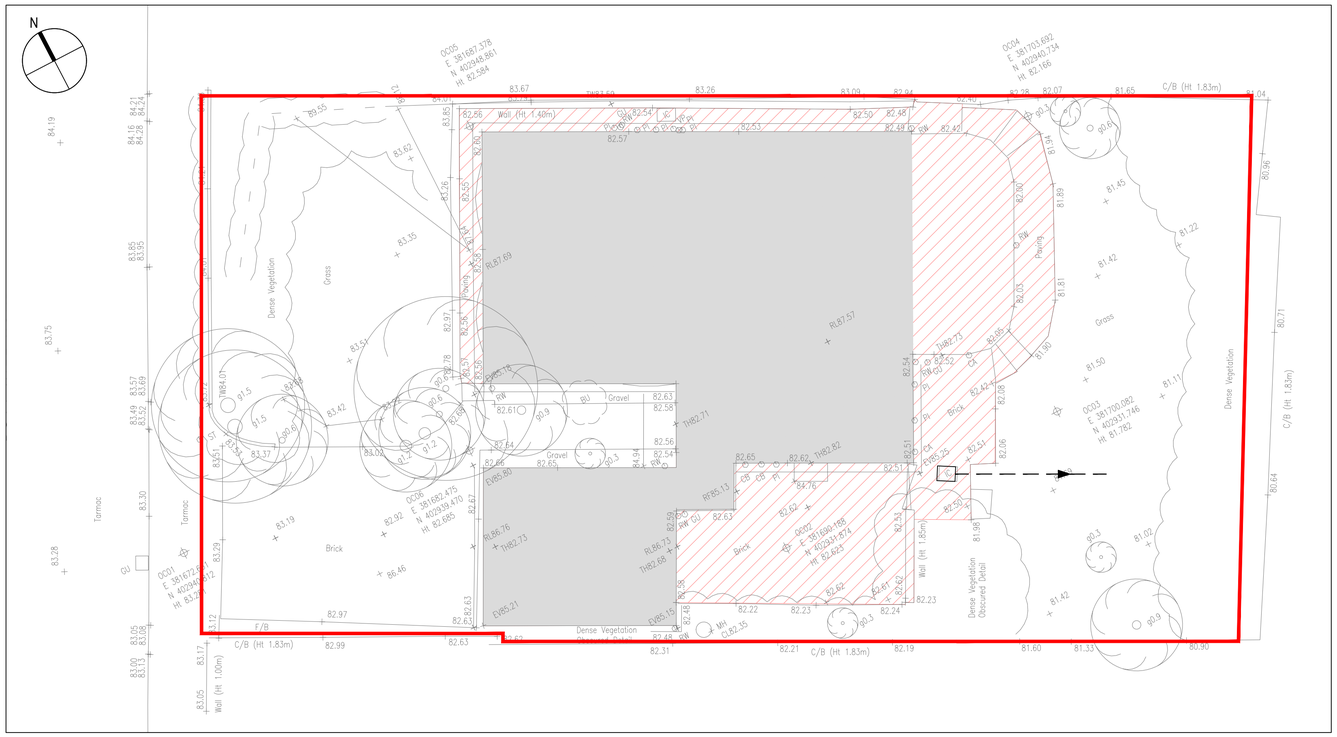
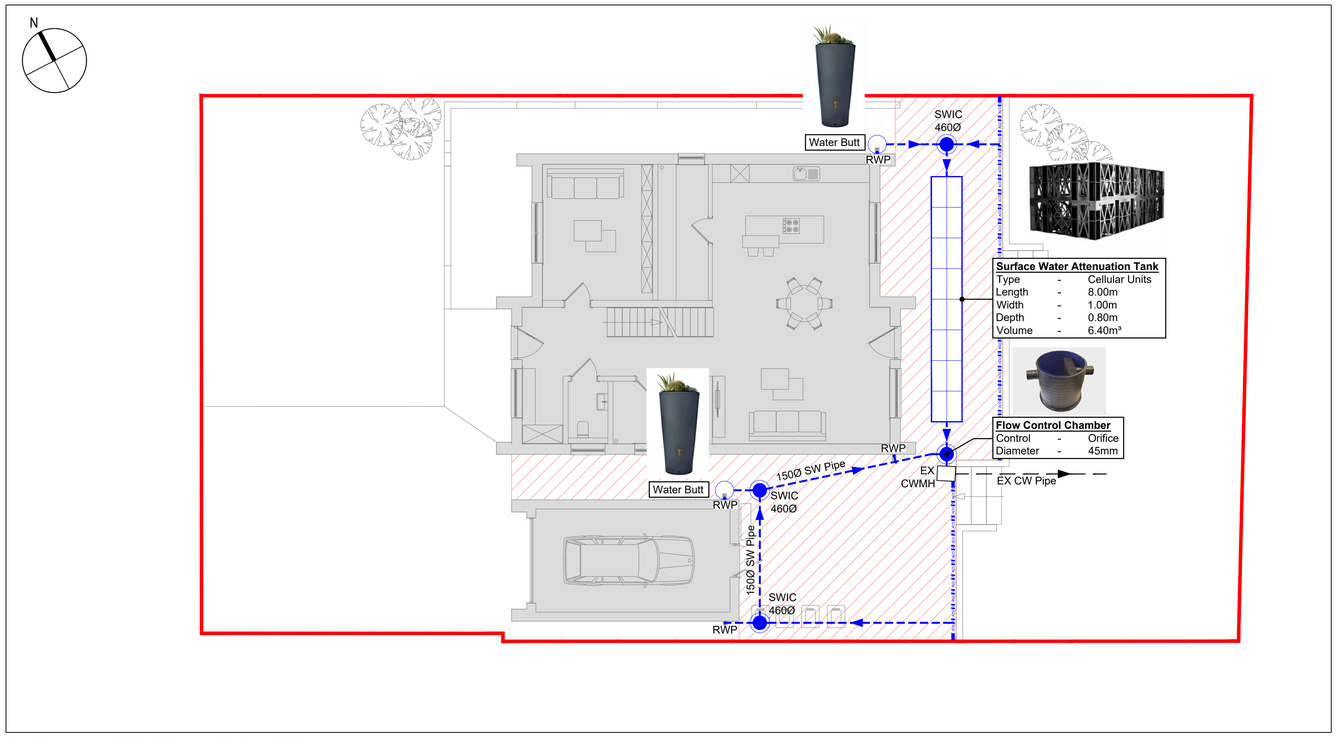


Pre-Development Site (Catchment 270m² / 0.027 ha



Post Development Site (Catchment 240m² / 0.024 ha)

Surface Water Management

Pre-Development Site

The pre-development site consists of a dwelling with attached garage to the centre, with a patio and conservatory leading to a garden to the rear, footapth areas around the perimeter, and a driveway with garden area to the front.

The dwelling, patio, conservatory and driveway are deemed, in terms of surface water management analysis, to be 'developed'.

Topographical and drainage survey information (shown on this drawing) shows that the existing dwelling and external areas of the site are served by rainwater pipes and gullies. The rainwater pipes and gullies discharge the surface water to a combined water drainage network to the rear of the site.

Therefore, surface water run-off from all 'developed' areas of the pre-development site discharge to the combined water drainage network.

Post Development Site

The development proposal is to demolish the existing dwelling, attached garage and conservatory, and to build a new dwelling and detached garage, with an extension to the rear patio area.

Footapth areas around the perimeters are to remain as existing, and driveway areas to the front of the dwelling are to remain as existing.

Therefore, the 'developed' in a post development state is the new dwelling and rear patio areas only.

Pre and Post Development Areas

The existing dwelling, conservatory and rear patio areas of the pre-development site (shown in grey and beige hatch) equates to approximately 270m² / 0.027 ha

The proposed dwelling and rear patio areas of the post development site (shown in grey and beige hatch) equates to approximately 240m² / 0.024 ha.

Therefore, the 'developed' area (areas of the site changing from pre-development to post development) has been reduced by approximately 30m² / 0.003 ha.

Pre-Development Surface Water Run-off Rate

Surface water run-off from the existing dwelling, conservatory and patio areas discharged to the combined water drainage network to the rear.

The pre-development surface water run-off rates have been calculated in the MicroDrainage computer software for an area of 0.027 ha, and using the FEH2013 rainfall data. The results for each storm are:

Q2 - 3.8 l/s
Q30 - 9.1 l/s
100 - 12.1 l/s

Post Development Surface Water Run-Off Rates

The post development surface water run-off rates for the catchment area of 0.024 ha, are to be reduced so that they are a 50% reduction of the pre-development rates, including climate change of 40%.

Surface water management details are shown on this drawing, with the calculations shown in the MicroDrainage computer software.

Surface water flow rates are to be reduced by a 45mm orifice within an inspection, with the results (Micro-Draiange calculation sheets) showing that the restricted rates for 0.024 ha including 40% climate change to be:

Q2 + CC - 1.7 l/s
Q30 + CC - 3.0 l/s
100 + CC - 3.6 l/s

Pre and Post Development Surface Water Run-Off Reduction

MicroDrainage calculations show that with the flow control, the surface water run-off rates have been reduced by a:

Q2 + CC - 3.8 l/s - 1.7 l/s = 55% Reduction
Q30 + CC - 9.1 l/s - 3.0 l/s = 67% Reduction
100 + CC - 12.1 l/s - 3.6 l/s = 70% Reduction

Calculations show that the post development surface water run-off rates will be between a 55% and 70% reduction of the pre-development rates, and are therefore deemed to be acceptable in terms of increased flood risk.

SuDS and Attenuation Volume

Surface water run-off from half the dwelling roof and half the garage roof will discharge to a water butt, were surface water can be re-used for irrigation in the garden, with the remaining rainwater pipes discharging though a trapped gully which captures the first 5mm of rainfall.

Surface water being attenuated by the orifice will be stored in cellular units with a volume of 6.40m³ to prevent flooding for all storms up to and including the 100-year 40% climate change event.

Maintenance

The drainage networks and SuDS features will be carried out by the owners of 4 Butt Hill, Prestwich.

Water Quality

The surface water run-off pollutant from the site are deemed to be very low, and will not change from a pre and post development state.

Exceedance Event

In a storm event exceeding the design 100-year + 40% climate change, surface water will flow to the garden at the rear of the dwelling. The exceedance flow routes in a post development state, will replicate the pre-development routes, and therefore no increase in floods risk to neighbouring land or properties.

Key:

- Proposed Surface Water Drainage
- Existing Combined Water Draiange
- Slot / Channel Drain
- SW Catchment Area Extents
- Ownership Boundary

Rev	Description	Drn	Chk	Date
P1	ISSUED FOR APPROVAL	MDS	NC	27.11.24

Client
MR & MRS JACOBS

Project
RESIDENTIAL DEVELOPMENT
4 BUTT HILL, PRESTWICH

Drawing
SURFACE WATER
MANAGEMENT STRATEGY

Scale	Date	Drawn by	Checked
1:100@A1	28.11.24	MDS	NC

Status
APPROVAL

Flo
Chiltern View Studio
Buslins Lane, Chesham
Buckinghamshire, HP5 2XD
m.07772 033 937
e.mark@flo-consult.co.uk
www.flo-consult.co.uk

Job No.	Drg. No.	Rev
1105	DR-100	P1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840

©1982-2020 Innovyze

Synthetic Rainfall Details

Storm Duration (mins) 30

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	2	+0%					10.040
1.001	2	15 Winter	2	+0%					9.950

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.110	0.000	0.16			2.5	OK	
1.001	2	-0.100	0.000	0.24			3.8	OK	

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%					10.063
1.001	2	15 Winter	30	+0%					9.983

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.087	0.000	0.36			5.7	OK	
1.001	2	-0.067	0.000	0.58			9.1	OK	

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+0%					10.074
1.001	2	15 Winter	100	+0%					10.001

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.076	0.000	0.48			7.5	OK	
1.001	2	-0.049	0.000	0.77			12.1	OK	

©1982-2020 Innovyze

Summary of Results for 2 year Return Period (+40%)

Half Drain Time : 8 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	81.848	0.148	0.0	1.5	1.5	1.1	O K
30	min Summer	81.868	0.168	0.0	1.6	1.6	1.3	O K
60	min Summer	81.863	0.163	0.0	1.6	1.6	1.2	O K
120	min Summer	81.846	0.146	0.0	1.5	1.5	1.1	O K
180	min Summer	81.825	0.125	0.0	1.4	1.4	1.0	O K
240	min Summer	81.808	0.108	0.0	1.2	1.2	0.8	O K
360	min Summer	81.785	0.085	0.0	1.1	1.1	0.6	O K
480	min Summer	81.771	0.071	0.0	0.9	0.9	0.5	O K
600	min Summer	81.763	0.063	0.0	0.8	0.8	0.5	O K
720	min Summer	81.758	0.058	0.0	0.8	0.8	0.4	O K
960	min Summer	81.752	0.052	0.0	0.6	0.6	0.4	O K
1440	min Summer	81.744	0.044	0.0	0.5	0.5	0.3	O K
2160	min Summer	81.738	0.038	0.0	0.4	0.4	0.3	O K
2880	min Summer	81.733	0.033	0.0	0.3	0.3	0.3	O K
4320	min Summer	81.728	0.028	0.0	0.2	0.2	0.2	O K
5760	min Summer	81.725	0.025	0.0	0.2	0.2	0.2	O K
7200	min Summer	81.724	0.024	0.0	0.2	0.2	0.2	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15	min Summer	46.357	0.0	2.1	19
30	min Summer	30.443	0.0	2.7	27
60	min Summer	19.311	0.0	3.5	42
120	min Summer	12.751	0.0	4.6	74
180	min Summer	9.859	0.0	5.3	104
240	min Summer	8.182	0.0	5.9	134
360	min Summer	6.273	0.0	6.8	194
480	min Summer	5.185	0.0	7.5	254
600	min Summer	4.470	0.0	8.0	312
720	min Summer	3.958	0.0	8.5	372
960	min Summer	3.268	0.0	9.4	492
1440	min Summer	2.496	0.0	10.8	736
2160	min Summer	1.915	0.0	12.4	1088
2880	min Summer	1.591	0.0	13.7	1456
4320	min Summer	1.234	0.0	16.0	2160
5760	min Summer	1.035	0.0	17.9	2904
7200	min Summer	0.907	0.0	19.6	3552

©1982-2020 Innovyze

Summary of Results for 2 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
8640 min Summer	81.723	0.023	0.0	0.2	0.2	0.2	O K
10080 min Summer	81.722	0.022	0.0	0.2	0.2	0.2	O K
15 min Winter	81.867	0.167	0.0	1.6	1.6	1.3	O K
30 min Winter	81.886	0.186	0.0	1.7	1.7	1.4	O K
60 min Winter	81.869	0.169	0.0	1.6	1.6	1.3	O K
120 min Winter	81.834	0.134	0.0	1.4	1.4	1.0	O K
180 min Winter	81.806	0.106	0.0	1.2	1.2	0.8	O K
240 min Winter	81.786	0.086	0.0	1.1	1.1	0.7	O K
360 min Winter	81.765	0.065	0.0	0.9	0.9	0.5	O K
480 min Winter	81.757	0.057	0.0	0.7	0.7	0.4	O K
600 min Winter	81.752	0.052	0.0	0.6	0.6	0.4	O K
720 min Winter	81.748	0.048	0.0	0.6	0.6	0.4	O K
960 min Winter	81.742	0.042	0.0	0.5	0.5	0.3	O K
1440 min Winter	81.736	0.036	0.0	0.4	0.4	0.3	O K
2160 min Winter	81.730	0.030	0.0	0.3	0.3	0.2	O K
2880 min Winter	81.727	0.027	0.0	0.2	0.2	0.2	O K
4320 min Winter	81.724	0.024	0.0	0.2	0.2	0.2	O K
5760 min Winter	81.722	0.022	0.0	0.2	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.817	0.0	21.2	4296
10080 min Summer	0.750	0.0	22.7	5048
15 min Winter	46.357	0.0	2.3	20
30 min Winter	30.443	0.0	3.1	28
60 min Winter	19.311	0.0	3.9	44
120 min Winter	12.751	0.0	5.1	76
180 min Winter	9.859	0.0	6.0	106
240 min Winter	8.182	0.0	6.6	136
360 min Winter	6.273	0.0	7.6	192
480 min Winter	5.185	0.0	8.4	252
600 min Winter	4.470	0.0	9.0	310
720 min Winter	3.958	0.0	9.6	370
960 min Winter	3.268	0.0	10.5	496
1440 min Winter	2.496	0.0	12.1	736
2160 min Winter	1.915	0.0	13.9	1084
2880 min Winter	1.591	0.0	15.4	1496
4320 min Winter	1.234	0.0	17.9	2124
5760 min Winter	1.035	0.0	20.0	2904

©1982-2020 Innovyze

Summary of Results for 2 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
7200 min Winter	81.721	0.021	0.0	0.1	0.1	0.2	O K
8640 min Winter	81.720	0.020	0.0	0.1	0.1	0.1	O K
10080 min Winter	81.719	0.019	0.0	0.1	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.907	0.0	21.9	3568
8640 min Winter	0.817	0.0	23.7	4272
10080 min Winter	0.750	0.0	25.4	4992

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.008	4	8	0.008	8	12	0.008

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 82.500

Cellular Storage Structure

Invert Level (m) 81.700 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	8.0	0.0	2.600	0.0	0.0
0.200	8.0	0.0	2.800	0.0	0.0
0.400	8.0	0.0	3.000	0.0	0.0
0.600	8.0	0.0	3.200	0.0	0.0
0.800	8.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Orifice Outflow Control

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 81.700

©1982-2020 Innovyze

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

Half Drain Time : 13 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	82.086	0.386	0.0	2.5	2.5	2.9	O K
30 min Summer	82.157	0.457	0.0	2.8	2.8	3.5	O K
60 min Summer	82.162	0.462	0.0	2.8	2.8	3.5	O K
120 min Summer	82.086	0.386	0.0	2.5	2.5	2.9	O K
180 min Summer	82.023	0.323	0.0	2.3	2.3	2.5	O K
240 min Summer	81.974	0.274	0.0	2.1	2.1	2.1	O K
360 min Summer	81.906	0.206	0.0	1.8	1.8	1.6	O K
480 min Summer	81.863	0.163	0.0	1.6	1.6	1.2	O K
600 min Summer	81.834	0.134	0.0	1.4	1.4	1.0	O K
720 min Summer	81.813	0.113	0.0	1.3	1.3	0.9	O K
960 min Summer	81.786	0.086	0.0	1.1	1.1	0.7	O K
1440 min Summer	81.762	0.062	0.0	0.8	0.8	0.5	O K
2160 min Summer	81.751	0.051	0.0	0.6	0.6	0.4	O K
2880 min Summer	81.745	0.045	0.0	0.5	0.5	0.3	O K
4320 min Summer	81.738	0.038	0.0	0.4	0.4	0.3	O K
5760 min Summer	81.733	0.033	0.0	0.3	0.3	0.3	O K
7200 min Summer	81.730	0.030	0.0	0.3	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	104.616	0.0	4.7	20
30 min Summer	70.053	0.0	6.3	29
60 min Summer	44.843	0.0	8.1	44
120 min Summer	26.890	0.0	9.7	76
180 min Summer	19.916	0.0	10.8	108
240 min Summer	16.088	0.0	11.6	138
360 min Summer	11.903	0.0	12.9	198
480 min Summer	9.600	0.0	13.8	258
600 min Summer	8.122	0.0	14.6	318
720 min Summer	7.083	0.0	15.3	376
960 min Summer	5.709	0.0	16.4	496
1440 min Summer	4.210	0.0	18.2	734
2160 min Summer	3.123	0.0	20.2	1100
2880 min Summer	2.540	0.0	21.9	1456
4320 min Summer	1.916	0.0	24.8	2172
5760 min Summer	1.583	0.0	27.3	2912
7200 min Summer	1.372	0.0	29.6	3640

©1982-2020 Innovyze

Summary of Results for 30 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
8640 min Summer	81.728	0.028	0.0	0.2	0.2	0.2	O K
10080 min Summer	81.726	0.026	0.0	0.2	0.2	0.2	O K
15 min Winter	82.135	0.435	0.0	2.7	2.7	3.3	O K
30 min Winter	82.213	0.513	0.0	3.0	3.0	3.9	Flood Risk
60 min Winter	82.200	0.500	0.0	2.9	2.9	3.8	O K
120 min Winter	82.080	0.380	0.0	2.5	2.5	2.9	O K
180 min Winter	81.992	0.292	0.0	2.2	2.2	2.2	O K
240 min Winter	81.932	0.232	0.0	1.9	1.9	1.8	O K
360 min Winter	81.858	0.158	0.0	1.6	1.6	1.2	O K
480 min Winter	81.817	0.117	0.0	1.3	1.3	0.9	O K
600 min Winter	81.793	0.093	0.0	1.1	1.1	0.7	O K
720 min Winter	81.777	0.077	0.0	1.0	1.0	0.6	O K
960 min Winter	81.761	0.061	0.0	0.8	0.8	0.5	O K
1440 min Winter	81.750	0.050	0.0	0.6	0.6	0.4	O K
2160 min Winter	81.741	0.041	0.0	0.4	0.4	0.3	O K
2880 min Winter	81.737	0.037	0.0	0.4	0.4	0.3	O K
4320 min Winter	81.730	0.030	0.0	0.3	0.3	0.2	O K
5760 min Winter	81.727	0.027	0.0	0.2	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.227	0.0	31.8	4312
10080 min Summer	1.120	0.0	33.9	4976
15 min Winter	104.616	0.0	5.3	20
30 min Winter	70.053	0.0	7.1	30
60 min Winter	44.843	0.0	9.0	46
120 min Winter	26.890	0.0	10.8	80
180 min Winter	19.916	0.0	12.0	112
240 min Winter	16.088	0.0	13.0	142
360 min Winter	11.903	0.0	14.4	202
480 min Winter	9.600	0.0	15.5	260
600 min Winter	8.122	0.0	16.4	318
720 min Winter	7.083	0.0	17.1	376
960 min Winter	5.709	0.0	18.4	496
1440 min Winter	4.210	0.0	20.4	734
2160 min Winter	3.123	0.0	22.7	1100
2880 min Winter	2.540	0.0	24.6	1432
4320 min Winter	1.916	0.0	27.8	2200
5760 min Winter	1.583	0.0	30.6	2936

©1982-2020 Innovyze

Summary of Results for 30 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
7200 min Winter	81.725	0.025	0.0	0.2	0.2	0.2	O K
8640 min Winter	81.724	0.024	0.0	0.2	0.2	0.2	O K
10080 min Winter	81.723	0.023	0.0	0.2	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.372	0.0	33.2	3600
8640 min Winter	1.227	0.0	35.6	4376
10080 min Winter	1.120	0.0	37.9	4976

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.008	4	8	0.008	8	12	0.008

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 82.500

Cellular Storage Structure

Invert Level (m) 81.700 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	8.0	0.0	2.600	0.0	0.0
0.200	8.0	0.0	2.800	0.0	0.0
0.400	8.0	0.0	3.000	0.0	0.0
0.600	8.0	0.0	3.200	0.0	0.0
0.800	8.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Orifice Outflow Control

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 81.700

©1982-2020 Innovyze

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	82.237	0.537	0.0	3.0	3.0	4.1	Flood Risk
30 min Summer	82.347	0.647	0.0	3.3	3.3	4.9	Flood Risk
60 min Summer	82.370	0.670	0.0	3.4	3.4	5.1	Flood Risk
120 min Summer	82.267	0.567	0.0	3.1	3.1	4.3	Flood Risk
180 min Summer	82.180	0.480	0.0	2.9	2.9	3.6	O K
240 min Summer	82.111	0.411	0.0	2.6	2.6	3.1	O K
360 min Summer	82.012	0.312	0.0	2.3	2.3	2.4	O K
480 min Summer	81.946	0.246	0.0	2.0	2.0	1.9	O K
600 min Summer	81.901	0.201	0.0	1.8	1.8	1.5	O K
720 min Summer	81.868	0.168	0.0	1.6	1.6	1.3	O K
960 min Summer	81.825	0.125	0.0	1.4	1.4	0.9	O K
1440 min Summer	81.782	0.082	0.0	1.0	1.0	0.6	O K
2160 min Summer	81.759	0.059	0.0	0.8	0.8	0.5	O K
2880 min Summer	81.751	0.051	0.0	0.6	0.6	0.4	O K
4320 min Summer	81.743	0.043	0.0	0.5	0.5	0.3	O K
5760 min Summer	81.738	0.038	0.0	0.4	0.4	0.3	O K
7200 min Summer	81.735	0.035	0.0	0.3	0.3	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.880	0.0	6.2	20
30 min Summer	93.727	0.0	8.4	29
60 min Summer	60.480	0.0	10.9	46
120 min Summer	35.998	0.0	13.0	78
180 min Summer	26.538	0.0	14.3	110
240 min Summer	21.359	0.0	15.4	140
360 min Summer	15.703	0.0	17.0	200
480 min Summer	12.604	0.0	18.1	260
600 min Summer	10.617	0.0	19.1	320
720 min Summer	9.223	0.0	19.9	378
960 min Summer	7.375	0.0	21.2	498
1440 min Summer	5.377	0.0	23.2	738
2160 min Summer	3.939	0.0	25.5	1100
2880 min Summer	3.176	0.0	27.4	1448
4320 min Summer	2.370	0.0	30.7	2196
5760 min Summer	1.943	0.0	33.6	2936
7200 min Summer	1.675	0.0	36.2	3624

©1982-2020 Innovyze

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
8640 min Summer	81.732	0.032	0.0	0.3	0.3	0.2	O K
10080 min Summer	81.730	0.030	0.0	0.3	0.3	0.2	O K
15 min Winter	82.306	0.606	0.0	3.2	3.2	4.6	Flood Risk
30 min Winter	82.430	0.730	0.0	3.6	3.6	5.5	Flood Risk
60 min Winter	82.434	0.734	0.0	3.6	3.6	5.6	Flood Risk
120 min Winter	82.273	0.573	0.0	3.1	3.1	4.4	Flood Risk
180 min Winter	82.149	0.449	0.0	2.8	2.8	3.4	O K
240 min Winter	82.060	0.360	0.0	2.5	2.5	2.7	O K
360 min Winter	81.946	0.246	0.0	2.0	2.0	1.9	O K
480 min Winter	81.880	0.180	0.0	1.7	1.7	1.4	O K
600 min Winter	81.840	0.140	0.0	1.5	1.5	1.1	O K
720 min Winter	81.814	0.114	0.0	1.3	1.3	0.9	O K
960 min Winter	81.782	0.082	0.0	1.0	1.0	0.6	O K
1440 min Winter	81.759	0.059	0.0	0.8	0.8	0.4	O K
2160 min Winter	81.748	0.048	0.0	0.6	0.6	0.4	O K
2880 min Winter	81.742	0.042	0.0	0.5	0.5	0.3	O K
4320 min Winter	81.735	0.035	0.0	0.3	0.3	0.3	O K
5760 min Winter	81.731	0.031	0.0	0.3	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.491	0.0	38.6	4296
10080 min Summer	1.356	0.0	41.0	4984
15 min Winter	138.880	0.0	7.0	21
30 min Winter	93.727	0.0	9.4	30
60 min Winter	60.480	0.0	12.2	48
120 min Winter	35.998	0.0	14.5	82
180 min Winter	26.538	0.0	16.0	114
240 min Winter	21.359	0.0	17.2	144
360 min Winter	15.703	0.0	19.0	204
480 min Winter	12.604	0.0	20.3	264
600 min Winter	10.617	0.0	21.4	322
720 min Winter	9.223	0.0	22.3	380
960 min Winter	7.375	0.0	23.8	498
1440 min Winter	5.377	0.0	26.0	732
2160 min Winter	3.939	0.0	28.6	1084
2880 min Winter	3.176	0.0	30.7	1448
4320 min Winter	2.370	0.0	34.4	2200
5760 min Winter	1.943	0.0	37.6	2920

©1982-2020 Innovyze

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
7200 min Winter	81.728	0.028	0.0	0.2	0.2	0.2	O K
8640 min Winter	81.726	0.026	0.0	0.2	0.2	0.2	O K
10080 min Winter	81.725	0.025	0.0	0.2	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.675	0.0	40.5	3640
8640 min Winter	1.491	0.0	43.3	4352
10080 min Winter	1.356	0.0	45.9	5120

©1982-2020 Innovyze

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 380483 406476 SD 80483 06476
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.008	4	8	0.008	8	12	0.008

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 82.500

Cellular Storage Structure

Invert Level (m) 81.700 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	8.0	0.0	2.600	0.0	0.0
0.200	8.0	0.0	2.800	0.0	0.0
0.400	8.0	0.0	3.000	0.0	0.0
0.600	8.0	0.0	3.200	0.0	0.0
0.800	8.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Orifice Outflow Control

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 81.700

©1982-2020 Innovyze