STORMWATER HYDRAULIC CALCULATIONS

26 New End Square, Hampstead, NW3 1LS

Project Ref: 930

Calcs prepared by MS Jul 2022

CHILTERN DESIGN
CONSULTING ENGINEERS

Quality Systems Certifications Ltd
ISO 9001 : 2015
REGISTERED FIRM

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Introduction and context:

The site is currently occupied by private lock-ups/garages and covers an area of 180 sq.m and is wholly impermeable. The proposal is to replace the garages with a new dwelling incorporating new garden space and landscaping to reduce the impermeable area to 122sq.m. The drainage proposal as depicted within EEP drawing 4114/PH/01 and 4114/PH/02 directs flow from a proposed basement light well via a pump system into a small gravity network which is balanced and attenuated using a proprietary storage tank system, some 1.8m diameter by 5m long positioned beneath the proposed garage space. The volume of attenuation provided is 12.7cu.m an the drained catchment = 122sq.m. The outflow from the attenuation vessel is via an integral pump system with a flow of 2l/s.

Flow Comparisons

Using the values presented within EEP document 'Discharge of Condition 7' dated March 2022 the following is confirmed:

Existing	**Proposed**	**% Reduction**
100 year 18.3l/s	2l/s Pumped outflow	89%
30 Year 14l/s	2l/s pumped Outflow	85%
2 Year 7.4l/s	2l/s Pumped Outflow	72%

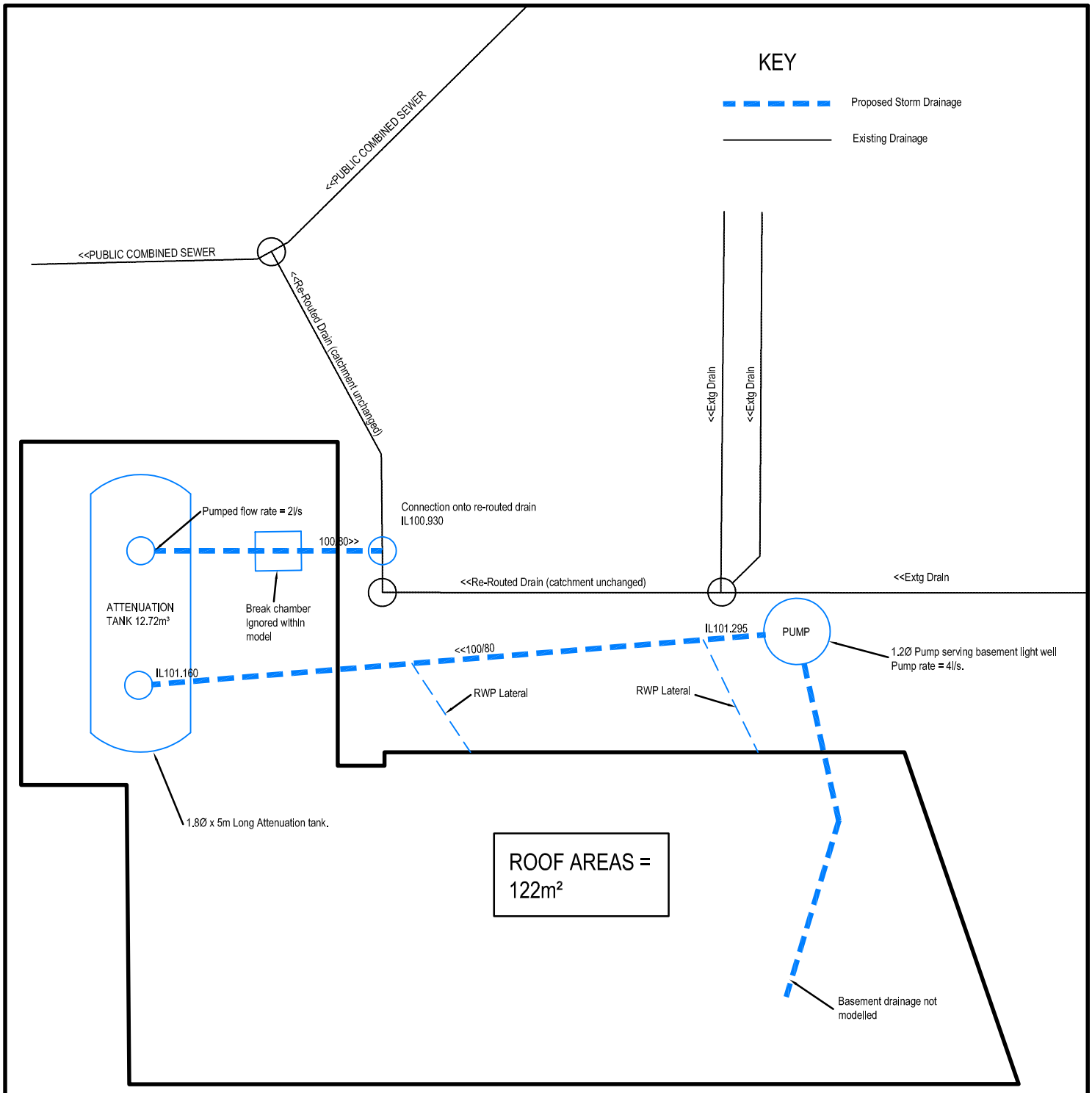
Therefore the proposed flows are less than existing rates of discharge.

Although not relevant, greenfield run-off values are generally less than 1l/s for a parcel of such modest area and in accordance with the Wallingford guidance, flows are capped at 2l/s for practical reasons.

Within the following calculations, only the attenuation vessel has been modelled due to the limitations of microdrainage for modelling pump systems within a network. Given the modest site area we do not perceive this to be an issue.

Contents

- Simplified Network Diagram 930-calc
- Drainage Layout 4114/PH/01
- Attenuation tank details
- Wallingford Greenfield Run-Off Estimation.
- Microdrainage Source Control calculations for attenuation vessel for the 1,2,30 & 100 year storm plus an allowance of 40% for climatic change.



Project Title

26 NEW END SQUARE

Drawing Title

NETWORK DIAGRAM

Date	JUL22	Checked DO	Checked ENG	Sheet Size
Drawn	MS	MS	MS	A4
Scale	NTS			

Project No.	Drawing No.	Rev.
930	CALC	P01

Rev.	Description	By	Date	Chk'd

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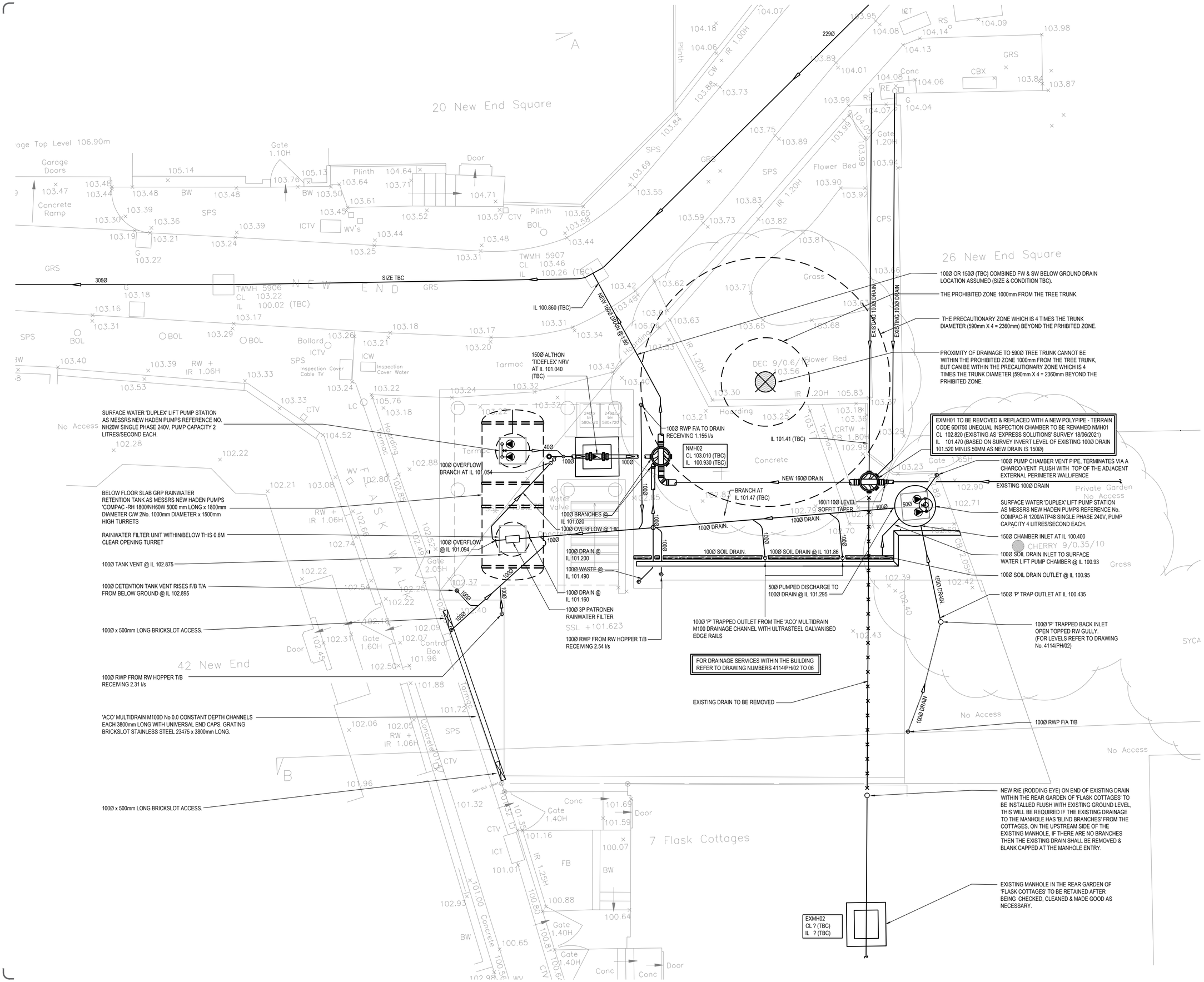


NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION FOR PUBLIC HEALTH SERVICES INSTALLATION AND ALL ASSOCIATED PUBLIC HEALTH DRAWINGS LISTED THEREIN.
2. ALL PUBLIC HEALTH SERVICES DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ASSOCIATED ARCHITECTURAL,STRUCTURAL, MECHANICAL AND ELECTRICAL SERVICES DRAWINGS.
3. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO COMMENCING CONSTRUCTION.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING NO. 3898/PH/01 (IN PARTICULAR).
5. DRAINAGE WITHIN THE TREE CANOPY/ROOT AREA SHALL BE ENCASED WITHIN 150mm THICK STRUCTURAL CONCRETE (TO STRUCTURAL ENGINEERS SPECIFICATION) TO PREVENT THE FUTURE INGRESS OF THE TREE ROOTS INTO THE DRAINAGE SYSTEM AT THE PIPE JOINTS.
6. NEW SERVICES WITHIN THE EXISTING TREE CANOPY/ROOT SYSTEMS SHALL BE CAREFULLY INSTALLED VIA HAND EXCAVATION TO NEGATE/MINIMISE POTENTIAL DAMAGE TO THE EXISTING TREE ROOT SYSTEMS, ALL AS REQUIRED BY THE CURRENT ISSUE OF VOLUME 4 THE NJUG GUIDELINES.

REV.	DATE	DESCRIPTION
P2	05/05/22	ARCHITECTS COMMENTS INCORPORATED
P1	04/04/22	PRELIMINARY ISSUE

ENVIRONMENTAL ENGINEERING PARTNERSHIP
CONSULTING ENGINEERS
www.eep.co.uk
01494 464 544

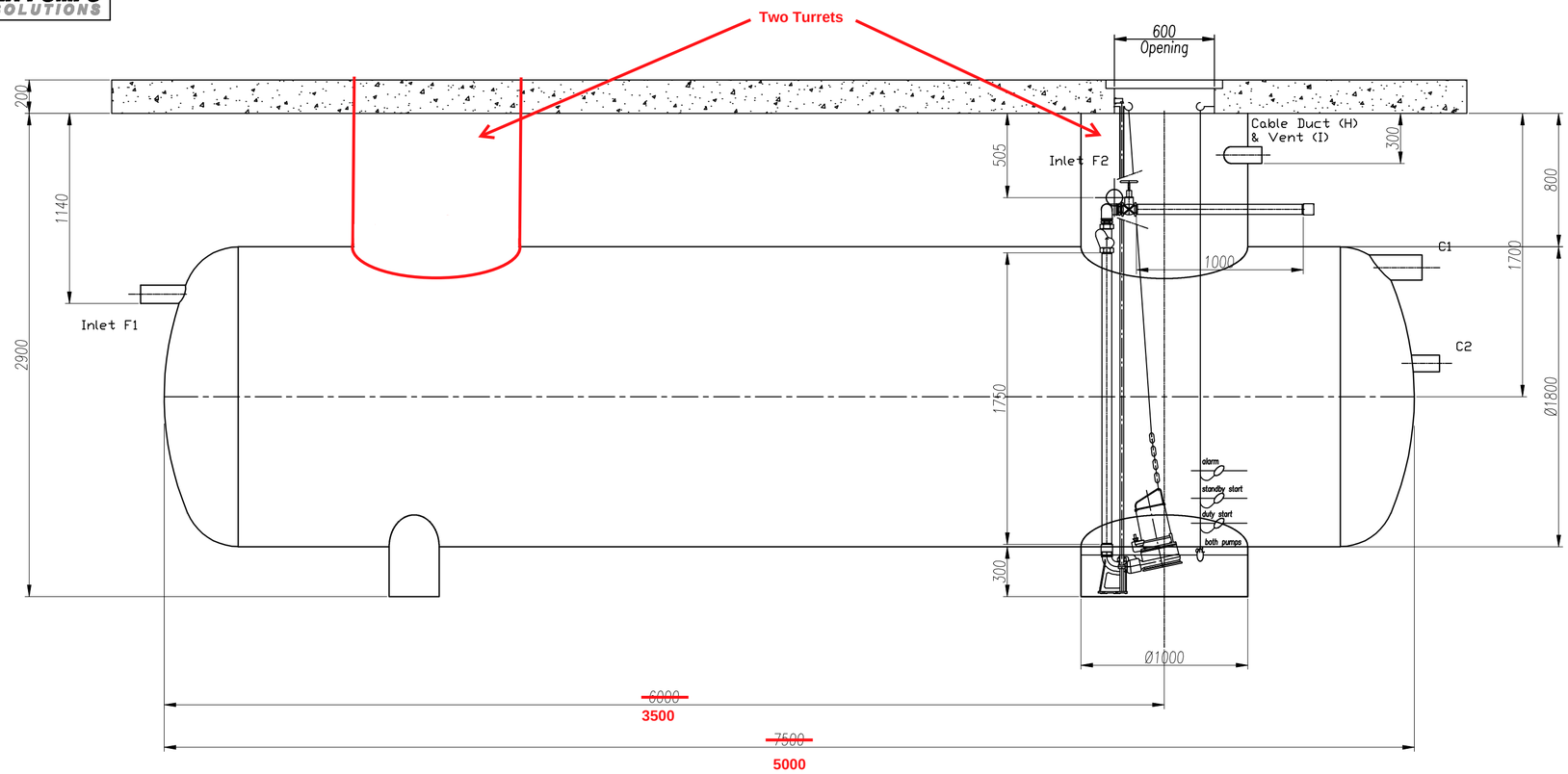
CLIENT: TIM DAVID PROPERTIES LTD

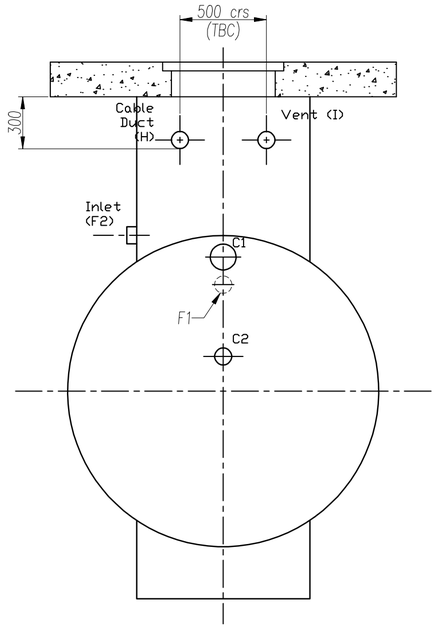
PROJECT: NEW END, HAMPSTEAD VILAGE LONDON

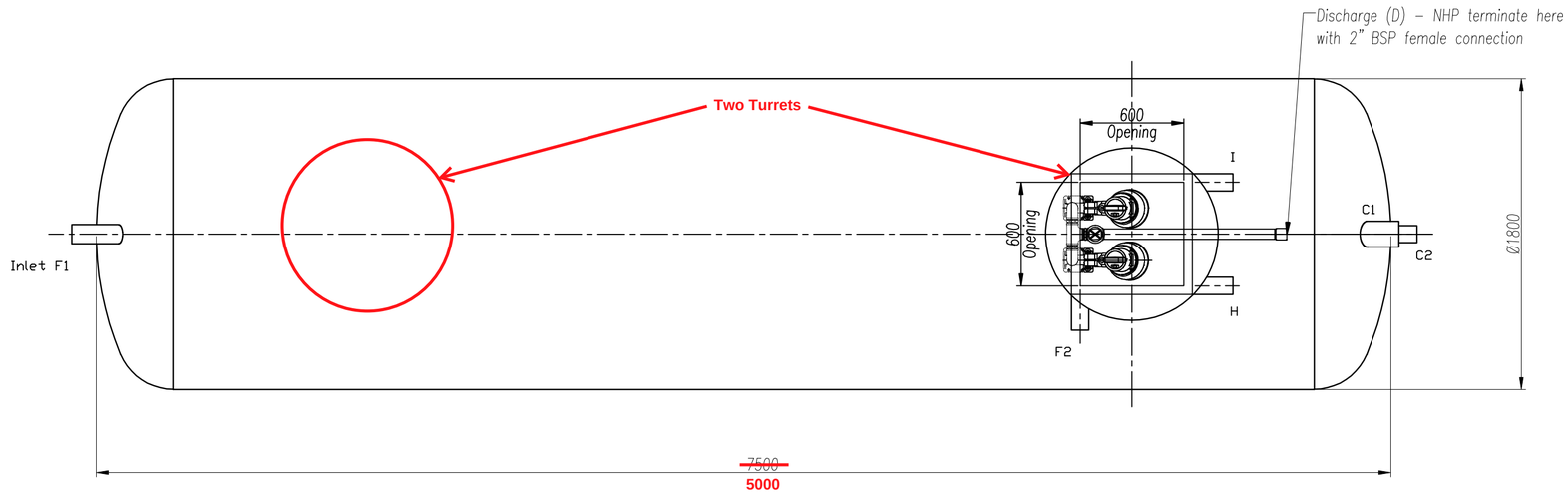
TITLE: BELOW GROUND DRAINAGE TO SEWER LAYOUT

DRAWN	SCALE
CF	1:50 @ A1
CHECKED	DATE
NR	APRIL 2022
DRAWING No.	REVISION
4114/PH/01	P2

NEW HADEN PUMPS
PUMPING SOLUTIONS







NOTES:
1. Effective sump capacity to equal one minute of pump output minimum.
2. Float switches to be positioned away from obstructions and in area of least disturbance.
3. Cable ducts to be 100 nb min, complete with draw rope, direct route to panel location avoiding sharp bends.
4. All civil engineering by main contractor.
5. Reinforcing bars in concrete to be kept at least 75mm away from access opening in the vicinity of the top guide-rail bracket fixing holes.

Tank manufactured to tolerance of ±10mm on all dimensions.

NEW HADEN PUMPS
PUMPING SOLUTIONS
www.nhpumps.com
Cheadle, Staffs., ST10 2NW.
Telephone: 01538 757900 Fax: 01538 757999

THE SOCIETY OF PUBLIC HEALTH ENGINEERS INDUSTRIAL ASSOCIATE

Typical arrangement of Horizontal GRP Tank
Pump Type:
For: .

Rev.	Drn.	Date	Rev.	Drn.	Date	Rev.	Drn.	Date	Rev.	Drn.	Date	Rev. .	Drn. .	Date .
												.		

Drawing to be altered only by NHP

ALL DIMENSIONS IN mm
DO NOT SCALE – IF IN DOUBT ASK

This is the property of New Haden Pumps Ltd. and must not be passed on to any person not authorised by New Haden Pumps Ltd. or be copied or otherwise utilized by anybody without New Haden Pumps Ltd. expressed written permission.

Client .

Scale 1:25 | Original Size A2 | 19.01.2009 Date | RH Drawn

Drg.No. MDXXXXXX–XX | Sheet 1 of 1 | ©

Print | Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	martin stovey
Site name:	new end
Site location:	hampstead NW3

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.

Site Details

Latitude:	51.55810° N
Longitude:	0.17574° W
Reference:	3945383469
Date:	Jul 21 2022 14:13

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	650	650
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

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.

(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.

(3) Is SPR/SPRHOST ≤ 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):	0.44	0.44
1 in 1 year (l/s):	0.38	0.38
1 in 30 years (l/s):	1.02	1.02
1 in 100 year (l/s):	1.41	1.41
1 in 200 years (l/s):	1.66	1.66

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.

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.743	0.065	1.3	0.2	O K
30 min Summer	100.738	0.060	1.2	0.2	O K
60 min Summer	100.726	0.048	1.0	0.1	O K
120 min Summer	100.713	0.035	0.7	0.1	O K
180 min Summer	100.706	0.028	0.6	0.1	O K
240 min Summer	100.701	0.023	0.5	0.0	O K
360 min Summer	100.696	0.018	0.4	0.0	O K
480 min Summer	100.692	0.014	0.3	0.0	O K
600 min Summer	100.690	0.012	0.2	0.0	O K
720 min Summer	100.689	0.011	0.2	0.0	O K
960 min Summer	100.687	0.009	0.2	0.0	O K
1440 min Summer	100.685	0.007	0.1	0.0	O K
2160 min Summer	100.683	0.005	0.1	0.0	O K
2880 min Summer	100.682	0.004	0.1	0.0	O K
4320 min Summer	100.681	0.003	0.1	0.0	O K
5760 min Summer	100.681	0.003	0.1	0.0	O K
7200 min Summer	100.680	0.002	0.0	0.0	O K
8640 min Summer	100.680	0.002	0.0	0.0	O K
10080 min Summer	100.680	0.002	0.0	0.0	O K
15 min Winter	100.745	0.067	1.3	0.2	O K
30 min Winter	100.735	0.057	1.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	30.991	0.0	0.7	11
30 min Summer	20.215	0.0	0.9	19
60 min Summer	12.800	0.0	1.2	34
120 min Summer	7.942	0.0	1.4	64
180 min Summer	5.979	0.0	1.6	94
240 min Summer	4.882	0.0	1.8	124
360 min Summer	3.646	0.0	2.0	184
480 min Summer	2.956	0.0	2.1	246
600 min Summer	2.511	0.0	2.3	306
720 min Summer	2.199	0.0	2.4	366
960 min Summer	1.782	0.0	2.6	476
1440 min Summer	1.326	0.0	2.9	710
2160 min Summer	0.988	0.0	3.2	1072
2880 min Summer	0.800	0.0	3.5	1436
4320 min Summer	0.595	0.0	3.9	2100
5760 min Summer	0.483	0.0	4.1	2928
7200 min Summer	0.410	0.0	4.4	3520
8640 min Summer	0.359	0.0	4.6	4232
10080 min Summer	0.322	0.0	4.8	4968
15 min Winter	30.991	0.0	0.8	11
30 min Winter	20.215	0.0	1.0	19

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Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.720	0.042	0.8	0.1	O K
120 min Winter	100.705	0.027	0.5	0.1	O K
180 min Winter	100.699	0.021	0.4	0.0	O K
240 min Winter	100.695	0.017	0.3	0.0	O K
360 min Winter	100.691	0.013	0.3	0.0	O K
480 min Winter	100.689	0.011	0.2	0.0	O K
600 min Winter	100.687	0.009	0.2	0.0	O K
720 min Winter	100.686	0.008	0.2	0.0	O K
960 min Winter	100.685	0.007	0.1	0.0	O K
1440 min Winter	100.683	0.005	0.1	0.0	O K
2160 min Winter	100.682	0.004	0.1	0.0	O K
2880 min Winter	100.681	0.003	0.1	0.0	O K
4320 min Winter	100.680	0.002	0.0	0.0	O K
5760 min Winter	100.680	0.002	0.0	0.0	O K
7200 min Winter	100.680	0.002	0.0	0.0	O K
8640 min Winter	100.680	0.002	0.0	0.0	O K
10080 min Winter	100.680	0.002	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	12.800	0.0	1.3	34
120 min Winter	7.942	0.0	1.6	64
180 min Winter	5.979	0.0	1.8	94
240 min Winter	4.882	0.0	2.0	126
360 min Winter	3.646	0.0	2.2	186
480 min Winter	2.956	0.0	2.4	246
600 min Winter	2.511	0.0	2.5	300
720 min Winter	2.199	0.0	2.7	368
960 min Winter	1.782	0.0	2.9	488
1440 min Winter	1.326	0.0	3.2	722
2160 min Winter	0.988	0.0	3.6	1092
2880 min Winter	0.800	0.0	3.9	1448
4320 min Winter	0.595	0.0	4.4	2196
5760 min Winter	0.483	0.0	4.6	2728
7200 min Winter	0.410	0.0	4.9	3872
8640 min Winter	0.359	0.0	5.2	4904
10080 min Winter	0.322	0.0	5.4	4864

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

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Model Details

Storage is Online Cover Level (m) 103.278

Pipe Structure

Diameter (m) 1.800 Length (m) 5.000
Slope (1:X) 1000.000 Invert Level (m) 100.678

Pump Outflow Control

Invert Level (m) 100.678

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.759	0.081	1.6	0.3	O K
30 min Summer	100.754	0.076	1.5	0.3	O K
60 min Summer	100.738	0.060	1.2	0.2	O K
120 min Summer	100.721	0.043	0.9	0.1	O K
180 min Summer	100.712	0.034	0.7	0.1	O K
240 min Summer	100.706	0.028	0.6	0.1	O K
360 min Summer	100.699	0.021	0.4	0.0	O K
480 min Summer	100.696	0.018	0.4	0.0	O K
600 min Summer	100.693	0.015	0.3	0.0	O K
720 min Summer	100.691	0.013	0.3	0.0	O K
960 min Summer	100.689	0.011	0.2	0.0	O K
1440 min Summer	100.686	0.008	0.2	0.0	O K
2160 min Summer	100.684	0.006	0.1	0.0	O K
2880 min Summer	100.683	0.005	0.1	0.0	O K
4320 min Summer	100.682	0.004	0.1	0.0	O K
5760 min Summer	100.681	0.003	0.1	0.0	O K
7200 min Summer	100.681	0.003	0.1	0.0	O K
8640 min Summer	100.680	0.002	0.0	0.0	O K
10080 min Summer	100.680	0.002	0.0	0.0	O K
15 min Winter	100.762	0.084	1.7	0.3	O K
30 min Winter	100.750	0.072	1.4	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	40.058	0.0	0.9	11
30 min Summer	25.963	0.0	1.2	19
60 min Summer	16.200	0.0	1.5	34
120 min Summer	9.897	0.0	1.8	64
180 min Summer	7.378	0.0	2.0	94
240 min Summer	5.982	0.0	2.2	124
360 min Summer	4.435	0.0	2.4	184
480 min Summer	3.581	0.0	2.6	244
600 min Summer	3.033	0.0	2.7	306
720 min Summer	2.647	0.0	2.9	364
960 min Summer	2.136	0.0	3.1	476
1440 min Summer	1.579	0.0	3.4	712
2160 min Summer	1.167	0.0	3.8	1076
2880 min Summer	0.941	0.0	4.1	1460
4320 min Summer	0.695	0.0	4.5	2160
5760 min Summer	0.561	0.0	4.8	2792
7200 min Summer	0.475	0.0	5.1	3608
8640 min Summer	0.414	0.0	5.3	4216
10080 min Summer	0.370	0.0	5.5	4928
15 min Winter	40.058	0.0	1.0	12
30 min Winter	25.963	0.0	1.3	19

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Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.730	0.052	1.0	0.2	O K
120 min Winter	100.712	0.034	0.7	0.1	O K
180 min Winter	100.704	0.026	0.5	0.1	O K
240 min Winter	100.699	0.021	0.4	0.0	O K
360 min Winter	100.694	0.016	0.3	0.0	O K
480 min Winter	100.691	0.013	0.3	0.0	O K
600 min Winter	100.689	0.011	0.2	0.0	O K
720 min Winter	100.688	0.010	0.2	0.0	O K
960 min Winter	100.686	0.008	0.2	0.0	O K
1440 min Winter	100.684	0.006	0.1	0.0	O K
2160 min Winter	100.682	0.004	0.1	0.0	O K
2880 min Winter	100.682	0.004	0.1	0.0	O K
4320 min Winter	100.681	0.003	0.1	0.0	O K
5760 min Winter	100.680	0.002	0.0	0.0	O K
7200 min Winter	100.680	0.002	0.0	0.0	O K
8640 min Winter	100.680	0.002	0.0	0.0	O K
10080 min Winter	100.680	0.002	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	16.200	0.0	1.6	34
120 min Winter	9.897	0.0	2.0	64
180 min Winter	7.378	0.0	2.2	94
240 min Winter	5.982	0.0	2.4	124
360 min Winter	4.435	0.0	2.7	180
480 min Winter	3.581	0.0	2.9	248
600 min Winter	3.033	0.0	3.1	300
720 min Winter	2.647	0.0	3.2	358
960 min Winter	2.136	0.0	3.4	488
1440 min Winter	1.579	0.0	3.8	736
2160 min Winter	1.167	0.0	4.2	1096
2880 min Winter	0.941	0.0	4.6	1332
4320 min Winter	0.695	0.0	5.1	2224
5760 min Winter	0.561	0.0	5.4	2696
7200 min Winter	0.475	0.0	5.6	3872
8640 min Winter	0.414	0.0	6.0	3992
10080 min Winter	0.370	0.0	6.2	5680

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

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Model Details

Storage is Online Cover Level (m) 103.278

Pipe Structure

Diameter (m) 1.800 Length (m) 5.000
Slope (1:X) 1000.000 Invert Level (m) 100.678

Pump Outflow Control

Invert Level (m) 100.678

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.837	0.159	2.0	0.7	O K
30 min Summer	100.830	0.152	2.0	0.7	O K
60 min Summer	100.790	0.112	2.0	0.4	O K
120 min Summer	100.757	0.079	1.6	0.3	O K
180 min Summer	100.740	0.062	1.2	0.2	O K
240 min Summer	100.729	0.051	1.0	0.1	O K
360 min Summer	100.717	0.039	0.8	0.1	O K
480 min Summer	100.709	0.031	0.6	0.1	O K
600 min Summer	100.705	0.027	0.5	0.1	O K
720 min Summer	100.701	0.023	0.5	0.0	O K
960 min Summer	100.697	0.019	0.4	0.0	O K
1440 min Summer	100.692	0.014	0.3	0.0	O K
2160 min Summer	100.688	0.010	0.2	0.0	O K
2880 min Summer	100.686	0.008	0.2	0.0	O K
4320 min Summer	100.684	0.006	0.1	0.0	O K
5760 min Summer	100.683	0.005	0.1	0.0	O K
7200 min Summer	100.682	0.004	0.1	0.0	O K
8640 min Summer	100.682	0.004	0.1	0.0	O K
10080 min Summer	100.681	0.003	0.1	0.0	O K
15 min Winter	100.852	0.174	2.0	0.8	O K
30 min Winter	100.830	0.152	2.0	0.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.035	0.0	1.7	12
30 min Summer	49.499	0.0	2.2	20
60 min Summer	30.811	0.0	2.8	36
120 min Summer	18.615	0.0	3.4	64
180 min Summer	13.715	0.0	3.7	94
240 min Summer	10.995	0.0	4.0	124
360 min Summer	8.034	0.0	4.3	184
480 min Summer	6.428	0.0	4.6	244
600 min Summer	5.404	0.0	4.9	304
720 min Summer	4.687	0.0	5.1	364
960 min Summer	3.743	0.0	5.4	482
1440 min Summer	2.723	0.0	5.9	716
2160 min Summer	1.979	0.0	6.4	1072
2880 min Summer	1.577	0.0	6.8	1448
4320 min Summer	1.143	0.0	7.4	2180
5760 min Summer	0.910	0.0	7.8	2992
7200 min Summer	0.762	0.0	8.1	3536
8640 min Summer	0.659	0.0	8.4	4296
10080 min Summer	0.583	0.0	8.6	4976
15 min Winter	76.035	0.0	1.9	13
30 min Winter	49.499	0.0	2.5	21

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Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.775	0.097	1.9	0.4	O K
120 min Winter	100.742	0.064	1.3	0.2	O K
180 min Winter	100.726	0.048	1.0	0.1	O K
240 min Winter	100.717	0.039	0.8	0.1	O K
360 min Winter	100.706	0.028	0.6	0.1	O K
480 min Winter	100.701	0.023	0.5	0.0	O K
600 min Winter	100.697	0.019	0.4	0.0	O K
720 min Winter	100.695	0.017	0.3	0.0	O K
960 min Winter	100.691	0.013	0.3	0.0	O K
1440 min Winter	100.688	0.010	0.2	0.0	O K
2160 min Winter	100.685	0.007	0.1	0.0	O K
2880 min Winter	100.684	0.006	0.1	0.0	O K
4320 min Winter	100.682	0.004	0.1	0.0	O K
5760 min Winter	100.682	0.004	0.1	0.0	O K
7200 min Winter	100.681	0.003	0.1	0.0	O K
8640 min Winter	100.681	0.003	0.1	0.0	O K
10080 min Winter	100.681	0.003	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	3.1	36
120 min Winter	18.615	0.0	3.8	66
180 min Winter	13.715	0.0	4.1	94
240 min Winter	10.995	0.0	4.4	124
360 min Winter	8.034	0.0	4.9	186
480 min Winter	6.428	0.0	5.2	244
600 min Winter	5.404	0.0	5.4	306
720 min Winter	4.687	0.0	5.7	366
960 min Winter	3.743	0.0	6.0	496
1440 min Winter	2.723	0.0	6.6	724
2160 min Winter	1.979	0.0	7.2	1040
2880 min Winter	1.577	0.0	7.6	1420
4320 min Winter	1.143	0.0	8.3	2360
5760 min Winter	0.910	0.0	8.8	3040
7200 min Winter	0.762	0.0	9.2	4008
8640 min Winter	0.659	0.0	9.4	4480
10080 min Winter	0.583	0.0	9.8	4632

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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	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

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Model Details

Storage is Online Cover Level (m) 103.278

Pipe Structure

Diameter (m) 1.800 Length (m) 5.000
Slope (1:X) 1000.000 Invert Level (m) 100.678

Pump Outflow Control

Invert Level (m) 100.678

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.989	0.311	2.0	1.8	O K
30 min Summer	100.998	0.320	2.0	1.8	O K
60 min Summer	100.960	0.282	2.0	1.5	O K
120 min Summer	100.870	0.192	2.0	0.9	O K
180 min Summer	100.799	0.121	2.0	0.5	O K
240 min Summer	100.770	0.092	1.8	0.3	O K
360 min Summer	100.747	0.069	1.4	0.2	O K
480 min Summer	100.734	0.056	1.1	0.2	O K
600 min Summer	100.726	0.048	1.0	0.1	O K
720 min Summer	100.719	0.041	0.8	0.1	O K
960 min Summer	100.711	0.033	0.7	0.1	O K
1440 min Summer	100.702	0.024	0.5	0.1	O K
2160 min Summer	100.695	0.017	0.3	0.0	O K
2880 min Summer	100.692	0.014	0.3	0.0	O K
4320 min Summer	100.688	0.010	0.2	0.0	O K
5760 min Summer	100.686	0.008	0.2	0.0	O K
7200 min Summer	100.685	0.007	0.1	0.0	O K
8640 min Summer	100.684	0.006	0.1	0.0	O K
10080 min Summer	100.683	0.005	0.1	0.0	O K
15 min Winter	101.025	0.347	2.0	2.0	O K
30 min Winter	101.029	0.351	2.0	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	3.1	14
30 min Summer	90.705	0.0	4.1	22
60 min Summer	56.713	0.0	5.1	38
120 min Summer	34.246	0.0	6.2	70
180 min Summer	25.149	0.0	6.8	98
240 min Summer	20.078	0.0	7.2	124
360 min Summer	14.585	0.0	7.9	186
480 min Summer	11.622	0.0	8.4	244
600 min Summer	9.738	0.0	8.8	306
720 min Summer	8.424	0.0	9.1	366
960 min Summer	6.697	0.0	9.6	488
1440 min Summer	4.839	0.0	10.5	732
2160 min Summer	3.490	0.0	11.3	1096
2880 min Summer	2.766	0.0	11.9	1460
4320 min Summer	1.989	0.0	12.9	2124
5760 min Summer	1.573	0.0	13.6	2856
7200 min Summer	1.311	0.0	14.1	3544
8640 min Summer	1.129	0.0	14.6	4272
10080 min Summer	0.994	0.0	15.0	5056
15 min Winter	138.153	0.0	3.5	14
30 min Winter	90.705	0.0	4.6	24

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.965	0.287	2.0	1.6	O K
120 min Winter	100.820	0.142	2.0	0.6	O K
180 min Winter	100.765	0.087	1.7	0.3	O K
240 min Winter	100.748	0.070	1.4	0.2	O K
360 min Winter	100.729	0.051	1.0	0.1	O K
480 min Winter	100.719	0.041	0.8	0.1	O K
600 min Winter	100.713	0.035	0.7	0.1	O K
720 min Winter	100.708	0.030	0.6	0.1	O K
960 min Winter	100.702	0.024	0.5	0.1	O K
1440 min Winter	100.695	0.017	0.3	0.0	O K
2160 min Winter	100.691	0.013	0.3	0.0	O K
2880 min Winter	100.688	0.010	0.2	0.0	O K
4320 min Winter	100.685	0.007	0.1	0.0	O K
5760 min Winter	100.684	0.006	0.1	0.0	O K
7200 min Winter	100.683	0.005	0.1	0.0	O K
8640 min Winter	100.682	0.004	0.1	0.0	O K
10080 min Winter	100.682	0.004	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	5.7	42
120 min Winter	34.246	0.0	6.9	70
180 min Winter	25.149	0.0	7.6	96
240 min Winter	20.078	0.0	8.1	126
360 min Winter	14.585	0.0	8.8	186
480 min Winter	11.622	0.0	9.4	246
600 min Winter	9.738	0.0	9.8	304
720 min Winter	8.424	0.0	10.2	368
960 min Winter	6.697	0.0	10.8	480
1440 min Winter	4.839	0.0	11.7	716
2160 min Winter	3.490	0.0	12.7	1072
2880 min Winter	2.766	0.0	13.4	1460
4320 min Winter	1.989	0.0	14.4	2184
5760 min Winter	1.573	0.0	15.2	2872
7200 min Winter	1.311	0.0	15.8	3600
8640 min Winter	1.129	0.0	16.4	4128
10080 min Winter	0.994	0.0	16.8	5040

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

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

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Model Details

Storage is Online Cover Level (m) 103.278

Pipe Structure

Diameter (m) 1.800 Length (m) 5.000
Slope (1:X) 1000.000 Invert Level (m) 100.678

Pump Outflow Control

Invert Level (m) 100.678

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

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