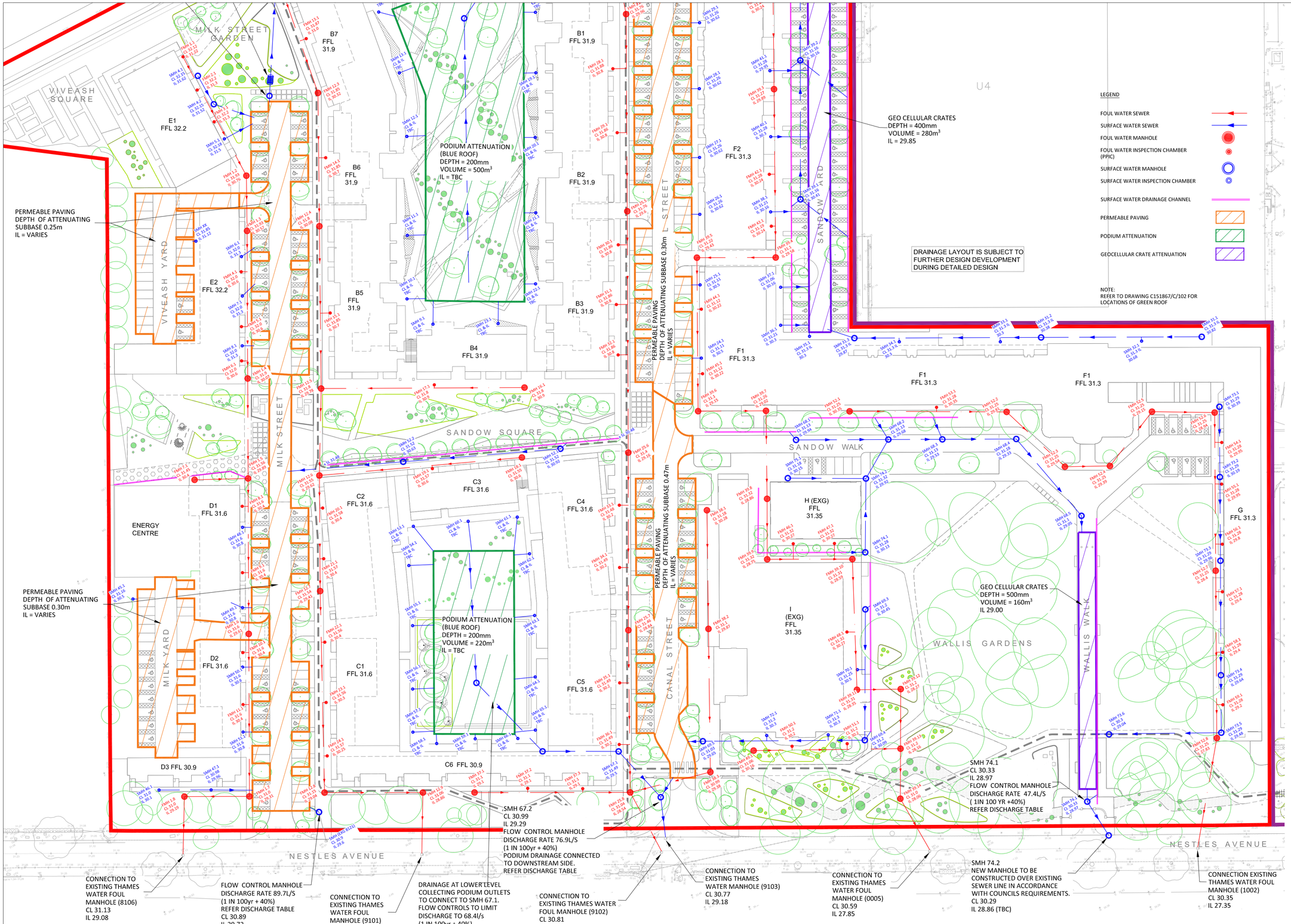

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH C151867/C/001, C151867/C/101 AND C151867/C/102.
2. THE LOCATION OF EXISTING MANHOLES, PIPE SIZES, PIPE TYPE AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR.
3. CONDITION OF EXISTING DRAINAGE CONNECTIONS FROM SITE TO BE CONFIRMED AND RETAINED IF FEASIBLE.

LEGEND

- FOUL WATER SEWER
- SURFACE WATER SEWER
- FOUL WATER MANHOLE
- FOUL WATER INSPECTION CHAMBER (PPIC)
- SURFACE WATER MANHOLE
- SURFACE WATER INSPECTION CHAMBER
- SURFACE WATER DRAINAGE CHANNEL
- PERMEABLE PAVING
- PODIUM ATTENUATION
- GEOCELLULAR CRATE ATTENUATION

SURFACE WATER DISCHARGE RATES TO THAMES WATER SEWERS

	RETURN PERIOD		
	1 IN 2 YR	1 IN 30 YR	1 IN 100 YR + 40%
TOTAL PROPOSED DISCHARGE L/S	74.7L/S	192.3 L/S	270.7L/S

COMPLEX FLOW CONTROLS TO BE USED TO ACHIEVE FLOW RESTRICTION FOR EACH RETURN PERIOD

Rev	Date	Description	By	Ckd
P3	21.04.17	UPDATED SITE LAYOUT	AB	JH
P2	27.01.17	SANDOW STREET & BUILDING H DRAINAGE	AB	JH
P1	25.01.17	PRELIMINARY ISSUE	AB	JH

Architect :

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Hydrock

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Client :

BARRATT LONDON

Project Title:

FORMER NESTLÉ SITE
HAYES

Drawing Title:

PROPOSED DRAINAGE
STRATEGY
SHEET 2

Drawing Status:

PRELIMINARY ISSUE

Hydrock Job No:

C151867

Drawn	Checked	Scale @ A1	Date	Issue Date
AB	JH	1:500	27.01.17	27.01.17

Drawing Number: C151867/C/002

Revision: P3

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Canal & River Trust

NESTLÉ DRIVE, HAYES STAGE THREE ASSESSMENT PRO-FORMA

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GATEWAY LINK

DATE ENQUIRY RECEIVED BY WATER MANAGEMENT

09/11/2016 (when **all** appropriate supporting information received)

SUMMARY OF PROPOSAL

The existing Nestlé factory, located alongside the Grand Union Canal in Hayes, London Borough of Hillingdon, is to be demolished. Barratt's are proposing a residential development comprising of apartment blocks to be constructed on their area of the site. The remainder of the site is to be developed by others. The Barratt's site is adjacent to the Grand Union Canal, GU-211. It is proposed to discharge to the canal via existing or possibly new outfalls.

PRE-DEVELOPMENT

The surface water from the site drains partly to the Grand Union Canal and partly to the Thames Water Sewers in Nestlés Avenue. A drainage survey of the existing site has been used to determine the existing catchment which drains into the canal through the existing 14 outfalls. Three of these are within the Barratt's area of the site.

- Total area draining to canal = 36,282m^2
- The Pre-development peak run-off (1:100 yr, excluding +30% cc) is estimated at 0.086 m^{3}s^{-1} (85.9 l/s).

POST-DEVELOPMENT

The existing site is to be split between two developers. This application is for the proposed Barratt's development only. The development shall comprise 1400 residential units. They are proposing to drain the surface water from the residential site partly to the canal and partly to the Thames Water Sewers. Infiltration testing has shown the ground conditions to be unsuitable for

infiltration. The post-development peak run-off flow is proposed to match the existing pre-developed flows to the canal. Currently, it is proposed to discharge via three outfalls, though this is subject to further design development. The existing outfalls will be reused if feasible.

Flow controls and attenuation shall be used to restrict the flows to the permitted discharge rates. The Barratt's development shall result in a 1.25ha reduction of impermeable area draining to the canal. From conversations with the neighbouring developer it is understood that they are currently proposing to abandon the existing outfalls to the canal within their section of the site in favour of draining to Thames Water Sewers. This will reduce the impermeable area draining to the canal by an additional 2.4ha. SUD's will be implemented, including permeable paving and green roofing.

- Total area draining to canal = 28,600m^2
- The Post-development peak run-off (1:100 yr, +20% cc) is estimated at 0.086 m^{3}s^{-1} (85.9 l/s). The proposed flows to match existing. No urban creep allowed for, as site to be fully developed with apartments, allowing no scope for extensions etc.

METHODOLOGY

The surface water discharge from the existing site, has been calculated as required by Part 2 of the Code of Practice. Pre-development flows were calculated using QMED with adjusted URBEXT. Growth Factors were used to establish 1 in 100 year flows.

According to the developer, the drainage survey information shown on drawing 909-4-GEN-0019 does not have sufficient information to enable accurate modelling of the network. The Greenfield methods have therefore been used with an URBEXT adjustment in compliance with Part 2.

The discharge calculated is based on the Barratt's site only.

RISK REGISTER SCORE

Likelihood = 0
Consequence = 3
Risk = 0

MAXIMUM DISCHARGE VELOCITY

Stated by developer as "to be confirmed".

In terms of the Code of Practice for Third Party Works, high discharge velocities can be a problem for navigational safety. High flow velocities can also cause scouring. It is the responsibility of the Works Engineer to agree a final design that does not exceed a maximum outfall velocity of 0.3 ms^{-1}, whilst also ensuring this does not affect ability of the drainage system to achieve the agreed flow rate of 0.086 m^{3}s^{-1}.

WATER ENGINEER COMMENTS

"I note the following: "The Post-development peak run-off (1:100 yr, +20% cc) is estimated at 0.086 m^3s^{-1} (85.9 l/s). The proposed flows to match existing". Should not the developer be encouraged to seek ways to reduce peak run off?"

Mike Wheeler, Senior Water Engineer, 15/11/16

ENVIRONMENT TEAM COMMENTS

"I have reviewed the various documents and would like the applicant to provide the following information or assurances:

1. There are three surface water outfalls to the canal. How many car parking spaces are served by each outfall?

2. The application states that the site exhibits soil contamination and that there will be removal of contaminated soil and site remediation. Can the developer please confirm that the surface water drains will only be laid in uncontaminated soils and that the sub-surface attenuation tanks will be resistant to the inward migration of any contaminants remaining in the surrounding soils."

Dr Lise Andreassen, Senior Environmental Scientist, 14/11/16

Response from developer:

1. "As per C151867/C/104 there were 63 parking spots draining to Canal Outlet 1, 68 parking spots to Canal Outlet 2 and 46 parking spots draining to Canal Outlet 3. These design plans have since been adjusted slightly and now there is 67, 67 and 51 parking spots draining to Canal Outlet 1,2 and 3 respectively. These may change again slightly (+/- 2) as the design plans have not yet been finalised.

2. The surface water drains will only be laid in uncontaminated soils and the proposed sub-surface attenuation systems will be lined with an impermeable membrane to prevent water infiltrating/ the inward migration of any contaminants.

Alex Badek, Senior Infrastructure Engineer, Hydrock, 15/11/16

Response from the environment team:

1. "As the number of car parking spaces exceeds 50 for each of the three outfalls to the canal, CRT requires that the Environment Agency's PPG3 guidance note on oil separators is followed:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf.

Although PPG3 has been withdrawn by the EA due to resource shortages, it is still used by CRT to establish the required standards of pollution prevention for discharges entering its waterways.

Given the nature of the site (i.e. general car parking), potential spills would be expected to be small. As such, Class 1 by-pass separators (with an alarm) are acceptable and need to be located prior to **each** of the three outfalls. Class 1 separators are required as the discharge is to a surface water (i.e. the canal).

The applicant needs to:

- demonstrate that the selected separators are of the type specified and are sized in accordance with PPG3 (shown via submitted calculations)
- account for how silt storage is to be provided for
- provide sufficient access points in the design to allow for inspection and cleaning of the interceptors' internal chambers
- label the separators above ground and show their presence on a revised drainage plan
- submit an adequate maintenance procedure for the separators."

Dr Lise Andreassen, Senior Environmental Scientist, 16/11/16

RESPONSE SUMMARY

On the basis of the information provided a maximum discharge rate of 0.086 m^3s^{-1} (in a 1:100 yr +20% cc return period event) to the Grand Union Canal is acceptable. The Works Engineer needs to ensure the outfall velocity does not exceed the Trusts maximum of 0.3 ms^{-1}.

With regards to environmental risk please see comments from the Environment Team (Lise Andreassen's comments).

SIGN OFF

Endorsed by Adam Comerford, National Hydrology Manager 09/12/2016

COMPLETED WITHIN FOUR WEEKS? Yes

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.450
Area (ha)	7.150	Urban	0.000
SAAR (mm)	640	Region Number	Region 6

Results	**l/s**
QBAR Rural	28.3
QBAR Urban	28.3
Q2 years	24.9
Q1 year	24.0
Q30 years	64.1
Q100 years	90.2

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Summary of Results for 30 year Return Period

Half Drain Time : 70 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	29.970	0.120	0.0	15.2	15.2	79.9	O K
30 min Summer	29.995	0.145	0.0	18.2	18.2	96.2	O K
60 min Summer	30.008	0.158	0.0	19.7	19.7	105.4	O K
120 min Summer	30.014	0.164	0.0	20.2	20.2	108.8	O K
180 min Summer	30.010	0.160	0.0	19.9	19.9	106.5	O K
240 min Summer	30.004	0.154	0.0	19.3	19.3	102.6	O K
360 min Summer	29.992	0.142	0.0	17.9	17.9	94.4	O K
480 min Summer	29.981	0.131	0.0	16.6	16.6	87.1	O K
600 min Summer	29.972	0.122	0.0	15.4	15.4	81.0	O K
720 min Summer	29.964	0.114	0.0	14.4	14.4	75.8	O K
960 min Summer	29.952	0.102	0.0	12.7	12.7	67.5	O K
1440 min Summer	29.934	0.084	0.0	10.3	10.3	56.0	O K
2160 min Summer	29.918	0.068	0.0	8.1	8.1	45.2	O K
2880 min Summer	29.907	0.057	0.0	6.7	6.7	38.1	O K
4320 min Summer	29.894	0.044	0.0	5.2	5.2	28.9	O K
5760 min Summer	29.885	0.035	0.0	4.2	4.2	23.1	O K
7200 min Summer	29.879	0.029	0.0	3.6	3.6	19.0	O K
8640 min Summer	29.874	0.024	0.0	3.1	3.1	15.8	O K
10080 min Summer	29.870	0.020	0.0	2.8	2.8	13.3	O K
15 min Winter	29.985	0.135	0.0	17.0	17.0	89.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.822	0.0	88.0	17
30 min Summer	49.886	0.0	114.3	31
60 min Summer	30.968	0.0	142.1	48
120 min Summer	18.658	0.0	171.2	82
180 min Summer	13.726	0.0	188.9	116
240 min Summer	10.992	0.0	201.8	150
360 min Summer	8.021	0.0	220.9	216
480 min Summer	6.411	0.0	235.5	280
600 min Summer	5.385	0.0	247.3	342
720 min Summer	4.668	0.0	257.2	404
960 min Summer	3.724	0.0	273.6	530
1440 min Summer	2.706	0.0	298.3	778
2160 min Summer	1.964	0.0	324.7	1144
2880 min Summer	1.563	0.0	344.6	1500
4320 min Summer	1.132	0.0	374.5	2244
5760 min Summer	0.900	0.0	397.0	2944
7200 min Summer	0.753	0.0	415.2	3680
8640 min Summer	0.651	0.0	430.7	4408
10080 min Summer	0.575	0.0	444.0	5144
15 min Winter	76.822	0.0	98.6	17

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Summary of Results for 30 year Return Period

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
30 min Winter	30.013	0.163	0.0	20.2	20.2	108.5	O K
60 min Winter	30.028	0.178	0.0	21.2	21.2	118.6	O K
120 min Winter	30.031	0.181	0.0	21.2	21.2	120.1	O K
180 min Winter	30.022	0.172	0.0	21.1	21.1	114.6	O K
240 min Winter	30.012	0.162	0.0	20.1	20.1	108.0	O K
360 min Winter	29.994	0.144	0.0	18.1	18.1	95.7	O K
480 min Winter	29.979	0.129	0.0	16.4	16.4	85.8	O K
600 min Winter	29.967	0.117	0.0	14.8	14.8	78.0	O K
720 min Winter	29.958	0.108	0.0	13.5	13.5	71.6	O K
960 min Winter	29.943	0.093	0.0	11.4	11.4	61.8	O K
1440 min Winter	29.924	0.074	0.0	8.8	8.8	49.0	O K
2160 min Winter	29.907	0.057	0.0	6.7	6.7	37.7	O K
2880 min Winter	29.896	0.046	0.0	5.4	5.4	30.6	O K
4320 min Winter	29.883	0.033	0.0	4.0	4.0	21.8	O K
5760 min Winter	29.875	0.025	0.0	3.2	3.2	16.3	O K
7200 min Winter	29.869	0.019	0.0	2.7	2.7	12.6	O K
8640 min Winter	29.865	0.015	0.0	2.3	2.3	9.7	O K
10080 min Winter	29.861	0.011	0.0	2.1	2.1	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.886	0.0	128.0	30
60 min Winter	30.968	0.0	159.1	50
120 min Winter	18.658	0.0	191.8	88
180 min Winter	13.726	0.0	211.7	124
240 min Winter	10.992	0.0	226.0	160
360 min Winter	8.021	0.0	247.5	228
480 min Winter	6.411	0.0	263.8	292
600 min Winter	5.385	0.0	277.0	356
720 min Winter	4.668	0.0	288.1	420
960 min Winter	3.724	0.0	306.5	548
1440 min Winter	2.706	0.0	334.1	794
2160 min Winter	1.964	0.0	363.6	1164
2880 min Winter	1.563	0.0	386.0	1528
4320 min Winter	1.132	0.0	419.4	2252
5760 min Winter	0.900	0.0	444.6	2992
7200 min Winter	0.753	0.0	465.1	3744
8640 min Winter	0.651	0.0	482.3	4408
10080 min Winter	0.575	0.0	497.4	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.100	Shortest Storm (mins)	15
Ratio R	0.406	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.613

Time (mins) From:	To:	Area (ha)
0	4	0.613

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Model Details

Storage is Online Cover Level (m) 31.320

Cellular Storage Structure

Invert Level (m) 29.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	0.0	0.401	0.0	0.0
0.400	700.0	0.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0207-2210-1000-2210
Design Head (m)	1.000
Design Flow (l/s)	22.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	207
Invert Level (m)	29.810
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	22.0
Flush-Flo™	0.349	22.0
Kick-Flo®	0.727	18.9
Mean Flow over Head Range	-	18.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.1	1.200	23.9	3.000	37.2	7.000	56.0
0.200	19.9	1.400	25.8	3.500	40.0	7.500	57.9
0.300	21.9	1.600	27.5	4.000	42.7	8.000	59.8
0.400	21.9	1.800	29.1	4.500	45.2	8.500	61.6
0.500	21.5	2.000	30.6	5.000	47.6	9.000	63.3
0.600	20.9	2.200	32.0	5.500	49.8	9.500	65.0
0.800	19.7	2.400	33.4	6.000	52.0		
1.000	22.0	2.600	34.7	6.500	54.0		

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

Half Drain Time : 98 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	30.071	0.221	0.0	21.7	21.7	147.1	O K
30 min Summer	30.127	0.277	0.0	21.9	21.9	184.4	O K
60 min Summer	30.167	0.317	0.0	22.0	22.0	210.8	O K
120 min Summer	30.181	0.331	0.0	22.0	22.0	219.9	O K
180 min Summer	30.177	0.327	0.0	22.0	22.0	217.2	O K
240 min Summer	30.166	0.316	0.0	22.0	22.0	210.2	O K
360 min Summer	30.140	0.290	0.0	22.0	22.0	193.0	O K
480 min Summer	30.114	0.264	0.0	21.9	21.9	175.7	O K
600 min Summer	30.090	0.240	0.0	21.8	21.8	159.6	O K
720 min Summer	30.068	0.218	0.0	21.6	21.6	145.3	O K
960 min Summer	30.034	0.184	0.0	21.3	21.3	122.4	O K
1440 min Summer	29.997	0.147	0.0	18.4	18.4	97.6	O K
2160 min Summer	29.967	0.117	0.0	14.7	14.7	77.5	O K
2880 min Summer	29.948	0.098	0.0	12.2	12.2	65.4	O K
4320 min Summer	29.926	0.076	0.0	9.2	9.2	50.6	O K
5760 min Summer	29.913	0.063	0.0	7.4	7.4	41.7	O K
7200 min Summer	29.903	0.053	0.0	6.3	6.3	35.5	O K
8640 min Summer	29.896	0.046	0.0	5.4	5.4	30.8	O K
10080 min Summer	29.891	0.041	0.0	4.8	4.8	27.1	O K
15 min Winter	30.099	0.249	0.0	21.8	21.8	165.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.635	0.0	160.1	18
30 min Summer	91.435	0.0	209.8	32
60 min Summer	57.005	0.0	261.8	60
120 min Summer	34.324	0.0	315.2	94
180 min Summer	25.168	0.0	346.7	128
240 min Summer	20.074	0.0	368.8	160
360 min Summer	14.562	0.0	401.4	228
480 min Summer	11.594	0.0	426.0	294
600 min Summer	9.707	0.0	446.0	356
720 min Summer	8.393	0.0	462.6	418
960 min Summer	6.666	0.0	489.9	536
1440 min Summer	4.811	0.0	530.6	768
2160 min Summer	3.466	0.0	573.4	1128
2880 min Summer	2.744	0.0	605.2	1500
4320 min Summer	1.972	0.0	652.4	2208
5760 min Summer	1.558	0.0	687.4	2944
7200 min Summer	1.297	0.0	715.4	3672
8640 min Summer	1.117	0.0	738.9	4408
10080 min Summer	0.983	0.0	759.2	5144
15 min Winter	139.635	0.0	179.4	18

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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
30 min Winter	30.164	0.314	0.0	22.0	22.0	208.9	O K
60 min Winter	30.213	0.363	0.0	22.0	22.0	241.1	O K
120 min Winter	30.226	0.376	0.0	22.0	22.0	250.0	O K
180 min Winter	30.218	0.368	0.0	22.0	22.0	244.6	O K
240 min Winter	30.201	0.351	0.0	22.0	22.0	233.1	O K
360 min Winter	30.160	0.310	0.0	22.0	22.0	206.0	O K
480 min Winter	30.120	0.270	0.0	21.9	21.9	179.4	O K
600 min Winter	30.084	0.234	0.0	21.8	21.8	155.5	O K
720 min Winter	30.054	0.204	0.0	21.5	21.5	135.3	O K
960 min Winter	30.014	0.164	0.0	20.2	20.2	109.0	O K
1440 min Winter	29.976	0.126	0.0	15.9	15.9	83.6	O K
2160 min Winter	29.947	0.097	0.0	12.0	12.0	64.2	O K
2880 min Winter	29.930	0.080	0.0	9.6	9.6	52.9	O K
4320 min Winter	29.909	0.059	0.0	7.0	7.0	39.5	O K
5760 min Winter	29.897	0.047	0.0	5.5	5.5	31.5	O K
7200 min Winter	29.889	0.039	0.0	4.7	4.7	26.0	O K
8640 min Winter	29.883	0.033	0.0	4.0	4.0	22.0	O K
10080 min Winter	29.878	0.028	0.0	3.5	3.5	18.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.435	0.0	235.0	32
60 min Winter	57.005	0.0	293.2	60
120 min Winter	34.324	0.0	353.1	104
180 min Winter	25.168	0.0	388.4	138
240 min Winter	20.074	0.0	413.1	176
360 min Winter	14.562	0.0	449.6	248
480 min Winter	11.594	0.0	477.2	314
600 min Winter	9.707	0.0	499.5	378
720 min Winter	8.393	0.0	518.3	436
960 min Winter	6.666	0.0	548.9	548
1440 min Winter	4.811	0.0	594.1	792
2160 min Winter	3.466	0.0	642.1	1148
2880 min Winter	2.744	0.0	678.0	1512
4320 min Winter	1.972	0.0	730.7	2248
5760 min Winter	1.558	0.0	769.9	2992
7200 min Winter	1.297	0.0	801.3	3680
8640 min Winter	1.117	0.0	827.6	4440
10080 min Winter	0.983	0.0	850.3	5144

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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)	20.100	Shortest Storm (mins)	15
Ratio R	0.406	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.613

Time (mins) From:	To:	Area (ha)
0	4	0.613

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Model Details

Storage is Online Cover Level (m) 31.320

Cellular Storage Structure

Invert Level (m) 29.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	0.0	0.401	0.0	0.0
0.400	700.0	0.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0207-2210-1000-2210
Design Head (m)	1.000
Design Flow (l/s)	22.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	207
Invert Level (m)	29.810
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	22.0
Flush-Flo™	0.349	22.0
Kick-Flo®	0.727	18.9
Mean Flow over Head Range	-	18.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.1	1.200	23.9	3.000	37.2	7.000	56.0
0.200	19.9	1.400	25.8	3.500	40.0	7.500	57.9
0.300	21.9	1.600	27.5	4.000	42.7	8.000	59.8
0.400	21.9	1.800	29.1	4.500	45.2	8.500	61.6
0.500	21.5	2.000	30.6	5.000	47.6	9.000	63.3
0.600	20.9	2.200	32.0	5.500	49.8	9.500	65.0
0.800	19.7	2.400	33.4	6.000	52.0		
1.000	22.0	2.600	34.7	6.500	54.0		

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Summary of Results for 30 year Return Period

Half Drain Time : 18 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	30.578	0.078	0.0	13.4	13.4	20.8	O K
30 min Summer	30.588	0.088	0.0	13.6	13.6	25.0	O K
60 min Summer	30.587	0.087	0.0	13.5	13.5	24.4	O K
120 min Summer	30.574	0.074	0.0	13.3	13.3	19.3	O K
180 min Summer	30.562	0.062	0.0	13.1	13.1	14.1	O K
240 min Summer	30.550	0.050	0.0	13.0	13.0	9.5	O K
360 min Summer	30.530	0.030	0.0	12.6	12.6	3.3	O K
480 min Summer	30.510	0.010	0.0	12.3	12.3	0.4	O K
600 min Summer	30.500	0.000	0.0	11.0	11.0	0.0	O K
720 min Summer	30.500	0.000	0.0	9.5	9.5	0.0	O K
960 min Summer	30.500	0.000	0.0	7.6	7.6	0.0	O K
1440 min Summer	30.500	0.000	0.0	5.5	5.5	0.0	O K
2160 min Summer	30.500	0.000	0.0	4.0	4.0	0.0	O K
2880 min Summer	30.500	0.000	0.0	3.2	3.2	0.0	O K
4320 min Summer	30.500	0.000	0.0	2.3	2.3	0.0	O K
5760 min Summer	30.500	0.000	0.0	1.8	1.8	0.0	O K
7200 min Summer	30.500	0.000	0.0	1.5	1.5	0.0	O K
8640 min Summer	30.500	0.000	0.0	1.3	1.3	0.0	O K
10080 min Summer	30.500	0.000	0.0	1.1	1.1	0.0	O K
15 min Winter	30.589	0.089	0.0	13.6	13.6	25.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.758	0.0	28.8	16
30 min Summer	49.865	0.0	40.3	25
60 min Summer	30.968	0.0	51.9	42
120 min Summer	18.666	0.0	63.5	76
180 min Summer	13.735	0.0	70.5	108
240 min Summer	11.001	0.0	75.2	138
360 min Summer	8.029	0.0	83.0	194
480 min Summer	6.419	0.0	88.4	248
600 min Summer	5.392	0.0	93.0	0
720 min Summer	4.675	0.0	96.8	0
960 min Summer	3.730	0.0	102.9	0
1440 min Summer	2.711	0.0	111.6	0
2160 min Summer	1.968	0.0	120.5	0
2880 min Summer	1.566	0.0	126.8	0
4320 min Summer	1.135	0.0	135.1	0
5760 min Summer	0.902	0.0	140.5	0
7200 min Summer	0.755	0.0	144.1	0
8640 min Summer	0.653	0.0	146.5	0
10080 min Summer	0.577	0.0	148.2	0
15 min Winter	76.758	0.0	33.8	16

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Summary of Results for 30 year Return Period

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
30 min Winter	30.598	0.098	0.0	13.7	13.7	29.3	O K
60 min Winter	30.596	0.096	0.0	13.7	13.7	28.1	O K
120 min Winter	30.576	0.076	0.0	13.4	13.4	19.8	O K
180 min Winter	30.556	0.056	0.0	13.0	13.0	11.8	O K
240 min Winter	30.538	0.038	0.0	12.8	12.8	5.5	O K
360 min Winter	30.500	0.000	0.0	11.8	11.8	0.0	O K
480 min Winter	30.500	0.000	0.0	9.4	9.4	0.0	O K
600 min Winter	30.500	0.000	0.0	7.9	7.9	0.0	O K
720 min Winter	30.500	0.000	0.0	6.9	6.9	0.0	O K
960 min Winter	30.500	0.000	0.0	5.5	5.5	0.0	O K
1440 min Winter	30.500	0.000	0.0	4.0	4.0	0.0	O K
2160 min Winter	30.500	0.000	0.0	2.9	2.9	0.0	O K
2880 min Winter	30.500	0.000	0.0	2.3	2.3	0.0	O K
4320 min Winter	30.500	0.000	0.0	1.6	1.6	0.0	O K
5760 min Winter	30.500	0.000	0.0	1.3	1.3	0.0	O K
7200 min Winter	30.500	0.000	0.0	1.1	1.1	0.0	O K
8640 min Winter	30.500	0.000	0.0	0.9	0.9	0.0	O K
10080 min Winter	30.500	0.000	0.0	0.8	0.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.865	0.0	46.2	27
60 min Winter	30.968	0.0	58.5	46
120 min Winter	18.666	0.0	71.7	82
180 min Winter	13.735	0.0	80.1	114
240 min Winter	11.001	0.0	85.2	142
360 min Winter	8.029	0.0	93.7	0
480 min Winter	6.419	0.0	100.1	0
600 min Winter	5.392	0.0	105.2	0
720 min Winter	4.675	0.0	109.4	0
960 min Winter	3.730	0.0	116.3	0
1440 min Winter	2.711	0.0	126.3	0
2160 min Winter	1.968	0.0	136.5	0
2880 min Winter	1.566	0.0	143.7	0
4320 min Winter	1.135	0.0	153.6	0
5760 min Winter	0.902	0.0	160.2	0
7200 min Winter	0.755	0.0	164.7	0
8640 min Winter	0.653	0.0	168.0	0
10080 min Winter	0.577	0.0	170.4	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.100	Shortest Storm (mins)	15
Ratio R	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.250

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

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Model Details

Storage is Online Cover Level (m) 31.180

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	71.8
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	359.0	Slope (1:X)	325.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	30.500	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.099 Discharge Coefficient 0.600 Invert Level (m) 30.100

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

Half Drain Time : 49 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	30.645	0.145	0.0	14.4	14.4	48.7	O K
30 min Summer	30.669	0.169	0.0	14.7	14.7	58.6	O K
60 min Summer	30.676	0.176	0.0	14.8	14.8	61.2	O K
120 min Summer	30.664	0.164	0.0	14.7	14.7	56.5	O K
180 min Summer	30.649	0.149	0.0	14.5	14.5	50.1	O K
240 min Summer	30.633	0.133	0.0	14.2	14.2	43.5	O K
360 min Summer	30.604	0.104	0.0	13.8	13.8	31.6	O K
480 min Summer	30.580	0.080	0.0	13.4	13.4	21.8	O K
600 min Summer	30.562	0.062	0.0	13.1	13.1	14.1	O K
720 min Summer	30.547	0.047	0.0	12.9	12.9	8.2	O K
960 min Summer	30.520	0.020	0.0	12.5	12.5	1.5	O K
1440 min Summer	30.500	0.000	0.0	9.8	9.8	0.0	O K
2160 min Summer	30.500	0.000	0.0	7.0	7.0	0.0	O K
2880 min Summer	30.500	0.000	0.0	5.6	5.6	0.0	O K
4320 min Summer	30.500	0.000	0.0	4.0	4.0	0.0	O K
5760 min Summer	30.500	0.000	0.0	3.1	3.1	0.0	O K
7200 min Summer	30.500	0.000	0.0	2.6	2.6	0.0	O K
8640 min Summer	30.500	0.000	0.0	2.2	2.2	0.0	O K
10080 min Summer	30.500	0.000	0.0	2.0	2.0	0.0	O K
15 min Winter	30.662	0.162	0.0	14.6	14.6	55.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.514	0.0	59.2	17
30 min Summer	91.395	0.0	78.9	30
60 min Summer	57.005	0.0	99.9	48
120 min Summer	34.338	0.0	121.3	82
180 min Summer	25.183	0.0	134.8	116
240 min Summer	20.089	0.0	143.2	150
360 min Summer	14.576	0.0	156.6	214
480 min Summer	11.607	0.0	166.7	274
600 min Summer	9.719	0.0	174.0	332
720 min Summer	8.404	0.0	180.9	390
960 min Summer	6.676	0.0	191.3	494
1440 min Summer	4.819	0.0	206.5	0
2160 min Summer	3.472	0.0	222.1	0
2880 min Summer	2.749	0.0	233.2	0
4320 min Summer	1.976	0.0	248.7	0
5760 min Summer	1.562	0.0	259.1	0
7200 min Summer	1.300	0.0	266.7	0
8640 min Summer	1.119	0.0	272.5	0
10080 min Summer	0.986	0.0	276.9	0
15 min Winter	139.514	0.0	66.3	17

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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
30 min Winter	30.694	0.194	0.0	15.1	15.1	68.7	O K
60 min Winter	30.701	0.201	0.0	15.2	15.2	71.8	O K
120 min Winter	30.685	0.185	0.0	15.0	15.0	65.1	O K
180 min Winter	30.661	0.161	0.0	14.6	14.6	55.3	O K
240 min Winter	30.637	0.137	0.0	14.3	14.3	45.1	O K
360 min Winter	30.594	0.094	0.0	13.6	13.6	27.5	O K
480 min Winter	30.561	0.061	0.0	13.1	13.1	13.9	O K
600 min Winter	30.535	0.035	0.0	12.7	12.7	4.6	O K
720 min Winter	30.506	0.006	0.0	12.2	12.2	0.2	O K
960 min Winter	30.500	0.000	0.0	9.8	9.8	0.0	O K
1440 min Winter	30.500	0.000	0.0	7.1	7.1	0.0	O K
2160 min Winter	30.500	0.000	0.0	5.1	5.1	0.0	O K
2880 min Winter	30.500	0.000	0.0	4.0	4.0	0.0	O K
4320 min Winter	30.500	0.000	0.0	2.9	2.9	0.0	O K
5760 min Winter	30.500	0.000	0.0	2.3	2.3	0.0	O K
7200 min Winter	30.500	0.000	0.0	1.9	1.9	0.0	O K
8640 min Winter	30.500	0.000	0.0	1.6	1.6	0.0	O K
10080 min Winter	30.500	0.000	0.0	1.4	1.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.395	0.0	89.2	30
60 min Winter	57.005	0.0	113.7	52
120 min Winter	34.338	0.0	137.3	90
180 min Winter	25.183	0.0	151.4	126
240 min Winter	20.089	0.0	161.4	160
360 min Winter	14.576	0.0	176.1	226
480 min Winter	11.607	0.0	187.3	284
600 min Winter	9.719	0.0	196.2	334
720 min Winter	8.404	0.0	203.4	370
960 min Winter	6.676	0.0	215.3	0
1440 min Winter	4.819	0.0	232.5	0
2160 min Winter	3.472	0.0	250.2	0
2880 min Winter	2.749	0.0	262.9	0
4320 min Winter	1.976	0.0	280.7	0
5760 min Winter	1.562	0.0	293.0	0
7200 min Winter	1.300	0.0	302.0	0
8640 min Winter	1.119	0.0	309.0	0
10080 min Winter	0.986	0.0	314.5	0

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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)	20.100	Shortest Storm (mins)	15
Ratio R	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.250

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

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Model Details

Storage is Online Cover Level (m) 31.180

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	71.8
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	359.0	Slope (1:X)	325.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	30.500	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.099 Discharge Coefficient 0.600 Invert Level (m) 30.100

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Summary of Results for 30 year Return Period

Half Drain Time : 100 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	31.151	0.051	0.0	2.4	2.4	23.1	O K
30 min Summer	31.167	0.067	0.0	3.3	3.3	30.9	O K
60 min Summer	31.180	0.080	0.0	4.1	4.1	36.6	O K
120 min Summer	31.186	0.086	0.0	4.5	4.5	39.6	O K
180 min Summer	31.188	0.088	0.0	4.7	4.7	40.7	O K
240 min Summer	31.189	0.089	0.0	4.7	4.7	40.8	O K
360 min Summer	31.187	0.087	0.0	4.6	4.6	40.1	O K
480 min Summer	31.185	0.085	0.0	4.4	4.4	38.9	O K
600 min Summer	31.182	0.082	0.0	4.2	4.2	37.5	O K
720 min Summer	31.179	0.079	0.0	4.0	4.0	36.2	O K
960 min Summer	31.173	0.073	0.0	3.6	3.6	33.7	O K
1440 min Summer	31.164	0.064	0.0	3.1	3.1	29.3	O K
2160 min Summer	31.154	0.054	0.0	2.6	2.6	24.5	O K
2880 min Summer	31.147	0.047	0.0	2.2	2.2	21.3	O K
4320 min Summer	31.139	0.039	0.0	1.7	1.7	17.6	O K
5760 min Summer	31.134	0.034	0.0	1.4	1.4	15.2	O K
7200 min Summer	31.129	0.029	0.0	1.2	1.2	13.2	O K
8640 min Summer	31.126	0.026	0.0	1.0	1.0	11.5	O K
10080 min Summer	31.123	0.023	0.0	0.9	0.9	10.3	O K
15 min Winter	31.158	0.058	0.0	2.8	2.8	26.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	24.3	18
30 min Summer	49.584	0.0	33.7	32
60 min Summer	30.811	0.0	43.6	60
120 min Summer	18.584	0.0	53.9	92
180 min Summer	13.680	0.0	60.2	124
240 min Summer	10.960	0.0	64.6	158
360 min Summer	8.001	0.0	71.2	226
480 min Summer	6.397	0.0	76.1	292
600 min Summer	5.375	0.0	80.0	358
720 min Summer	4.661	0.0	83.2	422
960 min Summer	3.719	0.0	88.4	550
1440 min Summer	2.704	0.0	95.9	796
2160 min Summer	1.963	0.0	103.3	1168
2880 min Summer	1.563	0.0	108.3	1528
4320 min Summer	1.133	0.0	114.8	2248
5760 min Summer	0.901	0.0	118.6	3000
7200 min Summer	0.754	0.0	120.8	3744
8640 min Summer	0.652	0.0	122.1	4488
10080 min Summer	0.576	0.0	122.6	5152
15 min Winter	76.290	0.0	28.1	18

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Summary of Results for 30 year Return Period

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
30 min Winter	31.177	0.077	0.0	3.9	3.9	35.4	O K
60 min Winter	31.191	0.091	0.0	4.8	4.8	41.8	O K
120 min Winter	31.197	0.097	0.0	5.3	5.3	44.8	O K
180 min Winter	31.198	0.098	0.0	5.4	5.4	45.3	O K
240 min Winter	31.197	0.097	0.0	5.3	5.3	44.7	O K
360 min Winter	31.193	0.093	0.0	5.0	5.0	42.7	O K
480 min Winter	31.188	0.088	0.0	4.6	4.6	40.4	O K
600 min Winter	31.183	0.083	0.0	4.3	4.3	38.2	O K
720 min Winter	31.179	0.079	0.0	4.0	4.0	36.2	O K
960 min Winter	31.171	0.071	0.0	3.5	3.5	32.7	O K
1440 min Winter	31.159	0.059	0.0	2.9	2.9	27.1	O K
2160 min Winter	31.147	0.047	0.0	2.3	2.3	21.6	O K
2880 min Winter	31.141	0.041	0.0	1.9	1.9	18.5	O K
4320 min Winter	31.133	0.033	0.0	1.4	1.4	15.0	O K
5760 min Winter	31.127	0.027	0.0	1.1	1.1	12.2	O K
7200 min Winter	31.123	0.023	0.0	0.9	0.9	10.1	O K
8640 min Winter	31.120	0.020	0.0	0.8	0.8	8.7	O K
10080 min Winter	31.117	0.017	0.0	0.7	0.7	7.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	38.6	32
60 min Winter	30.811	0.0	49.7	60
120 min Winter	18.584	0.0	61.3	94
180 min Winter	13.680	0.0	68.3	132
240 min Winter	10.960	0.0	73.4	170
360 min Winter	8.001	0.0	80.7	240
480 min Winter	6.397	0.0	86.3	310
600 min Winter	5.375	0.0	90.7	378
720 min Winter	4.661	0.0	94.3	444
960 min Winter	3.719	0.0	100.3	576
1440 min Winter	2.704	0.0	108.8	824
2160 min Winter	1.963	0.0	117.3	1192
2880 min Winter	1.563	0.0	123.3	1556
4320 min Winter	1.133	0.0	131.2	2292
5760 min Winter	0.901	0.0	136.1	3056
7200 min Winter	0.754	0.0	139.2	3752
8640 min Winter	0.652	0.0	141.2	4464
10080 min Winter	0.576	0.0	142.5	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.221

Time (mins) From:	To:	Area (ha)
0	4	0.221

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Model Details

Storage is Online Cover Level (m) 31.960

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	80.8
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	404.0	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	31.100	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.111 Discharge Coefficient 0.600 Invert Level (m) 31.080

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

Half Drain Time : 98 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	31.203	0.103	0.0	5.7	5.7	47.4	O K
30 min Summer	31.232	0.132	0.0	7.8	7.8	61.0	O K
60 min Summer	31.252	0.152	0.0	8.8	8.8	70.5	O K
120 min Summer	31.264	0.164	0.0	9.2	9.2	75.8	O K
180 min Summer	31.266	0.166	0.0	9.3	9.3	76.8	O K
240 min Summer	31.264	0.164	0.0	9.2	9.2	76.1	O K
360 min Summer	31.258	0.158	0.0	9.0	9.0	72.9	O K
480 min Summer	31.250	0.150	0.0	8.7	8.7	69.3	O K
600 min Summer	31.242	0.142	0.0	8.4	8.4	65.7	O K
720 min Summer	31.235	0.135	0.0	8.0	8.0	62.6	O K
960 min Summer	31.224	0.124	0.0	7.2	7.2	57.3	O K
1440 min Summer	31.207	0.107	0.0	6.0	6.0	49.3	O K
2160 min Summer	31.190	0.090	0.0	4.8	4.8	41.4	O K
2880 min Summer	31.178	0.078	0.0	4.0	4.0	36.0	O K
4320 min Summer	31.163	0.063	0.0	3.0	3.0	28.7	O K
5760 min Summer	31.152	0.052	0.0	2.5	2.5	23.8	O K
7200 min Summer	31.145	0.045	0.0	2.2	2.2	20.7	O K
8640 min Summer	31.141	0.041	0.0	1.9	1.9	18.7	O K
10080 min Summer	31.138	0.038	0.0	1.7	1.7	17.2	O K
15 min Winter	31.217	0.117	0.0	6.7	6.7	53.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	50.1	18
30 min Summer	90.866	0.0	67.9	32
60 min Summer	56.713	0.0	86.5	60
120 min Summer	34.190	0.0	105.7	88
180 min Summer	25.088	0.0	116.9	122
240 min Summer	20.020	0.0	124.7	156
360 min Summer	14.528	0.0	136.1	224
480 min Summer	11.570	0.0	144.7	290
600 min Summer	9.690	0.0	151.5	352
720 min Summer	8.380	0.0	157.2	414
960 min Summer	6.658	0.0	166.3	540
1440 min Summer	4.807	0.0	179.5	792
2160 min Summer	3.465	0.0	192.9	1152
2880 min Summer	2.744	0.0	202.3	1528
4320 min Summer	1.973	0.0	215.0	2248
5760 min Summer	1.559	0.0	223.4	2992
7200 min Summer	1.298	0.0	229.2	3680
8640 min Summer	1.118	0.0	233.3	4408
10080 min Summer	0.985	0.0	236.3	5144
15 min Winter	138.634	0.0	57.0	18

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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
30 min Winter	31.250	0.150	0.0	8.7	8.7	69.3	O K
60 min Winter	31.274	0.174	0.0	9.6	9.6	80.7	O K
120 min Winter	31.285	0.185	0.0	9.9	9.9	85.5	O K
180 min Winter	31.284	0.184	0.0	9.9	9.9	85.3	O K
240 min Winter	31.279	0.179	0.0	9.8	9.8	82.9	O K
360 min Winter	31.266	0.166	0.0	9.3	9.3	76.9	O K
480 min Winter	31.253	0.153	0.0	8.8	8.8	70.9	O K
600 min Winter	31.242	0.142	0.0	8.4	8.4	65.6	O K
720 min Winter	31.233	0.133	0.0	7.8	7.8	61.3	O K
960 min Winter	31.218	0.118	0.0	6.8	6.8	54.6	O K
1440 min Winter	31.198	0.098	0.0	5.3	5.3	45.2	O K
2160 min Winter	31.179	0.079	0.0	4.1	4.1	36.6	O K
2880 min Winter	31.167	0.067	0.0	3.3	3.3	30.9	O K
4320 min Winter	31.151	0.051	0.0	2.4	2.4	23.1	O K
5760 min Winter	31.142	0.042	0.0	2.0	2.0	19.1	O K
7200 min Winter	31.137	0.037	0.0	1.6	1.6	16.9	O K
8640 min Winter	31.134	0.034	0.0	1.4	1.4	15.2	O K
10080 min Winter	31.131	0.031	0.0	1.2	1.2	13.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	76.9	31
60 min Winter	56.713	0.0	97.8	58
120 min Winter	34.190	0.0	119.3	94
180 min Winter	25.088	0.0	131.9	132
240 min Winter	20.020	0.0	140.6	170
360 min Winter	14.528	0.0	153.4	240
480 min Winter	11.570	0.0	163.1	306
600 min Winter	9.690	0.0	170.8	370
720 min Winter	8.380	0.0	177.2	434
960 min Winter	6.658	0.0	187.5	560
1440 min Winter	4.807	0.0	202.5	810
2160 min Winter	3.465	0.0	217.7	1188
2880 min Winter	2.744	0.0	228.5	1560
4320 min Winter	1.973	0.0	243.4	2288
5760 min Winter	1.559	0.0	253.3	2944
7200 min Winter	1.298	0.0	260.4	3680
8640 min Winter	1.118	0.0	265.7	4408
10080 min Winter	0.985	0.0	269.6	5240

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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	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.221

Time (mins) From:	To:	Area (ha)
0	4	0.221

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Model Details

Storage is Online Cover Level (m) 31.960

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	80.8
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	404.0	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	31.100	Cap Volume Depth (m)	0.250

Orifice Outflow Control

Diameter (m) 0.111 Discharge Coefficient 0.600 Invert Level (m) 31.080

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Summary of Results for 30 year Return Period

Half Drain Time : 171 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	38.558	0.058	0.0	1.5	1.5	27.4	O K
30 min Summer	38.573	0.073	0.0	2.1	2.1	34.7	O K
60 min Summer	38.586	0.086	0.0	2.7	2.7	40.7	O K
120 min Summer	38.593	0.093	0.0	3.1	3.1	44.1	O K
180 min Summer	38.595	0.095	0.0	3.2	3.2	45.3	O K
240 min Summer	38.597	0.097	0.0	3.3	3.3	45.9	O K
360 min Summer	38.597	0.097	0.0	3.3	3.3	46.1	O K
480 min Summer	38.596	0.096	0.0	3.3	3.3	45.6	O K
600 min Summer	38.594	0.094	0.0	3.2	3.2	44.9	O K
720 min Summer	38.593	0.093	0.0	3.1	3.1	44.0	O K
960 min Summer	38.589	0.089	0.0	2.9	2.9	42.1	O K
1440 min Summer	38.582	0.082	0.0	2.5	2.5	38.8	O K
2160 min Summer	38.573	0.073	0.0	2.1	2.1	34.9	O K
2880 min Summer	38.567	0.067	0.0	1.8	1.8	31.7	O K
4320 min Summer	38.558	0.058	0.0	1.5	1.5	27.4	O K
5760 min Summer	38.552	0.052	0.0	1.3	1.3	24.9	O K
7200 min Summer	38.549	0.049	0.0	1.1	1.1	23.1	O K
8640 min Summer	38.546	0.046	0.0	1.0	1.0	21.9	O K
10080 min Summer	38.544	0.044	0.0	0.8	0.8	20.8	O K
15 min Winter	38.565	0.065	0.0	1.7	1.7	30.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.822	0.0	23.5	18
30 min Summer	49.886	0.0	31.6	33
60 min Summer	30.968	0.0	42.8	62
120 min Summer	18.658	0.0	52.0	104
180 min Summer	13.726	0.0	57.6	132
240 min Summer	10.992	0.0	61.6	166
360 min Summer	8.021	0.0	67.6	234
480 min Summer	6.411	0.0	72.2	302
600 min Summer	5.385	0.0	75.8	368
720 min Summer	4.668	0.0	78.9	434
960 min Summer	3.724	0.0	83.9	562
1440 min Summer	2.706	0.0	90.9	812
2160 min Summer	1.964	0.0	101.6	1192
2880 min Summer	1.563	0.0	107.6	1556
4320 min Summer	1.132	0.0	116.0	2288
5760 min Summer	0.900	0.0	125.3	3000
7200 min Summer	0.753	0.0	130.8	3744
8640 min Summer	0.651	0.0	135.3	4448
10080 min Summer	0.575	0.0	138.6	5240
15 min Winter	76.822	0.0	26.7	18

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Summary of Results for 30 year Return Period

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
30 min Winter	38.582	0.082	0.0	2.5	2.5	38.8	O K
60 min Winter	38.596	0.096	0.0	3.2	3.2	45.5	O K
120 min Winter	38.603	0.103	0.0	3.6	3.6	49.1	O K
180 min Winter	38.606	0.106	0.0	3.8	3.8	50.2	O K
240 min Winter	38.606	0.106	0.0	3.8	3.8	50.4	O K
360 min Winter	38.604	0.104	0.0	3.7	3.7	49.5	O K
480 min Winter	38.601	0.101	0.0	3.5	3.5	48.1	O K
600 min Winter	38.598	0.098	0.0	3.4	3.4	46.6	O K
720 min Winter	38.595	0.095	0.0	3.2	3.2	45.0	O K
960 min Winter	38.589	0.089	0.0	2.9	2.9	42.2	O K
1440 min Winter	38.579	0.079	0.0	2.4	2.4	37.7	O K
2160 min Winter	38.569	0.069	0.0	1.9	1.9	32.6	O K
2880 min Winter	38.561	0.061	0.0	1.6	1.6	28.9	O K
4320 min Winter	38.552	0.052	0.0	1.2	1.2	24.6	O K
5760 min Winter	38.547	0.047	0.0	1.0	1.0	22.4	O K
7200 min Winter	38.544	0.044	0.0	0.8	0.8	20.8	O K
8640 min Winter	38.541	0.041	0.0	0.7	0.7	19.4	O K
10080 min Winter	38.538	0.038	0.0	0.6	0.6	18.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.886	0.0	35.9	32
60 min Winter	30.968	0.0	48.2	60
120 min Winter	18.658	0.0	58.5	112
180 min Winter	13.726	0.0	64.8	138
240 min Winter	10.992	0.0	69.3	176
360 min Winter	8.021	0.0	76.1	250
480 min Winter	6.411	0.0	81.2	320
600 min Winter	5.385	0.0	85.2	390
720 min Winter	4.668	0.0	88.7	458
960 min Winter	3.724	0.0	94.3	590
1440 min Winter	2.706	0.0	102.3	852
2160 min Winter	1.964	0.0	114.0	1232
2880 min Winter	1.563	0.0	120.8	1588
4320 min Winter	1.132	0.0	130.3	2296
5760 min Winter	0.900	0.0	140.5	3000
7200 min Winter	0.753	0.0	146.7	3816
8640 min Winter	0.651	0.0	151.7	4576
10080 min Winter	0.575	0.0	155.7	5248

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.100	Shortest Storm (mins)	15
Ratio R	0.406	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.195

Time (mins) From:	To:	Area (ha)
0	4	0.195

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Model Details

Storage is Online Cover Level (m) 40.000

Cellular Storage Structure

Invert Level (m) 38.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	500.0	0.0	0.201	0.0	0.0
0.200	500.0	0.0			

Orifice Outflow Control

Diameter (m) 0.092 Discharge Coefficient 0.600 Invert Level (m) 38.500

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

Half Drain Time : 164 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	38.604	0.104	0.0	3.7	3.7	49.3	O K
30 min Summer	38.631	0.131	0.0	5.2	5.2	62.3	O K
60 min Summer	38.653	0.153	0.0	5.8	5.8	72.8	O K
120 min Summer	38.665	0.165	0.0	6.1	6.1	78.5	O K
180 min Summer	38.669	0.169	0.0	6.2	6.2	80.3	O K
240 min Summer	38.670	0.170	0.0	6.2	6.2	80.5	O K
360 min Summer	38.667	0.167	0.0	6.2	6.2	79.3	O K
480 min Summer	38.663	0.163	0.0	6.0	6.0	77.2	O K
600 min Summer	38.657	0.157	0.0	5.9	5.9	74.7	O K
720 min Summer	38.652	0.152	0.0	5.7	5.7	72.1	O K
960 min Summer	38.641	0.141	0.0	5.5	5.5	67.2	O K
1440 min Summer	38.626	0.126	0.0	4.9	4.9	59.6	O K
2160 min Summer	38.610	0.110	0.0	4.0	4.0	52.1	O K
2880 min Summer	38.599	0.099	0.0	3.4	3.4	46.9	O K
4320 min Summer	38.584	0.084	0.0	2.6	2.6	39.9	O K
5760 min Summer	38.575	0.075	0.0	2.1	2.1	35.5	O K
7200 min Summer	38.567	0.067	0.0	1.8	1.8	31.9	O K
8640 min Summer	38.561	0.061	0.0	1.6	1.6	29.2	O K
10080 min Summer	38.557	0.057	0.0	1.5	1.5	27.2	O K
15 min Winter	38.616	0.116	0.0	4.3	4.3	55.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.635	0.0	45.9	18
30 min Summer	91.435	0.0	61.5	32
60 min Summer	57.005	0.0	80.8	62
120 min Summer	34.324	0.0	97.7	100
180 min Summer	25.168	0.0	107.7	130
240 min Summer	20.074	0.0	114.7	164
360 min Summer	14.562	0.0	124.9	232
480 min Summer	11.594	0.0	132.7	300
600 min Summer	9.707	0.0	138.9	366
720 min Summer	8.393	0.0	144.1	432
960 min Summer	6.666	0.0	152.5	558
1440 min Summer	4.811	0.0	164.5	806
2160 min Summer	3.466	0.0	180.6	1168
2880 min Summer	2.744	0.0	190.4	1532
4320 min Summer	1.972	0.0	204.0	2252
5760 min Summer	1.558	0.0	217.6	3000
7200 min Summer	1.297	0.0	226.3	3744
8640 min Summer	1.117	0.0	233.2	4488
10080 min Summer	0.983	0.0	238.5	5152
15 min Winter	139.635	0.0	51.9	18

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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
30 min Winter	38.647	0.147	0.0	5.6	5.6	69.9	O K
60 min Winter	38.673	0.173	0.0	6.3	6.3	82.1	O K
120 min Winter	38.686	0.186	0.0	6.6	6.6	88.4	O K
180 min Winter	38.689	0.189	0.0	6.7	6.7	89.5	O K
240 min Winter	38.687	0.187	0.0	6.6	6.6	88.9	O K
360 min Winter	38.680	0.180	0.0	6.5	6.5	85.5	O K
480 min Winter	38.671	0.171	0.0	6.3	6.3	81.4	O K
600 min Winter	38.662	0.162	0.0	6.0	6.0	77.1	O K
720 min Winter	38.654	0.154	0.0	5.8	5.8	73.0	O K
960 min Winter	38.639	0.139	0.0	5.4	5.4	65.9	O K
1440 min Winter	38.619	0.119	0.0	4.5	4.5	56.6	O K
2160 min Winter	38.601	0.101	0.0	3.5	3.5	47.9	O K
2880 min Winter	38.589	0.089	0.0	2.9	2.9	42.3	O K
4320 min Winter	38.574	0.074	0.0	2.1	2.1	35.4	O K
5760 min Winter	38.564	0.064	0.0	1.7	1.7	30.4	O K
7200 min Winter	38.557	0.057	0.0	1.4	1.4	27.0	O K
8640 min Winter	38.552	0.052	0.0	1.3	1.3	24.9	O K
10080 min Winter	38.550	0.050	0.0	1.1	1.1	23.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.435	0.0	69.4	32
60 min Winter	57.005	0.0	90.7	60
120 min Winter	34.324	0.0	109.7	112
180 min Winter	25.168	0.0	120.9	140
240 min Winter	20.074	0.0	128.7	178
360 min Winter	14.562	0.0	140.2	252
480 min Winter	11.594	0.0	148.9	322
600 min Winter	9.707	0.0	155.9	390
720 min Winter	8.393	0.0	161.8	456
960 min Winter	6.666	0.0	171.2	586
1440 min Winter	4.811	0.0	184.7	836
2160 min Winter	3.466	0.0	202.5	1208
2880 min Winter	2.744	0.0	213.6	1584
4320 min Winter	1.972	0.0	229.0	2332
5760 min Winter	1.558	0.0	243.9	3056
7200 min Winter	1.297	0.0	253.6	3752
8640 min Winter	1.117	0.0	261.4	4496
10080 min Winter	0.983	0.0	267.7	5152

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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)	20.100	Shortest Storm (mins)	15
Ratio R	0.406	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.195

Time (mins) From:	To:	Area (ha)
0	4	0.195

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Model Details

Storage is Online Cover Level (m) 40.000

Cellular Storage Structure

Invert Level (m) 38.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	500.0	0.0	0.201	0.0	0.0
0.200	500.0	0.0			

Orifice Outflow Control

Diameter (m) 0.092 Discharge Coefficient 0.600 Invert Level (m) 38.500

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Summary of Results for 30 year Return Period

Half Drain Time : 6 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	30.480	0.070	0.0	71.8	71.8	37.8	O K
30 min Summer	30.478	0.068	0.0	71.7	71.7	36.6	O K
60 min Summer	30.459	0.049	0.0	70.7	70.7	25.7	O K
120 min Summer	30.428	0.018	0.0	68.9	68.9	7.3	O K
180 min Summer	30.410	0.000	0.0	67.9	67.9	0.0	O K
240 min Summer	30.410	0.000	0.0	55.2	55.2	0.0	O K
360 min Summer	30.410	0.000	0.0	40.3	40.3	0.0	O K
480 min Summer	30.410	0.000	0.0	32.2	32.2	0.0	O K
600 min Summer	30.410	0.000	0.0	27.0	27.0	0.0	O K
720 min Summer	30.410	0.000	0.0	23.4	23.4	0.0	O K
960 min Summer	30.410	0.000	0.0	18.7	18.7	0.0	O K
1440 min Summer	30.410	0.000	0.0	13.6	13.6	0.0	O K
2160 min Summer	30.410	0.000	0.0	9.8	9.8	0.0	O K
2880 min Summer	30.410	0.000	0.0	7.8	7.8	0.0	O K
4320 min Summer	30.410	0.000	0.0	5.6	5.6	0.0	O K
5760 min Summer	30.410	0.000	0.0	4.5	4.5	0.0	O K
7200 min Summer	30.410	0.000	0.0	3.7	3.7	0.0	O K
8640 min Summer	30.410	0.000	0.0	3.2	3.2	0.0	O K
10080 min Summer	30.410	0.000	0.0	2.8	2.8	0.0	O K
15 min Winter	30.490	0.080	0.0	72.4	72.4	43.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	79.2	13
30 min Summer	49.584	0.0	103.5	21
60 min Summer	30.811	0.0	131.9	38
120 min Summer	18.584	0.0	163.7	66
180 min Summer	13.680	0.0	180.1	0
240 min Summer	10.960	0.0	192.8	0
360 min Summer	8.001	0.0	211.7	0
480 min Summer	6.397	0.0	225.9	0
600 min Summer	5.375	0.0	237.3	0
720 min Summer	4.661	0.0	246.9	0
960 min Summer	3.719	0.0	262.6	0
1440 min Summer	2.704	0.0	285.7	0
2160 min Summer	1.963	0.0	309.7	0
2880 min Summer	1.563	0.0	327.1	0
4320 min Summer	1.133	0.0	351.9	0
5760 min Summer	0.901	0.0	369.2	0
7200 min Summer	0.754	0.0	382.2	0
8640 min Summer	0.652	0.0	392.3	0
10080 min Summer	0.576	0.0	400.5	0
15 min Winter	76.290	0.0	89.7	14

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Summary of Results for 30 year Return Period

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
30 min Winter	30.484	0.074	0.0	72.0	72.0	40.4	O K
60 min Winter	30.453	0.043	0.0	70.3	70.3	22.2	O K
120 min Winter	30.410	0.000	0.0	67.2	67.2	0.0	O K
180 min Winter	30.410	0.000	0.0	49.7	49.7	0.0	O K
240 min Winter	30.410	0.000	0.0	39.8	39.8	0.0	O K
360 min Winter	30.410	0.000	0.0	29.1	29.1	0.0	O K
480 min Winter	30.410	0.000	0.0	23.2	23.2	0.0	O K
600 min Winter	30.410	0.000	0.0	19.5	19.5	0.0	O K
720 min Winter	30.410	0.000	0.0	16.9	16.9	0.0	O K
960 min Winter	30.410	0.000	0.0	13.5	13.5	0.0	O K
1440 min Winter	30.410	0.000	0.0	9.8	9.8	0.0	O K
2160 min Winter	30.410	0.000	0.0	7.1	7.1	0.0	O K
2880 min Winter	30.410	0.000	0.0	5.6	5.6	0.0	O K
4320 min Winter	30.410	0.000	0.0	4.1	4.1	0.0	O K
5760 min Winter	30.410	0.000	0.0	3.2	3.2	0.0	O K
7200 min Winter	30.410	0.000	0.0	2.7	2.7	0.0	O K
8640 min Winter	30.410	0.000	0.0	2.3	2.3	0.0	O K
10080 min Winter	30.410	0.000	0.0	2.0	2.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	117.3	23
60 min Winter	30.811	0.0	149.3	40
120 min Winter	18.584	0.0	183.0	0
180 min Winter	13.680	0.0	202.9	0
240 min Winter	10.960	0.0	217.2	0
360 min Winter	8.001	0.0	238.3	0
480 min Winter	6.397	0.0	254.3	0
600 min Winter	5.375	0.0	267.2	0
720 min Winter	4.661	0.0	278.0	0
960 min Winter	3.719	0.0	295.7	0
1440 min Winter	2.704	0.0	321.7	0
2160 min Winter	1.963	0.0	348.9	0
2880 min Winter	1.563	0.0	368.8	0
4320 min Winter	1.133	0.0	397.2	0
5760 min Winter	0.901	0.0	417.3	0
7200 min Winter	0.754	0.0	432.7	0
8640 min Winter	0.652	0.0	444.8	0
10080 min Winter	0.576	0.0	454.6	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.617

Time (mins) From:	To:	Area (ha)
0	4	0.617

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Model Details

Storage is Online Cover Level (m) 31.100

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.0
Membrane Percolation (mm/hr)	1000	Length (m)	101.4
Max Percolation (l/s)	507.0	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	30.410	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.206 Discharge Coefficient 0.600 Invert Level (m) 29.720

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

Half Drain Time : 16 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	30.579	0.169	0.0	77.0	77.0	95.7	O K
30 min Summer	30.590	0.180	0.0	77.6	77.6	102.3	O K
60 min Summer	30.577	0.167	0.0	76.9	76.9	94.4	O K
120 min Summer	30.530	0.120	0.0	74.5	74.5	66.9	O K
180 min Summer	30.486	0.076	0.0	72.1	72.1	41.7	O K
240 min Summer	30.453	0.043	0.0	70.3	70.3	22.3	O K
360 min Summer	30.418	0.008	0.0	68.3	68.3	1.8	O K
480 min Summer	30.410	0.000	0.0	58.2	58.2	0.0	O K
600 min Summer	30.410	0.000	0.0	48.8	48.8	0.0	O K
720 min Summer	30.410	0.000	0.0	42.2	42.2	0.0	O K
960 min Summer	30.410	0.000	0.0	33.5	33.5	0.0	O K
1440 min Summer	30.410	0.000	0.0	24.2	24.2	0.0	O K
2160 min Summer	30.410	0.000	0.0	17.4	17.4	0.0	O K
2880 min Summer	30.410	0.000	0.0	13.8	13.8	0.0	O K
4320 min Summer	30.410	0.000	0.0	9.9	9.9	0.0	O K
5760 min Summer	30.410	0.000	0.0	7.8	7.8	0.0	O K
7200 min Summer	30.410	0.000	0.0	6.5	6.5	0.0	O K
8640 min Summer	30.410	0.000	0.0	5.6	5.6	0.0	O K
10080 min Summer	30.410	0.000	0.0	4.9	4.9	0.0	O K
15 min Winter	30.609	0.199	0.0	78.5	78.5	113.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	149.8	15
30 min Summer	90.866	0.0	201.3	23
60 min Summer	56.713	0.0	254.7	40
120 min Summer	34.190	0.0	309.4	74
180 min Summer	25.088	0.0	337.9	104
240 min Summer	20.020	0.0	359.4	132
360 min Summer	14.528	0.0	392.9	186
480 min Summer	11.570	0.0	417.4	0
600 min Summer	9.690	0.0	437.0	0
720 min Summer	8.380	0.0	453.5	0
960 min Summer	6.658	0.0	480.2	0
1440 min Summer	4.807	0.0	519.3	0
2160 min Summer	3.465	0.0	559.9	0
2880 min Summer	2.744	0.0	589.4	0
4320 min Summer	1.973	0.0	631.7	0
5760 min Summer	1.559	0.0	661.6	0
7200 min Summer	1.298	0.0	684.6	0
8640 min Summer	1.118	0.0	702.9	0
10080 min Summer	0.985	0.0	718.0	0
15 min Winter	138.634	0.0	170.1	15

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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
30 min Winter	30.621	0.211	0.0	79.1	79.1	120.1	O K
60 min Winter	30.595	0.185	0.0	77.8	77.8	105.0	O K
120 min Winter	30.521	0.111	0.0	74.0	74.0	61.7	O K
180 min Winter	30.459	0.049	0.0	70.6	70.6	25.6	O K
240 min Winter	30.420	0.010	0.0	68.5	68.5	3.0	O K
360 min Winter	30.410	0.000	0.0	52.8	52.8	0.0	O K
480 min Winter	30.410	0.000	0.0	42.1	42.1	0.0	O K
600 min Winter	30.410	0.000	0.0	35.2	35.2	0.0	O K
720 min Winter	30.410	0.000	0.0	30.4	30.4	0.0	O K
960 min Winter	30.410	0.000	0.0	24.2	24.2	0.0	O K
1440 min Winter	30.410	0.000	0.0	17.4	17.4	0.0	O K
2160 min Winter	30.410	0.000	0.0	12.6	12.6	0.0	O K
2880 min Winter	30.410	0.000	0.0	9.9	9.9	0.0	O K
4320 min Winter	30.410	0.000	0.0	7.1	7.1	0.0	O K
5760 min Winter	30.410	0.000	0.0	5.6	5.6	0.0	O K
7200 min Winter	30.410	0.000	0.0	4.7	4.7	0.0	O K
8640 min Winter	30.410	0.000	0.0	4.0	4.0	0.0	O K
10080 min Winter	30.410	0.000	0.0	3.5	3.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	224.6	25
60 min Winter	56.713	0.0	284.0	44
120 min Winter	34.190	0.0	344.5	78
180 min Winter	25.088	0.0	379.8	108
240 min Winter	20.020	0.0	404.8	130
360 min Winter	14.528	0.0	441.3	0
480 min Winter	11.570	0.0	468.8	0
600 min Winter	9.690	0.0	490.8	0
720 min Winter	8.380	0.0	509.3	0
960 min Winter	6.658	0.0	539.3	0
1440 min Winter	4.807	0.0	583.3	0
2160 min Winter	3.465	0.0	629.2	0
2880 min Winter	2.744	0.0	662.6	0
4320 min Winter	1.973	0.0	710.5	0
5760 min Winter	1.559	0.0	744.7	0
7200 min Winter	1.298	0.0	771.1	0
8640 min Winter	1.118	0.0	792.4	0
10080 min Winter	0.985	0.0	810.0	0

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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	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.617

Time (mins) From:	To:	Area (ha)
0	4	0.617

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Model Details

Storage is Online Cover Level (m) 31.100

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.0
Membrane Percolation (mm/hr)	1000	Length (m)	101.4
Max Percolation (l/s)	507.0	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	30.410	Cap Volume Depth (m)	0.300

Orifice Outflow Control

Diameter (m) 0.206 Discharge Coefficient 0.600 Invert Level (m) 29.720

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Summary of Results for 30 year Return Period

Half Drain Time : 11 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	29.584	0.224	0.0	47.2	47.2	38.9	O K
30 min Summer	29.594	0.234	0.0	49.6	49.6	42.1	O K
60 min Summer	29.584	0.224	0.0	47.2	47.2	38.9	O K
120 min Summer	29.556	0.196	0.0	40.6	40.6	30.1	O K
180 min Summer	29.533	0.173	0.0	35.2	35.2	23.6	O K
240 min Summer	29.515	0.155	0.0	31.0	31.0	18.9	O K
360 min Summer	29.489	0.129	0.0	25.0	25.0	13.0	O K
480 min Summer	29.468	0.108	0.0	21.4	21.4	9.1	O K
600 min Summer	29.452	0.092	0.0	18.8	18.8	6.6	O K
720 min Summer	29.440	0.080	0.0	16.8	16.8	5.0	O K
960 min Summer	29.426	0.066	0.0	13.9	13.9	3.4	O K
1440 min Summer	29.409	0.049	0.0	10.1	10.1	1.9	O K
2160 min Summer	29.390	0.030	0.0	7.4	7.4	0.7	O K
2880 min Summer	29.379	0.019	0.0	5.9	5.9	0.3	O K
4320 min Summer	29.366	0.006	0.0	4.3	4.3	0.0	O K
5760 min Summer	29.360	0.000	0.0	3.4	3.4	0.0	O K
7200 min Summer	29.360	0.000	0.0	2.8	2.8	0.0	O K
8640 min Summer	29.360	0.000	0.0	2.4	2.4	0.0	O K
10080 min Summer	29.360	0.000	0.0	2.1	2.1	0.0	O K
15 min Winter	29.601	0.241	0.0	51.2	51.2	44.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.290	0.0	61.2	13
30 min Summer	49.584	0.0	80.9	22
60 min Summer	30.811	0.0	101.4	38
120 min Summer	18.584	0.0	123.4	70
180 min Summer	13.680	0.0	136.8	100
240 min Summer	10.960	0.0	146.5	132
360 min Summer	8.001	0.0	160.7	192
480 min Summer	6.397	0.0	171.5	250
600 min Summer	5.375	0.0	180.1	310
720 min Summer	4.661	0.0	187.4	370
960 min Summer	3.719	0.0	199.4	490
1440 min Summer	2.704	0.0	217.0	734
2160 min Summer	1.963	0.0	235.5	1100
2880 min Summer	1.563	0.0	249.2	1436
4320 min Summer	1.133	0.0	268.9	2200
5760 min Summer	0.901	0.0	283.0	0
7200 min Summer	0.754	0.0	293.9	0
8640 min Summer	0.652	0.0	302.7	0
10080 min Summer	0.576	0.0	309.9	0
15 min Winter	76.290	0.0	69.1	14

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Summary of Results for 30 year Return Period

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
30 min Winter	29.608	0.248	0.0	52.9	52.9	46.3	O K
60 min Winter	29.588	0.228	0.0	48.1	48.1	40.1	O K
120 min Winter	29.548	0.188	0.0	38.6	38.6	27.7	O K
180 min Winter	29.519	0.159	0.0	31.8	31.8	19.8	O K
240 min Winter	29.497	0.137	0.0	26.9	26.9	14.8	O K
360 min Winter	29.464	0.104	0.0	20.7	20.7	8.4	O K
480 min Winter	29.441	0.081	0.0	17.0	17.0	5.2	O K
600 min Winter	29.429	0.069	0.0	14.5	14.5	3.7	O K
720 min Winter	29.420	0.060	0.0	12.7	12.7	2.8	O K
960 min Winter	29.409	0.049	0.0	10.1	10.1	1.8	O K
1440 min Winter	29.390	0.030	0.0	7.4	7.4	0.7	O K
2160 min Winter	29.375	0.015	0.0	5.4	5.4	0.2	O K
2880 min Winter	29.366	0.006	0.0	4.3	4.3	0.0	O K
4320 min Winter	29.360	0.000	0.0	3.1	3.1	0.0	O K
5760 min Winter	29.360	0.000	0.0	2.4	2.4	0.0	O K
7200 min Winter	29.360	0.000	0.0	2.0	2.0	0.0	O K
8640 min Winter	29.360	0.000	0.0	1.7	1.7	0.0	O K
10080 min Winter	29.360	0.000	0.0	1.5	1.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.584	0.0	91.2	23
60 min Winter	30.811	0.0	114.4	40
120 min Winter	18.584	0.0	139.1	72
180 min Winter	13.680	0.0	154.0	104
240 min Winter	10.960	0.0	164.7	134
360 min Winter	8.001	0.0	180.7	194
480 min Winter	6.397	0.0	192.7	252
600 min Winter	5.375	0.0	202.4	308
720 min Winter	4.661	0.0	210.7	366
960 min Winter	3.719	0.0	224.1	482
1440 min Winter	2.704	0.0	244.0	734
2160 min Winter	1.963	0.0	264.9	1076
2880 min Winter	1.563	0.0	280.3	1416
4320 min Winter	1.133	0.0	302.8	0
5760 min Winter	0.901	0.0	319.0	0
7200 min Winter	0.754	0.0	331.6	0
8640 min Winter	0.652	0.0	341.8	0
10080 min Winter	0.576	0.0	350.3	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.462

Time (mins) From:	To:	Area (ha)
0	4	0.462

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Model Details

Storage is Online Cover Level (m) 31.320

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	54.4
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	272.0	Slope (1:X)	90.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	29.360	Cap Volume Depth (m)	0.470

Orifice Outflow Control

Diameter (m) 0.248 Discharge Coefficient 0.600 Invert Level (m) 29.290

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

Half Drain Time : 15 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	29.711	0.351	0.0	70.0	70.0	78.7	O K
30 min Summer	29.740	0.380	0.0	73.3	73.3	87.6	O K
60 min Summer	29.728	0.368	0.0	72.0	72.0	84.1	O K
120 min Summer	29.678	0.318	0.0	65.9	65.9	68.2	O K
180 min Summer	29.637	0.277	0.0	59.8	59.8	55.4	O K
240 min Summer	29.608	0.248	0.0	52.9	52.9	46.3	O K
360 min Summer	29.568	0.208	0.0	43.3	43.3	33.7	O K
480 min Summer	29.542	0.182	0.0	37.2	37.2	25.8	O K
600 min Summer	29.522	0.162	0.0	32.5	32.5	20.5	O K
720 min Summer	29.506	0.146	0.0	28.9	28.9	16.6	O K
960 min Summer	29.481	0.121	0.0	23.7	23.7	11.5	O K
1440 min Summer	29.446	0.086	0.0	17.8	17.8	5.8	O K
2160 min Summer	29.422	0.062	0.0	13.1	13.1	3.0	O K
2880 min Summer	29.410	0.050	0.0	10.3	10.3	1.9	O K
4320 min Summer	29.391	0.031	0.0	7.4	7.4	0.7	O K
5760 min Summer	29.379	0.019	0.0	5.9	5.9	0.3	O K
7200 min Summer	29.371	0.011	0.0	4.9	4.9	0.1	O K
8640 min Summer	29.366	0.006	0.0	4.2	4.2	0.0	O K
10080 min Summer	29.360	0.000	0.0	3.7	3.7	0.0	O K
15 min Winter	29.746	0.386	0.0	74.0	74.0	89.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.634	0.0	115.3	14
30 min Summer	90.866	0.0	152.4	22
60 min Summer	56.713	0.0	191.5	40
120 min Summer	34.190	0.0	231.7	72
180 min Summer	25.088	0.0	255.6	102
240 min Summer	20.020	0.0	272.0	132
360 min Summer	14.528	0.0	296.4	194
480 min Summer	11.570	0.0	314.8	254
600 min Summer	9.690	0.0	329.6	314
720 min Summer	8.380	0.0	342.1	372
960 min Summer	6.658	0.0	362.2	492
1440 min Summer	4.807	0.0	391.9	734
2160 min Summer	3.465	0.0	422.9	1096
2880 min Summer	2.744	0.0	445.6	1464
4320 min Summer	1.973	0.0	478.4	2188
5760 min Summer	1.559	0.0	501.8	2840
7200 min Summer	1.298	0.0	520.2	3544
8640 min Summer	1.118	0.0	535.1	4312
10080 min Summer	0.985	0.0	547.7	4976
15 min Winter	138.634	0.0	129.5	15

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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
30 min Winter	29.773	0.413	0.0	76.9	76.9	98.0	O K
60 min Winter	29.747	0.387	0.0	74.1	74.1	89.9	O K
120 min Winter	29.669	0.309	0.0	64.9	64.9	65.5	O K
180 min Winter	29.618	0.258	0.0	55.4	55.4	49.6	O K
240 min Winter	29.584	0.224	0.0	47.1	47.1	38.8	O K
360 min Winter	29.540	0.180	0.0	36.7	36.7	25.4	O K
480 min Winter	29.512	0.152	0.0	30.2	30.2	18.0	O K
600 min Winter	29.491	0.131	0.0	25.6	25.6	13.5	O K
720 min Winter	29.473	0.113	0.0	22.3	22.3	10.0	O K
960 min Winter	29.447	0.087	0.0	18.0	18.0	5.9	O K
1440 min Winter	29.422	0.062	0.0	13.1	13.1	3.0	O K
2160 min Winter	29.406	0.046	0.0	9.5	9.5	1.6	O K
2880 min Winter	29.391	0.031	0.0	7.5	7.5	0.8	O K
4320 min Winter	29.375	0.015	0.0	5.4	5.4	0.2	O K
5760 min Winter	29.366	0.006	0.0	4.3	4.3	0.0	O K
7200 min Winter	29.360	0.000	0.0	3.5	3.5	0.0	O K
8640 min Winter	29.360	0.000	0.0	3.0	3.0	0.0	O K
10080 min Winter	29.360	0.000	0.0	2.7	2.7	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	90.866	0.0	171.3	24
60 min Winter	56.713	0.0	214.9	42
120 min Winter	34.190	0.0	260.2	74
180 min Winter	25.088	0.0	286.8	106
240 min Winter	20.020	0.0	305.3	136
360 min Winter	14.528	0.0	332.5	196
480 min Winter	11.570	0.0	353.3	256
600 min Winter	9.690	0.0	369.9	316
720 min Winter	8.380	0.0	383.9	376
960 min Winter	6.658	0.0	406.5	492
1440 min Winter	4.807	0.0	439.9	726
2160 min Winter	3.465	0.0	474.7	1080
2880 min Winter	2.744	0.0	500.4	1460
4320 min Winter	1.973	0.0	537.4	2176
5760 min Winter	1.559	0.0	564.1	2944
7200 min Winter	1.298	0.0	585.1	0
8640 min Winter	1.118	0.0	602.1	0
10080 min Winter	0.985	0.0	616.4	0

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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	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.462

Time (mins) From:	To:	Area (ha)
0	4	0.462

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Model Details

Storage is Online Cover Level (m) 31.320

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	54.4
Membrane Percolation (mm/hr)	1000	Length (m)	18.0
Max Percolation (l/s)	272.0	Slope (1:X)	90.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	29.360	Cap Volume Depth (m)	0.470

Orifice Outflow Control

Diameter (m) 0.248 Discharge Coefficient 0.600 Invert Level (m) 29.290

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Summary of Results for 30 year Return Period

Half Drain Time : 57 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	38.578	0.078	0.0	3.4	3.4	16.3	O K
30 min Summer	38.593	0.093	0.0	4.4	4.4	19.3	O K
60 min Summer	38.602	0.102	0.0	5.0	5.0	21.2	O K
120 min Summer	38.606	0.106	0.0	5.2	5.2	22.1	O K
180 min Summer	38.604	0.104	0.0	5.1	5.1	21.7	O K
240 min Summer	38.601	0.101	0.0	4.9	4.9	21.1	O K
360 min Summer	38.594	0.094	0.0	4.5	4.5	19.7	O K
480 min Summer	38.588	0.088	0.0	4.1	4.1	18.4	O K
600 min Summer	38.583	0.083	0.0	3.7	3.7	17.4	O K
720 min Summer	38.579	0.079	0.0	3.5	3.5	16.6	O K
960 min Summer	38.573	0.073	0.0	3.0	3.0	15.3	O K
1440 min Summer	38.565	0.065	0.0	2.3	2.3	13.7	O K
2160 min Summer	38.557	0.057	0.0	1.7	1.7	11.9	O K
2880 min Summer	38.551	0.051	0.0	1.4	1.4	10.7	O K
4320 min Summer	38.544	0.044	0.0	1.1	1.1	9.3	O K
5760 min Summer	38.540	0.040	0.0	0.9	0.9	8.3	O K
7200 min Summer	38.536	0.036	0.0	0.7	0.7	7.6	O K
8640 min Summer	38.534	0.034	0.0	0.6	0.6	7.1	O K
10080 min Summer	38.532	0.032	0.0	0.6	0.6	6.7	O K
15 min Winter	38.587	0.087	0.0	4.0	4.0	18.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.354	0.0	17.0	17
30 min Summer	49.606	0.0	22.3	30
60 min Summer	30.811	0.0	28.3	44
120 min Summer	18.576	0.0	34.2	78
180 min Summer	13.671	0.0	37.8	112
240 min Summer	10.952	0.0	40.4	144
360 min Summer	7.993	0.0	44.2	208
480 min Summer	6.390	0.0	47.2	268
600 min Summer	5.368	0.0	49.5	330
720 min Summer	4.654	0.0	51.5	390
960 min Summer	3.714	0.0	54.7	512
1440 min Summer	2.699	0.0	59.6	762
2160 min Summer	1.959	0.0	65.4	1124
2880 min Summer	1.560	0.0	69.4	1496
4320 min Summer	1.130	0.0	75.1	2208
5760 min Summer	0.899	0.0	80.1	2944
7200 min Summer	0.752	0.0	83.8	3672
8640 min Summer	0.650	0.0	86.8	4408
10080 min Summer	0.575	0.0	89.2	5144
15 min Winter	76.354	0.0	19.1	17

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Summary of Results for 30 year Return Period

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
30 min Winter	38.604	0.104	0.0	5.1	5.1	21.6	O K
60 min Winter	38.612	0.112	0.0	5.8	5.8	23.5	O K
120 min Winter	38.613	0.113	0.0	5.9	5.9	23.5	O K
180 min Winter	38.608	0.108	0.0	5.4	5.4	22.6	O K
240 min Winter	38.602	0.102	0.0	5.0	5.0	21.4	O K
360 min Winter	38.592	0.092	0.0	4.3	4.3	19.2	O K
480 min Winter	38.584	0.084	0.0	3.8	3.8	17.6	O K
600 min Winter	38.578	0.078	0.0	3.4	3.4	16.4	O K
720 min Winter	38.574	0.074	0.0	3.1	3.1	15.5	O K
960 min Winter	38.568	0.068	0.0	2.5	2.5	14.2	O K
1440 min Winter	38.559	0.059	0.0	1.8	1.8	12.4	O K
2160 min Winter	38.550	0.050	0.0	1.4	1.4	10.5	O K
2880 min Winter	38.545	0.045	0.0	1.1	1.1	9.4	O K
4320 min Winter	38.539	0.039	0.0	0.8	0.8	8.0	O K
5760 min Winter	38.534	0.034	0.0	0.7	0.7	7.1	O K
7200 min Winter	38.531	0.031	0.0	0.5	0.5	6.5	O K
8640 min Winter	38.529	0.029	0.0	0.5	0.5	6.1	O K
10080 min Winter	38.527	0.027	0.0	0.4	0.4	5.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.606	0.0	25.0	30
60 min Winter	30.811	0.0	31.8	46
120 min Winter	18.576	0.0	38.4	84
180 min Winter	13.671	0.0	42.4	118
240 min Winter	10.952	0.0	45.3	152
360 min Winter	7.993	0.0	49.6	216
480 min Winter	6.390	0.0	52.9	278
600 min Winter	5.368	0.0	55.5	338
720 min Winter	4.654	0.0	57.7	398
960 min Winter	3.714	0.0	61.4	524
1440 min Winter	2.699	0.0	66.8	780
2160 min Winter	1.959	0.0	73.3	1144
2880 min Winter	1.560	0.0	77.7	1496
4320 min Winter	1.130	0.0	84.2	2252
5760 min Winter	0.899	0.0	89.7	2976
7200 min Winter	0.752	0.0	93.9	3672
8640 min Winter	0.650	0.0	97.3	4408
10080 min Winter	0.575	0.0	100.0	5240

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.124

Time (mins) From:	To:	Area (ha)
0	4	0.124

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Model Details

Storage is Online Cover Level (m) 40.000

Cellular Storage Structure

Invert Level (m) 38.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	0.201	0.0	0.0
0.200	220.0	0.0			

Orifice Outflow Control

Diameter (m) 0.134 Discharge Coefficient 0.600 Invert Level (m) 38.500

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

Half Drain Time : 40 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	38.637	0.137	0.0	8.0	8.0	28.6	O K
30 min Summer	38.661	0.161	0.0	10.3	10.3	33.6	O K
60 min Summer	38.675	0.175	0.0	11.7	11.7	36.7	O K
120 min Summer	38.677	0.177	0.0	11.9	11.9	37.0	O K
180 min Summer	38.670	0.170	0.0	11.2	11.2	35.5	O K
240 min Summer	38.662	0.162	0.0	10.4	10.4	33.8	O K
360 min Summer	38.647	0.147	0.0	9.0	9.0	30.7	O K
480 min Summer	38.635	0.135	0.0	7.9	7.9	28.3	O K
600 min Summer	38.626	0.126	0.0	7.1	7.1	26.4	O K
720 min Summer	38.619	0.119	0.0	6.4	6.4	24.8	O K
960 min Summer	38.607	0.107	0.0	5.4	5.4	22.4	O K
1440 min Summer	38.590	0.090	0.0	4.2	4.2	18.8	O K
2160 min Summer	38.577	0.077	0.0	3.3	3.3	16.0	O K
2880 min Summer	38.570	0.070	0.0	2.7	2.7	14.5	O K
4320 min Summer	38.560	0.060	0.0	1.9	1.9	12.6	O K
5760 min Summer	38.553	0.053	0.0	1.5	1.5	11.1	O K
7200 min Summer	38.549	0.049	0.0	1.3	1.3	10.1	O K
8640 min Summer	38.545	0.045	0.0	1.1	1.1	9.4	O K
10080 min Summer	38.543	0.043	0.0	1.0	1.0	8.9	O K
15 min Winter	38.653	0.153	0.0	9.6	9.6	31.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.754	0.0	31.4	17
30 min Summer	90.906	0.0	41.4	27
60 min Summer	56.713	0.0	52.4	42
120 min Summer	34.176	0.0	63.2	76
180 min Summer	25.072	0.0	69.6	108
240 min Summer	20.006	0.0	74.1	140
360 min Summer	14.514	0.0	80.6	204
480 min Summer	11.557	0.0	85.6	266
600 min Summer	9.678	0.0	89.6	326
720 min Summer	8.369	0.0	92.9	390
960 min Summer	6.648	0.0	98.4	512
1440 min Summer	4.799	0.0	106.4	752
2160 min Summer	3.459	0.0	115.6	1104
2880 min Summer	2.739	0.0	122.0	1472
4320 min Summer	1.968	0.0	131.2	2204
5760 min Summer	1.556	0.0	138.8	2936
7200 min Summer	1.295	0.0	144.5	3672
8640 min Summer	1.115	0.0	149.1	4400
10080 min Summer	0.982	0.0	152.9	5104
15 min Winter	138.754	0.0	35.3	16

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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
30 min Winter	38.679	0.179	0.0	12.0	12.0	37.4	O K
60 min Winter	38.692	0.192	0.0	13.3	13.3	40.0	O K
120 min Winter	38.685	0.185	0.0	12.6	12.6	38.8	O K
180 min Winter	38.673	0.173	0.0	11.4	11.4	36.1	O K
240 min Winter	38.660	0.160	0.0	10.3	10.3	33.5	O K
360 min Winter	38.641	0.141	0.0	8.4	8.4	29.5	O K
480 min Winter	38.627	0.127	0.0	7.2	7.2	26.6	O K
600 min Winter	38.617	0.117	0.0	6.2	6.2	24.4	O K
720 min Winter	38.609	0.109	0.0	5.5	5.5	22.7	O K
960 min Winter	38.595	0.095	0.0	4.5	4.5	19.8	O K
1440 min Winter	38.578	0.078	0.0	3.4	3.4	16.3	O K
2160 min Winter	38.568	0.068	0.0	2.5	2.5	14.2	O K
2880 min Winter	38.562	0.062	0.0	2.0	2.0	12.9	O K
4320 min Winter	38.551	0.051	0.0	1.4	1.4	10.7	O K
5760 min Winter	38.545	0.045	0.0	1.1	1.1	9.5	O K
7200 min Winter	38.542	0.042	0.0	0.9	0.9	8.7	O K
8640 min Winter	38.539	0.039	0.0	0.8	0.8	8.0	O K
10080 min Winter	38.536	0.036	0.0	0.7	0.7	7.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	90.906	0.0	46.5	27
60 min Winter	56.713	0.0	58.8	46
120 min Winter	34.176	0.0	70.9	80
180 min Winter	25.072	0.0	78.0	114
240 min Winter	20.006	0.0	83.0	148
360 min Winter	14.514	0.0	90.3	212
480 min Winter	11.557	0.0	95.9	274
600 min Winter	9.678	0.0	100.4	338
720 min Winter	8.369	0.0	104.1	400
960 min Winter	6.648	0.0	110.3	520
1440 min Winter	4.799	0.0	119.3	752
2160 min Winter	3.459	0.0	129.5	1124
2880 min Winter	2.739	0.0	136.7	1496
4320 min Winter	1.968	0.0	147.0	2204
5760 min Winter	1.556	0.0	155.5	2992
7200 min Winter	1.295	0.0	161.8	3672
8640 min Winter	1.115	0.0	167.1	4408
10080 min Winter	0.982	0.0	171.3	5152

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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	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.124

Time (mins) From:	To:	Area (ha)
0	4	0.124

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Model Details

Storage is Online Cover Level (m) 40.000

Cellular Storage Structure

Invert Level (m) 38.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	0.201	0.0	0.0
0.200	220.0	0.0			

Orifice Outflow Control

Diameter (m) 0.134 Discharge Coefficient 0.600 Invert Level (m) 38.500

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Summary of Results for 30 year Return Period

Half Drain Time : 23 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	29.191	0.191	0.0	34.2	34.2	60.0	O K
30 min Summer	29.217	0.217	0.0	38.8	38.8	68.0	O K
60 min Summer	29.225	0.225	0.0	40.2	40.2	70.4	O K
120 min Summer	29.208	0.208	0.0	37.4	37.4	65.2	O K
180 min Summer	29.189	0.189	0.0	33.8	33.8	59.1	O K
240 min Summer	29.172	0.172	0.0	30.4	30.4	54.0	O K
360 min Summer	29.149	0.149	0.0	25.2	25.2	46.7	O K
480 min Summer	29.133	0.133	0.0	21.7	21.7	41.6	O K
600 min Summer	29.120	0.120	0.0	19.0	19.0	37.7	O K
720 min Summer	29.111	0.111	0.0	17.0	17.0	34.7	O K
960 min Summer	29.097	0.097	0.0	14.2	14.2	30.3	O K
1440 min Summer	29.078	0.078	0.0	10.7	10.7	24.6	O K
2160 min Summer	29.063	0.063	0.0	8.1	8.1	19.6	O K
2880 min Summer	29.053	0.053	0.0	6.5	6.5	16.5	O K
4320 min Summer	29.040	0.040	0.0	4.8	4.8	12.6	O K
5760 min Summer	29.033	0.033	0.0	3.9	3.9	10.2	O K
7200 min Summer	29.027	0.027	0.0	3.2	3.2	8.5	O K
8640 min Summer	29.023	0.023	0.0	2.8	2.8	7.2	O K
10080 min Summer	29.020	0.020	0.0	2.5	2.5	6.2	O K
15 min Winter	29.215	0.215	0.0	38.5	38.5	67.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.354	0.0	75.9	15
30 min Summer	49.606	0.0	98.6	23
60 min Summer	30.811	0.0	122.5	40
120 min Summer	18.576	0.0	147.8	72
180 min Summer	13.671	0.0	163.2	104
240 min Summer	10.952	0.0	174.3	136
360 min Summer	7.993	0.0	190.8	196
480 min Summer	6.390	0.0	203.4	258
600 min Summer	5.368	0.0	213.6	320
720 min Summer	4.654	0.0	222.3	378
960 min Summer	3.714	0.0	236.4	500
1440 min Summer	2.699	0.0	257.8	740
2160 min Summer	1.959	0.0	280.7	1104
2880 min Summer	1.560	0.0	298.0	1468
4320 min Summer	1.130	0.0	323.9	2204
5760 min Summer	0.899	0.0	343.4	2936
7200 min Summer	0.752	0.0	359.2	3672
8640 min Summer	0.650	0.0	372.6	4400
10080 min Summer	0.575	0.0	384.3	5136
15 min Winter	76.354	0.0	85.0	15

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Summary of Results for 30 year Return Period

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
30 min Winter	29.240	0.240	0.0	42.6	42.6	75.2	O K
60 min Winter	29.240	0.240	0.0	42.6	42.6	75.2	O K
120 min Winter	29.209	0.209	0.0	37.5	37.5	65.6	O K
180 min Winter	29.182	0.182	0.0	32.5	32.5	57.1	O K
240 min Winter	29.162	0.162	0.0	28.2	28.2	50.8	O K
360 min Winter	29.135	0.135	0.0	22.2	22.2	42.3	O K
480 min Winter	29.117	0.117	0.0	18.4	18.4	36.7	O K
600 min Winter	29.105	0.105	0.0	15.8	15.8	32.8	O K
720 min Winter	29.095	0.095	0.0	13.8	13.8	29.8	O K
960 min Winter	29.081	0.081	0.0	11.3	11.3	25.4	O K
1440 min Winter	29.064	0.064	0.0	8.2	8.2	20.1	O K
2160 min Winter	29.050	0.050	0.0	6.1	6.1	15.5	O K
2880 min Winter	29.041	0.041	0.0	4.9	4.9	12.7	O K
4320 min Winter	29.030	0.030	0.0	3.5	3.5	9.3	O K
5760 min Winter	29.023	0.023	0.0	2.8	2.8	7.2	O K
7200 min Winter	29.018	0.018	0.0	2.3	2.3	5.8	O K
8640 min Winter	29.015	0.015	0.0	2.1	2.1	4.7	O K
10080 min Winter	29.012	0.012	0.0	1.8	1.8	3.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.606	0.0	110.5	24
60 min Winter	30.811	0.0	137.3	42
120 min Winter	18.576	0.0	165.5	76
180 min Winter	13.671	0.0	182.8	108
240 min Winter	10.952	0.0	195.2	140
360 min Winter	7.993	0.0	213.8	202
480 min Winter	6.390	0.0	227.8	264
600 min Winter	5.368	0.0	239.3	324
720 min Winter	4.654	0.0	249.0	386
960 min Winter	3.714	0.0	264.9	504
1440 min Winter	2.699	0.0	288.8	752
2160 min Winter	1.959	0.0	314.4	1120
2880 min Winter	1.560	0.0	333.8	1468
4320 min Winter	1.130	0.0	362.8	2204
5760 min Winter	0.899	0.0	384.6	2912
7200 min Winter	0.752	0.0	402.3	3680
8640 min Winter	0.650	0.0	417.3	4400
10080 min Winter	0.575	0.0	430.4	5088

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.531

Time (mins) From:	To:	Area (ha)
0	4	0.531

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Model Details

Storage is Online Cover Level (m) 30.300

Cellular Storage Structure

Invert Level (m) 29.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	330.0	0.0	0.501	0.0	0.0
0.500	330.0	0.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SCL-0263-4820-1000-4820
Design Head (m)	1.000
Design Flow (l/s)	48.2
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Diameter (mm)	263
Invert Level (m)	28.970
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	47.5
Flush-Flo™	0.336	47.4
Kick-Flo®	0.684	39.6
Mean Flow over Head Range	-	37.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.3	1.200	51.9	3.000	80.8	7.000	122.0
0.200	29.9	1.400	55.9	3.500	87.0	7.500	126.1
0.300	47.1	1.600	59.6	4.000	92.9	8.000	130.2
0.400	47.1	1.800	63.1	4.500	98.3	8.500	134.1
0.500	45.5	2.000	66.4	5.000	103.5	9.000	137.9
0.600	43.0	2.200	69.5	5.500	108.4	9.500	141.6
0.800	42.7	2.400	72.5	6.000	113.1		
1.000	47.5	2.600	75.4	6.500	117.6		

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

Half Drain Time : 34 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	29.356	0.356	0.0	47.4	47.4	111.8	O K
30 min Summer	29.419	0.419	0.0	47.4	47.4	131.4	O K
60 min Summer	29.446	0.446	0.0	47.4	47.4	139.7	O K
120 min Summer	29.415	0.415	0.0	47.4	47.4	130.0	O K
180 min Summer	29.363	0.363	0.0	47.4	47.4	113.9	O K
240 min Summer	29.315	0.315	0.0	47.4	47.4	98.8	O K
360 min Summer	29.254	0.254	0.0	44.7	44.7	79.6	O K
480 min Summer	29.219	0.219	0.0	39.2	39.2	68.7	O K
600 min Summer	29.195	0.195	0.0	34.9	34.9	61.0	O K
720 min Summer	29.177	0.177	0.0	31.4	31.4	55.5	O K
960 min Summer	29.152	0.152	0.0	26.0	26.0	47.7	O K
1440 min Summer	29.123	0.123	0.0	19.6	19.6	38.5	O K
2160 min Summer	29.098	0.098	0.0	14.5	14.5	30.8	O K
2880 min Summer	29.083	0.083	0.0	11.6	11.6	26.1	O K
4320 min Summer	29.065	0.065	0.0	8.5	8.5	20.4	O K
5760 min Summer	29.054	0.054	0.0	6.8	6.8	16.9	O K
7200 min Summer	29.046	0.046	0.0	5.6	5.6	14.5	O K
8640 min Summer	29.041	0.041	0.0	4.9	4.9	12.7	O K
10080 min Summer	29.036	0.036	0.0	4.2	4.2	11.3	O K
15 min Winter	29.406	0.406	0.0	47.4	47.4	127.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.754	0.0	138.0	16
30 min Summer	90.906	0.0	180.8	26
60 min Summer	56.713	0.0	225.7	44
120 min Summer	34.176	0.0	272.0	78
180 min Summer	25.072	0.0	299.4	110
240 min Summer	20.006	0.0	318.6	140
360 min Summer	14.514	0.0	346.8	198
480 min Summer	11.557	0.0	368.1	258
600 min Summer	9.678	0.0	385.2	318
720 min Summer	8.369	0.0	399.7	376
960 min Summer	6.648	0.0	423.4	500
1440 min Summer	4.799	0.0	458.5	738
2160 min Summer	3.459	0.0	495.7	1104
2880 min Summer	2.739	0.0	523.3	1468
4320 min Summer	1.968	0.0	564.2	2200
5760 min Summer	1.556	0.0	594.6	2936
7200 min Summer	1.295	0.0	618.9	3672
8640 min Summer	1.115	0.0	639.3	4400
10080 min Summer	0.982	0.0	657.0	5136
15 min Winter	138.754	0.0	154.6	16

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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
30 min Winter	29.479	0.479	0.0	47.4	47.4	150.3	O K
60 min Winter	29.499	0.499	0.0	47.4	47.4	156.5	O K
120 min Winter	29.439	0.439	0.0	47.4	47.4	137.5	O K
180 min Winter	29.356	0.356	0.0	47.4	47.4	111.6	O K
240 min Winter	29.288	0.288	0.0	47.4	47.4	90.4	O K
360 min Winter	29.223	0.223	0.0	39.9	39.9	70.1	O K
480 min Winter	29.188	0.188	0.0	33.6	33.6	58.8	O K
600 min Winter	29.165	0.165	0.0	28.7	28.7	51.7	O K
720 min Winter	29.149	0.149	0.0	25.2	25.2	46.6	O K
960 min Winter	29.126	0.126	0.0	20.3	20.3	39.5	O K
1440 min Winter	29.100	0.100	0.0	14.8	14.8	31.3	O K
2160 min Winter	29.078	0.078	0.0	10.7	10.7	24.6	O K
2880 min Winter	29.066	0.066	0.0	8.6	8.6	20.5	O K
4320 min Winter	29.050	0.050	0.0	6.2	6.2	15.7	O K
5760 min Winter	29.041	0.041	0.0	4.9	4.9	12.7	O K
7200 min Winter	29.034	0.034	0.0	4.1	4.1	10.7	O K
8640 min Winter	29.030	0.030	0.0	3.5	3.5	9.3	O K
10080 min Winter	29.026	0.026	0.0	3.1	3.1	8.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	90.906	0.0	202.6	29
60 min Winter	56.713	0.0	252.8	48
120 min Winter	34.176	0.0	304.7	84
180 min Winter	25.072	0.0	335.3	116
240 min Winter	20.006	0.0	356.7	144
360 min Winter	14.514	0.0	388.3	202
480 min Winter	11.557	0.0	412.3	262
600 min Winter	9.678	0.0	431.6	322
720 min Winter	8.369	0.0	447.8	382
960 min Winter	6.648	0.0	474.3	502
1440 min Winter	4.799	0.0	513.6	748
2160 min Winter	3.459	0.0	555.2	1108
2880 min Winter	2.739	0.0	586.2	1468
4320 min Winter	1.968	0.0	632.0	2168
5760 min Winter	1.556	0.0	666.0	2936
7200 min Winter	1.295	0.0	693.2	3672
8640 min Winter	1.115	0.0	716.1	4368
10080 min Winter	0.982	0.0	735.8	5024

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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	0.405	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.531

Time (mins) From:	To:	Area (ha)
0	4	0.531

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Model Details

Storage is Online Cover Level (m) 30.300

Cellular Storage Structure

Invert Level (m) 29.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	330.0	0.0	0.501	0.0	0.0
0.500	330.0	0.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SCL-0263-4820-1000-4820
Design Head (m)	1.000
Design Flow (l/s)	48.2
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Diameter (mm)	263
Invert Level (m)	28.970
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	47.5
Flush-Flo™	0.336	47.4
Kick-Flo®	0.684	39.6
Mean Flow over Head Range	-	37.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.3	1.200	51.9	3.000	80.8	7.000	122.0
0.200	29.9	1.400	55.9	3.500	87.0	7.500	126.1
0.300	47.1	1.600	59.6	4.000	92.9	8.000	130.2
0.400	47.1	1.800	63.1	4.500	98.3	8.500	134.1
0.500	45.5	2.000	66.4	5.000	103.5	9.000	137.9
0.600	43.0	2.200	69.5	5.500	108.4	9.500	141.6
0.800	42.7	2.400	72.5	6.000	113.1		
1.000	47.5	2.600	75.4	6.500	117.6		

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