

Job Title Land adjacent to the Watermill, Halfway Bridge, Lodsworth, GU28 9BP		Date January 2023	
Item Drainage Strategy	Revision A	Job No. E8017	Report No. RE004

Introduction

This Drainage Strategy has been produced for Newman Developments by Stephen Wilson Partnership (SWP). The aim of the short report is to summarise the surface and foul drainage strategy for the development at Land adjacent to the Watermill, Halfway Bridge, Lodsworth, GU28 9BP. This document should be read in conjunction with drawing 8017-SWP-XX-XX-PL-C-1101 and all other supporting information.

Location

The site is located at Land adjacent to the Watermill, Halfway Bridge, Lodsworth, GU28 9BP. The figure below shows the site in its current context.



Site Location – Site Boundary in red

The centre of the site can be located using the National Grid Reference 493117, 121984.

The British Geological Survey (BGS) map shows that the site is underlain by Sandstone (Easebourne Member). At the time of writing no intrusive ground investigation works had been carried out.

A topographical survey shows the site is mostly impermeable with a building and associated hard landscaping taking up most of the site.

The site slopes in general west to east. The River Rother runs along the Eastern boundary, which runs from North to South.

Proposed Plans

The proposed development comprises the construction of 7 dwellings with associated hard and soft landscaping. The figure below shows the current proposals.



Development Proposals – Site Boundary in red

The proposed impermeable areas are summarised as follows:

Development Site Area:	<u>1284 m²</u>
Proposed Roof Area:	388 m ²
Proposed Hard Paved	386m ²
(Existing Car Park	186 m ²)
Total Impermeable Area:	<u>774 m² (960 m²)</u>

The drainage strategy has not included the existing car park as no significant changes are proposed. The existing car park is also isolated from the main development by the public highway.

Surface Water Strategy

The proposed surface water drainage strategy has followed the drainage hierarchy.

Due to the proximity of the river Rother where groundwater is likely to be high, and there being no space to allow for infiltration for a 5m offset to buildings and structures, discharge via soakage is not a viable option.

It is therefore proposed to discharge surface water to the river Rother located to the east of the site.

The existing drainage on site is unknown and so a CCTV survey is to be carried out before detailed design to review the use of the existing drainage. The CCTV survey shall find out the routing, levels, and condition of the existing drainage. Should existing drainage be found to be unusable, a new surface water headwall should be constructed to allow for the discharge to the river Rother. A flood risk activity permit will be required from the Environment Agency to allow the construction of the headwall.

It is proposed to construct a traditional piped drainage system which will connect to a sealed geocellular attenuation tank. Flow will be controlled by a Hydrobrake at 3.5l/s with attenuation provided in the geocellular attenuation tank 1.5m(W) x 25m(L) x 1.2m(D) for up to and including the 1in100 plus 45% climate change rainfall event.

WSSC current SUDS policy for the surface water discharge flow rate allow for a minimum 50% betterment of existing run off rates, should it not be possible to achieve greenfield run off rates on brownfield sites. During preliminary design, the use of a greenfield runoff rate was explored. With the limited space available due to Flood Risk, engineering challenges of the site (retaining walls) and keeping the attenuation outside the flood risk areas, the use of the greenfield runoff rate did not prove viable due to the lack of available space for attenuation.

The following table shows the existing run off rate vs the proposed run off rate (without flow control) and the proposed discharge rate of this drainage strategy. The proposed drainage strategy with flow control provides a minimum 50% betterment on the existing run off rate, which fulfils the requirement of WSSC's discharge policy.

	Run off rate (Existing)	Run off rate (Proposed)	Proposed with Flow Control
Rainfall Event		<i>With +45%CC</i>	
1in2	7.907 l/s	11.570 l/s	2.8l/s
1in30	17.876 l/s	26.157 l/s	2.8l/s
1in100	22.555 l/s	33.003 l/s	3.5l/s

Drainage calculations can be found in appendix 2.

It should be noted that the surface water drainage systems shall be developed during the detailed design of this project and is subject to change. However, the sustainable principles of this strategy shall be followed.

Foul water Strategy

It is proposed to install new foul water drainage to serve the development, which will discharge to the existing foul Public Sewer to the south of the site.

All private foul water drainage will be designed and constructed in accordance with the requirements of the Building Regulations approved Document H.

Peak foul flow rates can be determined for the whole site and will be used to guide the detailed foul water drainage design to minimise the risk of sewer flooding.

The current proposals are for 7 residential homes. As such, the peak foul flow can be determined using the guidance in the DCG.

$$\frac{4000 \text{ l/s/day} \times 7}{24 \times 60 \times 60} = 0.32 \text{ l/s peak foul flow}$$

Therefore, the proposed peak foul flow rate is calculated to be 0.32l/s.

All new connections to the public sewer shall be subject to approval under a Section 106 Agreement with Southern Water.

A CCTV survey will be carried out to confirm the extent and condition of the existing drainage before construction. Where possible, existing drainage will be renewed and repaired as required.

Maintenance

All drainage within the site boundary will be the responsibility of the private management company. The details for the private management company are to be confirmed.

A drainage maintenance plan will be detailed as the design of the drainage system develops.

The following maintenance regime would be recommended as a minimum, but actions and frequencies should be adjusted to suit the specific requirements of this development. The component specific regimes and any manufacturer's specific recommendations should always be followed.

Maintenance Schedule	Required Works/Action	Frequency
Routine Maintenance	Inspect and identify incorrect operation.	Monthly
	Debris removal from catchment area using sweeping and vacuuming.	3 Monthly
	Removal of sediment from pre-treatment components i.e. catchpits.	Annually

Summary

This drainage strategy outlines the foul & surface strategy for the proposed development on for the construction of 7 dwellings with associated hard and soft landscaping at Land adjacent to the Watermill, Halfway Bridge, Lodsworth, GU28 9BP.

In preparation of this drainage strategy, all current local policy and the NPPF (National Planning Policy Framework) has been reviewed to confirm compliance.

It should be noted that the systems shall be developed during the detailed design of this project and is subject to change. However, the sustainable principles of this strategy shall be followed.

Prepared By	Seen By	Date
Craig Searle Civil Engineer	Dean Giles Managing Director	17-01-2024

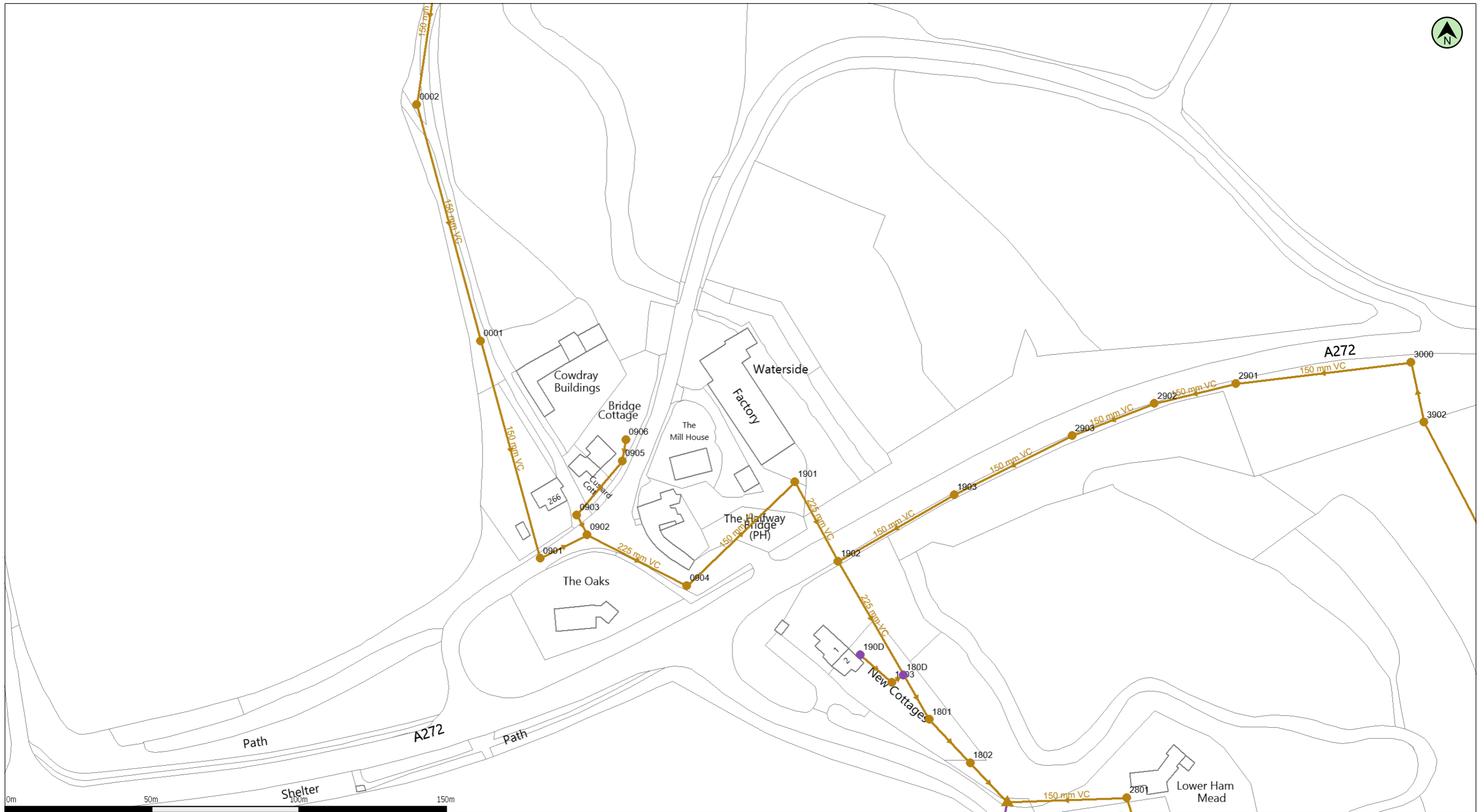
Appendix 1 – Southern Water Sewer Records

Appendix 2 – Preliminary Surface Water Calculations

Appendix 3 – Impermeable Areas

Appendix 1

Southern Water Sewer Records



(c) Crown copyright and database rights 2020 Ordnance Survey 100031673 Date: 08/10/20 Scale: 1:1250 Map Centre: 493114,121985 Data updated: 21/09/20 Our Ref: 446284 - 1 Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.
 WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

craig@swphove.co.uk

E8017



Appendix 2

Preliminary Surface Water Calculations

Title	Land Adjacent to The Watermill, GU28 9BP	Job No:	E8017
Description :	Preliminary Surface Water Calculations	By:	CRS
		Date:	Jan-24
		Sheet No:	1

Design Data

FEH Data (2013) at 493118, 121984

Design Criteria

Design Storm = 100Yr + 45% Climate Change

Discharge Rate = 3.5l/s

Above the required minimum 50% betterment for brownfield sites

Discharge Point = River Rother

Total Impermeable Area = 774m² or 0.078Ha

Results

Please refer to attached sheets

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	<input type="text" value="1"/>	<input type="text" value="1"/>
HOST class:	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
SPR/SPRHOST:	<input type="text" value="0.1"/>	<input type="text" value="0.1"/>

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	<input type="text" value="858"/>	<input type="text" value="858"/>
Hydrological region:	<input type="text" value="7"/>	<input type="text" value="7"/>
Growth curve factor 1 year:	<input type="text" value="0.85"/>	<input type="text" value="0.85"/>
Growth curve factor 30 years:	<input type="text" value="2.3"/>	<input type="text" value="2.3"/>
Growth curve factor 100 years:	<input type="text" value="3.19"/>	<input type="text" value="3.19"/>
Growth curve factor 200 years:	<input type="text" value="3.74"/>	<input type="text" value="3.74"/>

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited

Q_{BAR} (l/s):	0.02	0.02
1 in 1 year (l/s):	0.02	0.02
1 in 30 years (l/s):	0.05	0.05
1 in 100 year (l/s):	0.07	0.07
1 in 200 years (l/s):	0.09	0.09

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



**STEPHEN WILSON
PARTNERSHIP LTD**

Chawington Barn, Dittres Business Park, Dittres Road,
POLLEGATE, BH28 6HY Telephone: 01323 412020
E-mail: info@swpasst.co.uk • Website: www.swpasst.co.uk

Title	Land Adjacent to The Watermill, GU28 9BP	Job No:	E8017
Decription :	Estimate of Existing and Proposed Peak Run-Off Rate using the Modified Rational Method	By:	CRS
		Date:	Jan-24
		Sheet No:	4

Existing Site

Pre-Developed Site: Estimate Surface Water Run-Off Using the Modified Rational Method

Site Area = 1098 M²

Existing Impermeable Area = 767 M²

Average Rate of Rainfall

2 Year 15 Minute Event (M2-15D) = 38.064 mm/hr (i)

30 Year 15 Minute Event (M30-15D) = 86.056 mm/hr (i)

100 Year 15 Minute Event (M100-15D) = 108.577 mm/hr (i)

Average Rainfall Values from FEH Data taken from the MicroDrainage Software

Peak Rate of Run-Off (Q_p)

$Q_p = C \cdot A_p \cdot i$ Where $C = C_v \cdot C_R$

$C_v = 0.75$ (Volumetric Co-efficient)

$C_R = 1.3$ (Routing Co-efficient)

$Q_{p2} = 7.907$ l/s

$Q_{p30} = 17.876$ l/s

$Q_{p100} = 22.555$ l/s



**STEPHEN WILSON
PARTNERSHIP LTD**

Chawington Barn, Orons Business Park, Dittree Road,
POLLEGATE, BN26 6HY Telephone: 01323 412020
E-mail: info@swp.co.uk • Website: www.swp.co.uk

Title	Land Adjacent to The Watermill, GU28 9BP	Job No:	E8017
Decription :	Estimate of Existing and Proposed Peak Run-Off Rate using the Modified Rational Method	By:	CRS
		Date:	Jan-24
		Sheet No:	5

Proposed Development

Total Impermeable Area = 774 M²

Adjust Average Rainfall for Climate Change in Accordance with the Requirements of the NPPF
Technical Guidance, +45% with FEH Data

M2-15D +45% = 55.193 mm/hr (i)

M30-15D +45% = 124.781 mm/hr (i)


M100 - 15D +45% = 157.437 mm/hr (i)

Proposed Peak Rate of Run-Off (Q_p)

Q_{p2} = 11.570 l/s

Q_{p30} = 26.157 l/s

Q_{p100} = 33.003 l/s

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 493118 121984 SU 93118 21984
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.078

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.049	4	8	0.029

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Model Details

Storage is Online Cover Level (m) 16.900

Cellular Storage Structure

Invert Level (m) 14.750 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	37.5	37.5	1.201	0.0	101.1
1.200	37.5	101.1			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0078-3800-2100-3800
 Design Head (m) 2.100
 Design Flow (l/s) 3.8
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 78
 Invert Level (m) 14.600
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	3.8	Kick-Flo®	0.703	2.3
Flush-Flo™	0.348	2.8	Mean Flow over Head Range	-	2.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	1.200	2.9	3.000	4.5	7.000	6.7
0.200	2.7	1.400	3.1	3.500	4.8	7.500	6.9
0.300	2.8	1.600	3.3	4.000	5.1	8.000	7.1
0.400	2.8	1.800	3.5	4.500	5.4	8.500	7.3
0.500	2.8	2.000	3.7	5.000	5.7	9.000	7.5
0.600	2.6	2.200	3.9	5.500	5.9	9.500	7.7
0.800	2.4	2.400	4.0	6.000	6.2		
1.000	2.7	2.600	4.2	6.500	6.4		


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Summary of Results for 2 year Return Period

Half Drain Time : 17 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	14.873	0.123	0.0	2.8	2.8	4.4	O K
30 min Summer	14.889	0.139	0.0	2.8	2.8	5.0	O K
60 min Summer	14.888	0.138	0.0	2.8	2.8	4.9	O K
120 min Summer	14.887	0.137	0.0	2.8	2.8	4.9	O K
180 min Summer	14.870	0.120	0.0	2.8	2.8	4.3	O K
240 min Summer	14.849	0.099	0.0	2.8	2.8	3.5	O K
360 min Summer	14.811	0.061	0.0	2.7	2.7	2.2	O K
480 min Summer	14.781	0.031	0.0	2.6	2.6	1.1	O K
600 min Summer	14.761	0.011	0.0	2.6	2.6	0.4	O K
720 min Summer	14.751	0.001	0.0	2.5	2.5	0.0	O K
960 min Summer	14.750	0.000	0.0	2.1	2.1	0.0	O K
1440 min Summer	14.750	0.000	0.0	1.6	1.6	0.0	O K
2160 min Summer	14.750	0.000	0.0	1.2	1.2	0.0	O K
2880 min Summer	14.750	0.000	0.0	1.0	1.0	0.0	O K
4320 min Summer	14.750	0.000	0.0	0.7	0.7	0.0	O K
5760 min Summer	14.750	0.000	0.0	0.6	0.6	0.0	O K
7200 min Summer	14.750	0.000	0.0	0.5	0.5	0.0	O K
8640 min Summer	14.750	0.000	0.0	0.5	0.5	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	38.064	0.0	7.1	17
30 min Summer	25.291	0.0	9.4	27
60 min Summer	16.134	0.0	12.0	44
120 min Summer	10.912	0.0	16.1	78
180 min Summer	8.482	0.0	18.9	112
240 min Summer	7.035	0.0	20.9	144
360 min Summer	5.347	0.0	23.8	204
480 min Summer	4.353	0.0	25.8	262
600 min Summer	3.699	0.0	27.4	316
720 min Summer	3.233	0.0	28.7	370
960 min Summer	2.612	0.0	31.0	0
1440 min Summer	1.938	0.0	34.5	0
2160 min Summer	1.448	0.0	38.6	0
2880 min Summer	1.187	0.0	42.2	0
4320 min Summer	0.912	0.0	48.7	0
5760 min Summer	0.766	0.0	54.5	0
7200 min Summer	0.676	0.0	60.1	0
8640 min Summer	0.614	0.0	65.5	0

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Summary of Results for 2 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
10080 min Summer	14.750	0.000	0.0	0.5	0.5	0.0	O K
15 min Winter	14.882	0.132	0.0	2.8	2.8	4.7	O K
30 min Winter	14.901	0.151	0.0	2.8	2.8	5.4	O K
60 min Winter	14.892	0.142	0.0	2.8	2.8	5.1	O K
120 min Winter	14.877	0.127	0.0	2.8	2.8	4.5	O K
180 min Winter	14.845	0.095	0.0	2.8	2.8	3.4	O K
240 min Winter	14.813	0.063	0.0	2.7	2.7	2.3	O K
360 min Winter	14.765	0.015	0.0	2.6	2.6	0.5	O K
480 min Winter	14.750	0.000	0.0	2.4	2.4	0.0	O K
600 min Winter	14.750	0.000	0.0	2.0	2.0	0.0	O K
720 min Winter	14.750	0.000	0.0	1.8	1.8	0.0	O K
960 min Winter	14.750	0.000	0.0	1.4	1.4	0.0	O K
1440 min Winter	14.750	0.000	0.0	1.1	1.1	0.0	O K
2160 min Winter	14.750	0.000	0.0	0.8	0.8	0.0	O K
2880 min Winter	14.750	0.000	0.0	0.7	0.7	0.0	O K
4320 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K
5760 min Winter	14.750	0.000	0.0	0.4	0.4	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	14.750	0.000	0.0	0.3	0.3	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.569	0.0	70.8	0
15 min Winter	38.064	0.0	7.5	18
30 min Winter	25.291	0.0	9.8	29
60 min Winter	16.134	0.0	12.5	46
120 min Winter	10.912	0.0	17.0	84
180 min Winter	8.482	0.0	19.7	118
240 min Winter	7.035	0.0	22.0	148
360 min Winter	5.347	0.0	25.0	204
480 min Winter	4.353	0.0	27.2	0
600 min Winter	3.699	0.0	28.9	0
720 min Winter	3.233	0.0	30.3	0
960 min Winter	2.612	0.0	32.6	0
1440 min Winter	1.938	0.0	36.3	0
2160 min Winter	1.448	0.0	40.7	0
2880 min Winter	1.187	0.0	44.4	0
4320 min Winter	0.912	0.0	51.2	0
5760 min Winter	0.766	0.0	57.4	0
7200 min Winter	0.676	0.0	63.3	0
8640 min Winter	0.614	0.0	69.0	0

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Summary of Results for 2 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
10080 min Winter	14.750	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.569	0.0	74.5	0


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Summary of Results for 2 year Return Period (+45%)

Half Drain Time : 31 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	14.954	0.204	0.0	2.8	2.8	7.3	O K
30 min Summer	14.993	0.243	0.0	2.8	2.8	8.6	O K
60 min Summer	15.000	0.250	0.0	2.8	2.8	8.9	O K
120 min Summer	15.019	0.269	0.0	2.8	2.8	9.6	O K
180 min Summer	15.009	0.259	0.0	2.8	2.8	9.2	O K
240 min Summer	14.989	0.239	0.0	2.8	2.8	8.5	O K
360 min Summer	14.940	0.190	0.0	2.8	2.8	6.8	O K
480 min Summer	14.890	0.140	0.0	2.8	2.8	5.0	O K
600 min Summer	14.849	0.099	0.0	2.8	2.8	3.5	O K
720 min Summer	14.816	0.066	0.0	2.7	2.7	2.3	O K
960 min Summer	14.772	0.022	0.0	2.6	2.6	0.8	O K
1440 min Summer	14.750	0.000	0.0	2.3	2.3	0.0	O K
2160 min Summer	14.750	0.000	0.0	1.7	1.7	0.0	O K
2880 min Summer	14.750	0.000	0.0	1.4	1.4	0.0	O K
4320 min Summer	14.750	0.000	0.0	1.1	1.1	0.0	O K
5760 min Summer	14.750	0.000	0.0	0.9	0.9	0.0	O K
7200 min Summer	14.750	0.000	0.0	0.8	0.8	0.0	O K
8640 min Summer	14.750	0.000	0.0	0.7	0.7	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	55.193	0.0	10.1	18
30 min Summer	36.672	0.0	13.6	30
60 min Summer	23.394	0.0	17.4	48
120 min Summer	15.823	0.0	23.5	84
180 min Summer	12.300	0.0	27.3	118
240 min Summer	10.201	0.0	30.2	152
360 min Summer	7.753	0.0	34.5	216
480 min Summer	6.312	0.0	37.4	278
600 min Summer	5.364	0.0	39.8	336
720 min Summer	4.688	0.0	41.7	394
960 min Summer	3.788	0.0	44.9	504
1440 min Summer	2.809	0.0	50.0	0
2160 min Summer	2.100	0.0	56.0	0
2880 min Summer	1.721	0.0	61.2	0
4320 min Summer	1.322	0.0	70.6	0
5760 min Summer	1.111	0.0	79.1	0
7200 min Summer	0.980	0.0	87.2	0
8640 min Summer	0.890	0.0	95.0	0

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Summary of Results for 2 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	14.750	0.000	0.0	0.7	0.7	0.0	O K
15 min Winter	14.969	0.219	0.0	2.8	2.8	7.8	O K
30 min Winter	15.013	0.263	0.0	2.8	2.8	9.4	O K
60 min Winter	15.018	0.268	0.0	2.8	2.8	9.5	O K
120 min Winter	15.026	0.276	0.0	2.8	2.8	9.8	O K
180 min Winter	14.999	0.249	0.0	2.8	2.8	8.9	O K
240 min Winter	14.961	0.211	0.0	2.8	2.8	7.5	O K
360 min Winter	14.884	0.134	0.0	2.8	2.8	4.8	O K
480 min Winter	14.819	0.069	0.0	2.7	2.7	2.5	O K
600 min Winter	14.775	0.025	0.0	2.6	2.6	0.9	O K
720 min Winter	14.751	0.001	0.0	2.5	2.5	0.0	O K
960 min Winter	14.750	0.000	0.0	2.1	2.1	0.0	O K
1440 min Winter	14.750	0.000	0.0	1.5	1.5	0.0	O K
2160 min Winter	14.750	0.000	0.0	1.2	1.2	0.0	O K
2880 min Winter	14.750	0.000	0.0	0.9	0.9	0.0	O K
4320 min Winter	14.750	0.000	0.0	0.7	0.7	0.0	O K
5760 min Winter	14.750	0.000	0.0	0.6	0.6	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K
8640 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.825	0.0	102.7	0
15 min Winter	55.193	0.0	10.8	18
30 min Winter	36.672	0.0	14.3	31
60 min Winter	23.394	0.0	18.2	50
120 min Winter	15.823	0.0	24.7	90
180 min Winter	12.300	0.0	28.9	126
240 min Winter	10.201	0.0	31.7	160
360 min Winter	7.753	0.0	36.4	224
480 min Winter	6.312	0.0	39.3	282
600 min Winter	5.364	0.0	41.8	336
720 min Winter	4.688	0.0	43.9	374
960 min Winter	3.788	0.0	47.3	0
1440 min Winter	2.809	0.0	52.6	0
2160 min Winter	2.100	0.0	59.0	0
2880 min Winter	1.721	0.0	64.4	0
4320 min Winter	1.322	0.0	74.3	0
5760 min Winter	1.111	0.0	83.2	0
7200 min Winter	0.980	0.0	91.8	0
8640 min Winter	0.890	0.0	100.0	0

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Summary of Results for 2 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.825	0.0	108.1	0


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Summary of Results for 30 year Return Period

Half Drain Time : 67 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	15.108	0.358	0.0	2.8	2.8	12.8	O K
30 min Summer	15.202	0.452	0.0	2.8	2.8	16.1	O K
60 min Summer	15.258	0.508	0.0	2.8	2.8	18.1	O K
120 min Summer	15.221	0.471	0.0	2.8	2.8	16.8	O K
180 min Summer	15.185	0.435	0.0	2.8	2.8	15.5	O K
240 min Summer	15.145	0.395	0.0	2.8	2.8	14.1	O K
360 min Summer	15.066	0.316	0.0	2.8	2.8	11.3	O K
480 min Summer	14.993	0.243	0.0	2.8	2.8	8.7	O K
600 min Summer	14.932	0.182	0.0	2.8	2.8	6.5	O K
720 min Summer	14.881	0.131	0.0	2.8	2.8	4.7	O K
960 min Summer	14.811	0.061	0.0	2.7	2.7	2.2	O K
1440 min Summer	14.751	0.001	0.0	2.5	2.5	0.0	O K
2160 min Summer	14.750	0.000	0.0	1.9	1.9	0.0	O K
2880 min Summer	14.750	0.000	0.0	1.5	1.5	0.0	O K
4320 min Summer	14.750	0.000	0.0	1.1	1.1	0.0	O K
5760 min Summer	14.750	0.000	0.0	0.9	0.9	0.0	O K
7200 min Summer	14.750	0.000	0.0	0.8	0.8	0.0	O K
8640 min Summer	14.750	0.000	0.0	0.7	0.7	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	86.056	0.0	16.0	19
30 min Summer	57.704	0.0	21.3	33
60 min Summer	37.129	0.0	27.4	60
120 min Summer	22.259	0.0	32.8	92
180 min Summer	16.407	0.0	36.4	124
240 min Summer	13.173	0.0	39.0	158
360 min Summer	9.616	0.0	42.6	224
480 min Summer	7.660	0.0	45.4	286
600 min Summer	6.412	0.0	47.4	346
720 min Summer	5.542	0.0	49.3	404
960 min Summer	4.401	0.0	52.2	518
1440 min Summer	3.191	0.0	56.8	736
2160 min Summer	2.335	0.0	62.3	0
2880 min Summer	1.883	0.0	67.0	0
4320 min Summer	1.407	0.0	75.0	0
5760 min Summer	1.155	0.0	82.1	0
7200 min Summer	0.998	0.0	88.7	0
8640 min Summer	0.890	0.0	95.0	0

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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
10080 min Summer	14.750	0.000	0.0	0.7	0.7	0.0	O K
15 min Winter	15.132	0.382	0.0	2.8	2.8	13.6	O K
30 min Winter	15.237	0.487	0.0	2.8	2.8	17.3	O K
60 min Winter	15.307	0.557	0.0	2.8	2.8	19.8	O K
120 min Winter	15.257	0.507	0.0	2.8	2.8	18.0	O K
180 min Winter	15.199	0.449	0.0	2.8	2.8	16.0	O K
240 min Winter	15.137	0.387	0.0	2.8	2.8	13.8	O K
360 min Winter	15.017	0.267	0.0	2.8	2.8	9.5	O K
480 min Winter	14.916	0.166	0.0	2.8	2.8	5.9	O K
600 min Winter	14.841	0.091	0.0	2.8	2.8	3.2	O K
720 min Winter	14.789	0.039	0.0	2.7	2.7	1.4	O K
960 min Winter	14.750	0.000	0.0	2.4	2.4	0.0	O K
1440 min Winter	14.750	0.000	0.0	1.7	1.7	0.0	O K
2160 min Winter	14.750	0.000	0.0	1.3	1.3	0.0	O K
2880 min Winter	14.750	0.000	0.0	1.0	1.0	0.0	O K
4320 min Winter	14.750	0.000	0.0	0.8	0.8	0.0	O K
5760 min Winter	14.750	0.000	0.0	0.6	0.6	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K
8640 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.811	0.0	101.0	0
15 min Winter	86.056	0.0	16.8	19
30 min Winter	57.704	0.0	22.4	33
60 min Winter	37.129	0.0	28.9	60
120 min Winter	22.259	0.0	34.8	98
180 min Winter	16.407	0.0	38.4	134
240 min Winter	13.173	0.0	41.1	170
360 min Winter	9.616	0.0	45.1	236
480 min Winter	7.660	0.0	47.8	298
600 min Winter	6.412	0.0	49.9	354
720 min Winter	5.542	0.0	51.8	404
960 min Winter	4.401	0.0	54.9	0
1440 min Winter	3.191	0.0	59.7	0
2160 min Winter	2.335	0.0	65.6	0
2880 min Winter	1.883	0.0	70.5	0
4320 min Winter	1.407	0.0	79.0	0
5760 min Winter	1.155	0.0	86.5	0
7200 min Winter	0.998	0.0	93.4	0
8640 min Winter	0.890	0.0	100.0	0

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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
10080 min Winter	14.750	0.000	0.0	0.4	0.4	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.811	0.0	106.3	0

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

Half Drain Time : 110 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	15.309	0.559	0.0	2.8	2.8	19.9	O K
30 min Summer	15.471	0.721	0.0	2.8	2.8	25.7	O K
60 min Summer	15.593	0.843	0.0	2.8	2.8	30.0	O K
120 min Summer	15.576	0.826	0.0	2.8	2.8	29.4	O K
180 min Summer	15.541	0.791	0.0	2.8	2.8	28.2	O K
240 min Summer	15.507	0.757	0.0	2.8	2.8	27.0	O K
360 min Summer	15.432	0.682	0.0	2.8	2.8	24.3	O K
480 min Summer	15.351	0.601	0.0	2.8	2.8	21.4	O K
600 min Summer	15.257	0.507	0.0	2.8	2.8	18.0	O K
720 min Summer	15.170	0.420	0.0	2.8	2.8	15.0	O K
960 min Summer	15.032	0.282	0.0	2.8	2.8	10.0	O K
1440 min Summer	14.863	0.113	0.0	2.8	2.8	4.0	O K
2160 min Summer	14.761	0.011	0.0	2.6	2.6	0.4	O K
2880 min Summer	14.750	0.000	0.0	2.2	2.2	0.0	O K
4320 min Summer	14.750	0.000	0.0	1.6	1.6	0.0	O K
5760 min Summer	14.750	0.000	0.0	1.4	1.4	0.0	O K
7200 min Summer	14.750	0.000	0.0	1.2	1.2	0.0	O K
8640 min Summer	14.750	0.000	0.0	1.0	1.0	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	124.781	0.0	23.1	20
30 min Summer	83.671	0.0	31.0	34
60 min Summer	53.836	0.0	39.9	62
120 min Summer	32.275	0.0	47.9	106
180 min Summer	23.790	0.0	52.8	138
240 min Summer	19.102	0.0	56.7	172
360 min Summer	13.943	0.0	62.1	242
480 min Summer	11.107	0.0	65.9	312
600 min Summer	9.298	0.0	69.0	376
720 min Summer	8.036	0.0	71.4	434
960 min Summer	6.382	0.0	75.7	552
1440 min Summer	4.627	0.0	82.3	778
2160 min Summer	3.386	0.0	90.3	1108
2880 min Summer	2.731	0.0	97.1	0
4320 min Summer	2.040	0.0	108.8	0
5760 min Summer	1.674	0.0	119.1	0
7200 min Summer	1.447	0.0	128.7	0
8640 min Summer	1.291	0.0	137.7	0

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	14.750	0.000	0.0	0.9	0.9	0.0	O K
15 min Winter	15.344	0.594	0.0	2.8	2.8	21.2	O K
30 min Winter	15.518	0.768	0.0	2.8	2.8	27.4	O K
60 min Winter	15.656	0.906	0.0	2.8	2.8	32.3	O K
120 min Winter	15.651	0.901	0.0	2.8	2.8	32.1	O K
180 min Winter	15.598	0.848	0.0	2.8	2.8	30.2	O K
240 min Winter	15.550	0.800	0.0	2.8	2.8	28.5	O K
360 min Winter	15.436	0.686	0.0	2.8	2.8	24.5	O K
480 min Winter	15.304	0.554	0.0	2.8	2.8	19.7	O K
600 min Winter	15.157	0.407	0.0	2.8	2.8	14.5	O K
720 min Winter	15.043	0.293	0.0	2.8	2.8	10.5	O K
960 min Winter	14.882	0.132	0.0	2.8	2.8	4.7	O K
1440 min Winter	14.750	0.000	0.0	2.5	2.5	0.0	O K
2160 min Winter	14.750	0.000	0.0	1.9	1.9	0.0	O K
2880 min Winter	14.750	0.000	0.0	1.5	1.5	0.0	O K
4320 min Winter	14.750	0.000	0.0	1.1	1.1	0.0	O K
5760 min Winter	14.750	0.000	0.0	0.9	0.9	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.8	0.8	0.0	O K
8640 min Winter	14.750	0.000	0.0	0.7	0.7	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.176	0.0	146.4	0
15 min Winter	124.781	0.0	24.3	20
30 min Winter	83.671	0.0	32.5	34
60 min Winter	53.836	0.0	41.8	62
120 min Winter	32.275	0.0	50.3	114
180 min Winter	23.790	0.0	55.7	144
240 min Winter	19.102	0.0	59.5	184
360 min Winter	13.943	0.0	65.3	260
480 min Winter	11.107	0.0	69.4	338
600 min Winter	9.298	0.0	72.4	392
720 min Winter	8.036	0.0	75.2	450
960 min Winter	6.382	0.0	79.6	558
1440 min Winter	4.627	0.0	86.6	0
2160 min Winter	3.386	0.0	95.1	0
2880 min Winter	2.731	0.0	102.3	0
4320 min Winter	2.040	0.0	114.5	0
5760 min Winter	1.674	0.0	125.4	0
7200 min Winter	1.447	0.0	135.4	0
8640 min Winter	1.291	0.0	145.0	0

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	14.750	0.000	0.0	0.6	0.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.176	0.0	154.1	0


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Summary of Results for 100 year Return Period

Half Drain Time : 95 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	15.224	0.474	0.0	2.8	2.8	16.9	O K
30 min Summer	15.370	0.620	0.0	2.8	2.8	22.1	O K
60 min Summer	15.475	0.725	0.0	2.8	2.8	25.8	O K
120 min Summer	15.426	0.676	0.0	2.8	2.8	24.1	O K
180 min Summer	15.381	0.631	0.0	2.8	2.8	22.5	O K
240 min Summer	15.338	0.588	0.0	2.8	2.8	21.0	O K
360 min Summer	15.241	0.491	0.0	2.8	2.8	17.5	O K
480 min Summer	15.150	0.400	0.0	2.8	2.8	14.2	O K
600 min Summer	15.071	0.321	0.0	2.8	2.8	11.4	O K
720 min Summer	15.003	0.253	0.0	2.8	2.8	9.0	O K
960 min Summer	14.900	0.150	0.0	2.8	2.8	5.3	O K
1440 min Summer	14.788	0.038	0.0	2.7	2.7	1.4	O K
2160 min Summer	14.750	0.000	0.0	2.3	2.3	0.0	O K
2880 min Summer	14.750	0.000	0.0	1.8	1.8	0.0	O K
4320 min Summer	14.750	0.000	0.0	1.4	1.4	0.0	O K
5760 min Summer	14.750	0.000	0.0	1.1	1.1	0.0	O K
7200 min Summer	14.750	0.000	0.0	0.9	0.9	0.0	O K
8640 min Summer	14.750	0.000	0.0	0.8	0.8	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	108.577	0.0	20.1	20
30 min Summer	73.688	0.0	27.2	34
60 min Summer	47.791	0.0	35.3	62
120 min Summer	27.954	0.0	41.5	102
180 min Summer	20.377	0.0	45.3	134
240 min Summer	16.256	0.0	48.1	170
360 min Summer	11.784	0.0	52.2	234
480 min Summer	9.350	0.0	55.5	298
600 min Summer	7.810	0.0	57.8	360
720 min Summer	6.742	0.0	59.9	418
960 min Summer	5.353	0.0	63.4	532
1440 min Summer	3.884	0.0	69.1	754
2160 min Summer	2.839	0.0	75.7	0
2880 min Summer	2.284	0.0	81.2	0
4320 min Summer	1.691	0.0	90.2	0
5760 min Summer	1.374	0.0	97.7	0
7200 min Summer	1.175	0.0	104.4	0
8640 min Summer	1.037	0.0	110.6	0

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Summary of Results for 100 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
10080 min Summer	14.750	0.000	0.0	0.8	0.8	0.0	O K
15 min Winter	15.255	0.505	0.0	2.8	2.8	18.0	O K
30 min Winter	15.412	0.662	0.0	2.8	2.8	23.6	O K
60 min Winter	15.531	0.781	0.0	2.8	2.8	27.8	O K
120 min Winter	15.481	0.731	0.0	2.8	2.8	26.1	O K
180 min Winter	15.421	0.671	0.0	2.8	2.8	23.9	O K
240 min Winter	15.360	0.610	0.0	2.8	2.8	21.7	O K
360 min Winter	15.210	0.460	0.0	2.8	2.8	16.4	O K
480 min Winter	15.078	0.328	0.0	2.8	2.8	11.7	O K
600 min Winter	14.970	0.220	0.0	2.8	2.8	7.9	O K
720 min Winter	14.888	0.138	0.0	2.8	2.8	4.9	O K
960 min Winter	14.785	0.035	0.0	2.7	2.7	1.3	O K
1440 min Winter	14.750	0.000	0.0	2.1	2.1	0.0	O K
2160 min Winter	14.750	0.000	0.0	1.6	1.6	0.0	O K
2880 min Winter	14.750	0.000	0.0	1.3	1.3	0.0	O K
4320 min Winter	14.750	0.000	0.0	0.9	0.9	0.0	O K
5760 min Winter	14.750	0.000	0.0	0.8	0.8	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.6	0.6	0.0	O K
8640 min Winter	14.750	0.000	0.0	0.6	0.6	0.0	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.936	0.0	116.5	0
15 min Winter	108.577	0.0	21.1	20
30 min Winter	73.688	0.0	28.7	33
60 min Winter	47.791	0.0	37.4	60
120 min Winter	27.954	0.0	43.6	114
180 min Winter	20.377	0.0	47.8	142
240 min Winter	16.256	0.0	50.6	182
360 min Winter	11.784	0.0	55.1	250
480 min Winter	9.350	0.0	58.4	314
600 min Winter	7.810	0.0	61.0	372
720 min Winter	6.742	0.0	63.0	428
960 min Winter	5.353	0.0	66.8	530
1440 min Winter	3.884	0.0	72.7	0
2160 min Winter	2.839	0.0	79.7	0
2880 min Winter	2.284	0.0	85.5	0
4320 min Winter	1.691	0.0	95.0	0
5760 min Winter	1.374	0.0	102.9	0
7200 min Winter	1.175	0.0	109.9	0
8640 min Winter	1.037	0.0	116.5	0

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Summary of Results for 100 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
10080 min Winter	14.750	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.936	0.0	122.6	0

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

Half Drain Time : 132 minutes.


Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	15.477	0.727	0.0	2.8	2.8	25.9	O K
30 min Summer	15.703	0.953	0.0	2.8	2.8	34.0	O K
60 min Summer	15.895	1.145	0.0	3.0	3.0	40.8	O K
120 min Summer	15.875	1.125	0.0	3.0	3.0	40.1	O K
180 min Summer	15.818	1.068	0.0	2.9	2.9	38.0	O K
240 min Summer	15.771	1.021	0.0	2.9	2.9	36.4	O K
360 min Summer	15.687	0.937	0.0	2.8	2.8	33.4	O K
480 min Summer	15.604	0.854	0.0	2.8	2.8	30.4	O K
600 min Summer	15.525	0.775	0.0	2.8	2.8	27.6	O K
720 min Summer	15.448	0.698	0.0	2.8	2.8	24.9	O K
960 min Summer	15.285	0.535	0.0	2.8	2.8	19.1	O K
1440 min Summer	15.018	0.268	0.0	2.8	2.8	9.5	O K
2160 min Summer	14.831	0.081	0.0	2.8	2.8	2.9	O K
2880 min Summer	14.760	0.010	0.0	2.6	2.6	0.4	O K
4320 min Summer	14.750	0.000	0.0	2.0	2.0	0.0	O K
5760 min Summer	14.750	0.000	0.0	1.6	1.6	0.0	O K
7200 min Summer	14.750	0.000	0.0	1.4	1.4	0.0	O K
8640 min Summer	14.750	0.000	0.0	1.2	1.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	157.436	0.0	29.1	21
30 min Summer	106.848	0.0	39.6	34
60 min Summer	69.297	0.0	51.2	62
120 min Summer	40.533	0.0	59.9	114
180 min Summer	29.547	0.0	65.6	144
240 min Summer	23.572	0.0	70.0	176
360 min Summer	17.087	0.0	76.1	246
480 min Summer	13.558	0.0	80.4	314
600 min Summer	11.325	0.0	83.9	384
720 min Summer	9.776	0.0	86.9	454
960 min Summer	7.762	0.0	92.1	586
1440 min Summer	5.632	0.0	100.2	808
2160 min Summer	4.117	0.0	109.8	1144
2880 min Summer	3.312	0.0	117.8	1472
4320 min Summer	2.452	0.0	130.8	0
5760 min Summer	1.992	0.0	141.7	0
7200 min Summer	1.703	0.0	151.4	0
8640 min Summer	1.503	0.0	160.4	0

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	14.750	0.000	0.0	1.1	1.1	0.0	O K
15 min Winter	15.520	0.770	0.0	2.8	2.8	27.4	O K
30 min Winter	15.764	1.014	0.0	2.9	2.9	36.1	O K
60 min Winter	16.701	1.951	0.0	3.8	3.8	43.5	O K
120 min Winter	16.481	1.731	0.0	3.6	3.6	43.3	O K
180 min Winter	15.905	1.155	0.0	3.0	3.0	41.2	O K
240 min Winter	15.844	1.094	0.0	3.0	3.0	39.0	O K
360 min Winter	15.726	0.976	0.0	2.8	2.8	34.8	O K
480 min Winter	15.603	0.853	0.0	2.8	2.8	30.4	O K
600 min Winter	15.484	0.734	0.0	2.8	2.8	26.1	O K
720 min Winter	15.361	0.611	0.0	2.8	2.8	21.8	O K
960 min Winter	15.092	0.342	0.0	2.8	2.8	12.2	O K
1440 min Winter	14.827	0.077	0.0	2.8	2.8	2.7	O K
2160 min Winter	14.750	0.000	0.0	2.3	2.3	0.0	O K
2880 min Winter	14.750	0.000	0.0	1.8	1.8	0.0	O K
4320 min Winter	14.750	0.000	0.0	1.3	1.3	0.0	O K
5760 min Winter	14.750	0.000	0.0	1.1	1.1	0.0	O K
7200 min Winter	14.750	0.000	0.0	0.9	0.9	0.0	O K
8640 min Winter	14.750	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)
10080 min Summer	1.357	0.0	168.9	0
15 min Winter	157.436	0.0	30.6	21
30 min Winter	106.848	0.0	41.7	34
60 min Winter	69.297	0.0	54.0	60
120 min Winter	40.533	0.0	63.2	114
180 min Winter	29.547	0.0	69.1	148
240 min Winter	23.572	0.0	73.6	186
360 min Winter	17.087	0.0	80.0	264
480 min Winter	13.558	0.0	84.6	340
600 min Winter	11.325	0.0	88.2	414
720 min Winter	9.776	0.0	91.5	488
960 min Winter	7.762	0.0	96.8	598
1440 min Winter	5.632	0.0	105.4	798
2160 min Winter	4.117	0.0	115.6	0
2880 min Winter	3.312	0.0	124.0	0
4320 min Winter	2.452	0.0	137.7	0
5760 min Winter	1.992	0.0	149.2	0
7200 min Winter	1.703	0.0	159.4	0
8640 min Winter	1.503	0.0	168.9	0

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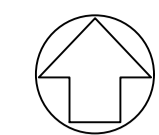
Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	14.750	0.000	0.0	0.7	0.7	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.357	0.0	177.8	0

Appendix 3

Impermeable Areas



Drawing Legend	
Impermeable Areas	
	Roofed Areas
	Hard Paved Areas
	Development Boundary

- NOTES:**
1. This drawing is to be read in conjunction with all other SWP drawings, and with all relevant architect's and engineer's drawings and specification and any discrepancies found are to be reported immediately to the engineer.
 2. No dimensions are to be scaled from this drawing, unless noted otherwise all dimensions are in millimeters and all levels are in metres from the site datum.
 3. All dimensions to be checked on site. All details and dimensions relating to sub-contractors work must be checked and agreed between the sub-contractor or supplier and the general contractor.
 4. The electronic information from this drawing can not be guaranteed as dimensionally drawn exact. figured dimensions must be used for setting out and detailing. swp logos and company information must be removed from copies if information is re-used.
 5. The main contractor is responsible for the design of all temporary works, and is also responsible for the safe maintenance and stability of existing buildings at all times.
 6. The main contractor is responsible for all occurrences of ground water during the construction period.
 7. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain. The main contractor is responsible for checking all information on site prior to work commencing and taking due care and attention whilst undertaking the works.
 8. The contractor must comply with all current legislation relating to health & safety.
 9. All products specified shall be installed in strict accordance with the manufacturers recommendations and instructions. If there are discrepancies between that information and the details on any swp drawings, the manufacturers instructions must be used.

Proposed Impermeable Areas
 Total Site Area = 1098m² (Car Park Excluded)
 Proposed Roof Area = 388m²
 Proposed Hard Paving = 386m²

Existing Impermeable Areas
 Total Site Area = 1098m² (Car Park excluded)
 Existing Roof Area = 495m²
 Existing Hard Paving = 272m²



P01	17.01.2024	PRELIMINARY ISSUE
REV.	DATE	DESCRIPTION

PRELIMINARY

STEPHEN WILSON PARTNERSHIP LTD
 Chalvington Barn, Dittons Business Park, Dittons Road, POLEGATE, BN26 6HY Telephone: 01323 412020 E-mail: info@swpeast.co.uk • Website: www.swpeast.co.uk

CLIENT **NEWMAN DEVELOPMENTS**

ARCHITECT **DLS: ARCH**

JOB TITLE **LAND ADJACENT THE WATERMILL
 HALFWAY BRIDGE, GU28 9BP**

DRAWING TITLE **IMPERMEABLE AREAS**

SCALE AT A1	DATE	JAN 2024	DRAWN	CRS
1-200	ENG.	CRS	CHECKED	DG

RIBA STATUS **STAGE 3 - SPATIAL COORDINATION**

DRAWING STATUS **S3** DRAWING SUBMITTAL **FOR REVIEW AND COMMENT**

JOB No.	DRAWING No.	REV.
E8017	8017-SWP-XX-XX-PL-C-1102	P01

