

17 August 2020

✉ 52 Common Lane
Titchfield, Hants,
PO14 4BU

Metis Homes
59 Tower Street
Winchester
Hants
SO23 8TA

☎ 07717 759149
🌐 www.aquacallidus.co.uk

FAO: Simon Davis/Laura Gibbons

Ref: 1833

**Re: Barnside, Hook Lane Aldingbourne, West Sussex
Drainage Condition AL/28/20/DOC**

Dear Sirs

Further to previous direction from Paul Cann and my subsequent dialogue with Laura Gibbons we have set out below the information sought for clearance of condition 14.

Design infiltration rate

Deep infiltration tests had been undertaken prior to the submissions made in May last year. On 14th-16th May 2019 shallow infiltration tests were undertaken by Messrs GESL and issued to ADC on 30th May 2019. These determined an infiltration rate of some 3.8×10^{-6} m/sec which was used in illustrative calculations at that time. It was subsequently agreed that there was sufficient storage proposed that even if a nil winter infiltration rate to be found that the site arrangement could support sufficient storage to effect attenuated discharge of 2 l/sec to the watercourse. As agreed with Laura on 11th August 2020 last week the testing from this Winter comprises only the results attached which determined a rate of 1.88×10^{-6} m/sec and a factor of safety has been applied determining a infiltration rate of 0.7×10^{-6} m/sec.

Ground Water Levels

Messrs GESL undertook GWL monitoring over the Winter 2018/2019 which identified GWLs to have peaked in December 2018 at the following levels:

	GL (mAOD)	GWL	GWL (mAOD)
WS1	10.46	0.73	9.73
WS2	10.33	0.60	9.73
WS4	10.43	0.89	9.54

The results demonstrate a seasonal high GWL of 9.73m AOD. A copy of the monitoring results is attached.

Catchment Plan

The impermeable area catchment plan is shown on Mapledean Projects drawing HLA-209, a copy of which is attached.

Surface Water Drainage Provision and Performance

The drainage arrangement is shown on Arch Associates drawing AAL156-501-P6 a copy of which is attached. The SW drainage arrangement has been modelled by Bright Plan Civils for 1%AEP rainfall +40%CC +10%UC and taking account of the rain falling into the pond. The attenuated outfall rate from the pond has been limited to 2 l/sec as previously agreed. The model layout and outputs are attached. The model demonstrates that there is sufficient storage provided within the site, that there is adequate conveyance capacity and that there is no flood risk from the required model scenarios.

Water Quality and Treatment

Catch pit chambers are provided upstream of each soakaway. Smart sponge outlets are fitted to all RGs which in conjunction with the soakaway performance will provide adequate mitigation as set out in the simple index approach of chapter 26 of CIRIA C753 in infiltration 'mode'. In attenuation mode the urban derived discharge also passes through a Klargester NPSB003 interceptor and the site pond and so provides adequate mitigation as set out in the simple index approach of chapter 26 of CIRIA C753 in attenuation 'mode'. Smart sponge, and Klargester NPSB003 details are attached along with simple index assessment calculations.

Construction Details

Construction details are shown on the following attached documents:

- Arch Associates drawing AAL156-551-P7
- Arch Associates drawing AAL156-552-P5

The proposed pond inlet and outlet details accord with the ADC standard details and are subject of an active OWC application to Paul Cann.

Construction Stage and OWC application

The drainage infrastructure has been constructed save for the inlet and outlet to the pond and watercourse, which as set out above is subject of an active OWC application to Paul Cann at ADC. As the principle and location for this was already agreed last year the application is a formality. Paul may request that the OWC elements are extracted and reproduced onto a separate drawing for OWC purposes only but this would not affect the performance of the site drainage system as set out above.

This winter has been particularly wet and no stability issues were encountered during the construction works which were undertaken during this time.

Drainage Manual

A provisional Drainage manual was issued in our letter of 20 July 2020. Following planned discussion for 18th August 2020 (tomorrow) with Laura the Drainage Manual will be finalised and issued to ADC.

Yours Sincerely

Aqua Callidus Consulting Ltd

Andy Traves

Enc Permeability Test results 6th March 2020
 GWL monitoring
 Mapledean Projects drawing HLA-209 (catchment areas)
 Arch Associates drawing AAL156-501-P6 (drainage layout)
 BPC hydraulic model outputs
 Q Brake details
 Smart sponge information
 Klargester NPSB003 interceptor information
 C753 water quality simple index assessments
 Arch Associates drawing AAL156-551-P7 (details)
 Arch Associates drawing AAL156-552-P5 (details)

Cc Andrew Sinclair- Metis Homes

aquacallidus

From: Nigel Freemantle <nigel@mapledean.co.uk>
Sent: 02 July 2020 12:41
To: aquacallidus
Subject: Hook Lane, Aldingbourne

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Andy

Written up notes of the infiltration test.

I left this quite late due to the phenomenal rainfall in December, January and February.....

I would prefer it if perhaps a more conservative figure was used, say around **1.4x10⁻⁶** in light of the general saturation of the ground and only undertaking test in one location.

INFILTRATION TESTING 6 MARCH 2020

Dry day following extended period of wet weather

Hole dug in front of plot 14 size 0.5x1.2m with a depth below current ground level of 0.9m

Invert level of hole 9.700 based on typical soakaway invert levels from Arch Associates designs.

Designs allow for 400mm crates with 400mm cover over. Site ground levels are raised 200 - 250mm

meaning that inverts are typically 600mm below original ground level falling within the river terrace deposits.

The hole was filled with water to a depth of 0.72m and the depth from reference point to water was 0.18m

The following depths to water were recorded

	movement		cumulative	
12.05pm	180	0	0	
12.15 pm	210	-30	-30	
12.30pm	232	-22	-52	
1.30pm 250	-18	-70		
2.30pm 300	-50	-120		
3.30pm 335	-35	-155		
4.30pm 365	-30	-185		25% drop after 265 mins
left overnight			-185	
09.00am	690	-325	-510	
09.30am	705	-15	-525	
10.00am	720	-15	-540	75% drop after 1315 mins
10.30am	730	-10	-550	
11.00am	740	-10	-560	
12.00am	760	-20	-580	test terminated

Water level reading @ 25% drop = 360mm

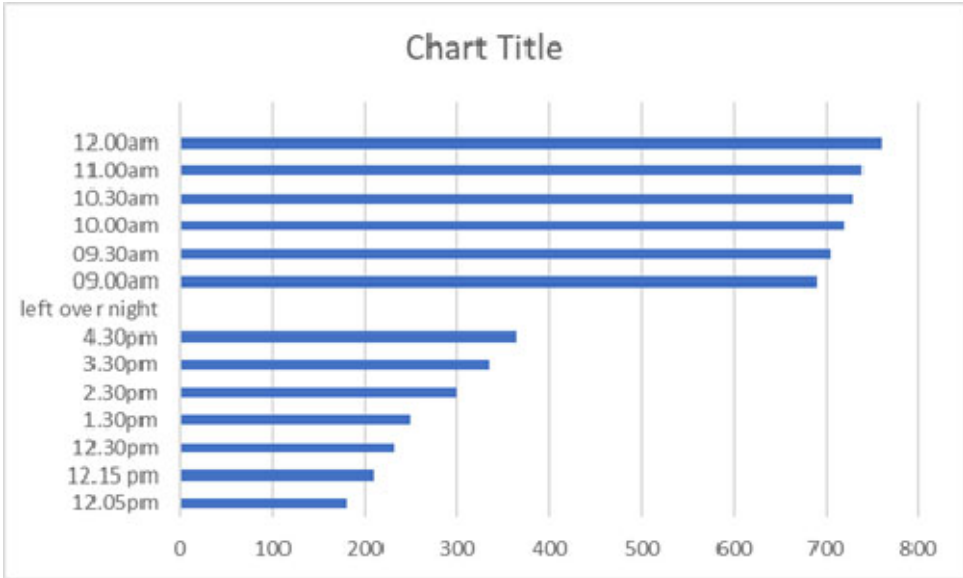
Water level reading @ 75% drop = 720mm

Time between 25% and 75% Empty is 1050 minutes / 63,000 seconds

F= (Vp75-25) / (ap50xtp75-25)

0.216 / (1.822x63,000)

1.88 x 10-6



Regards,

Nigel

Nigel Freemantle



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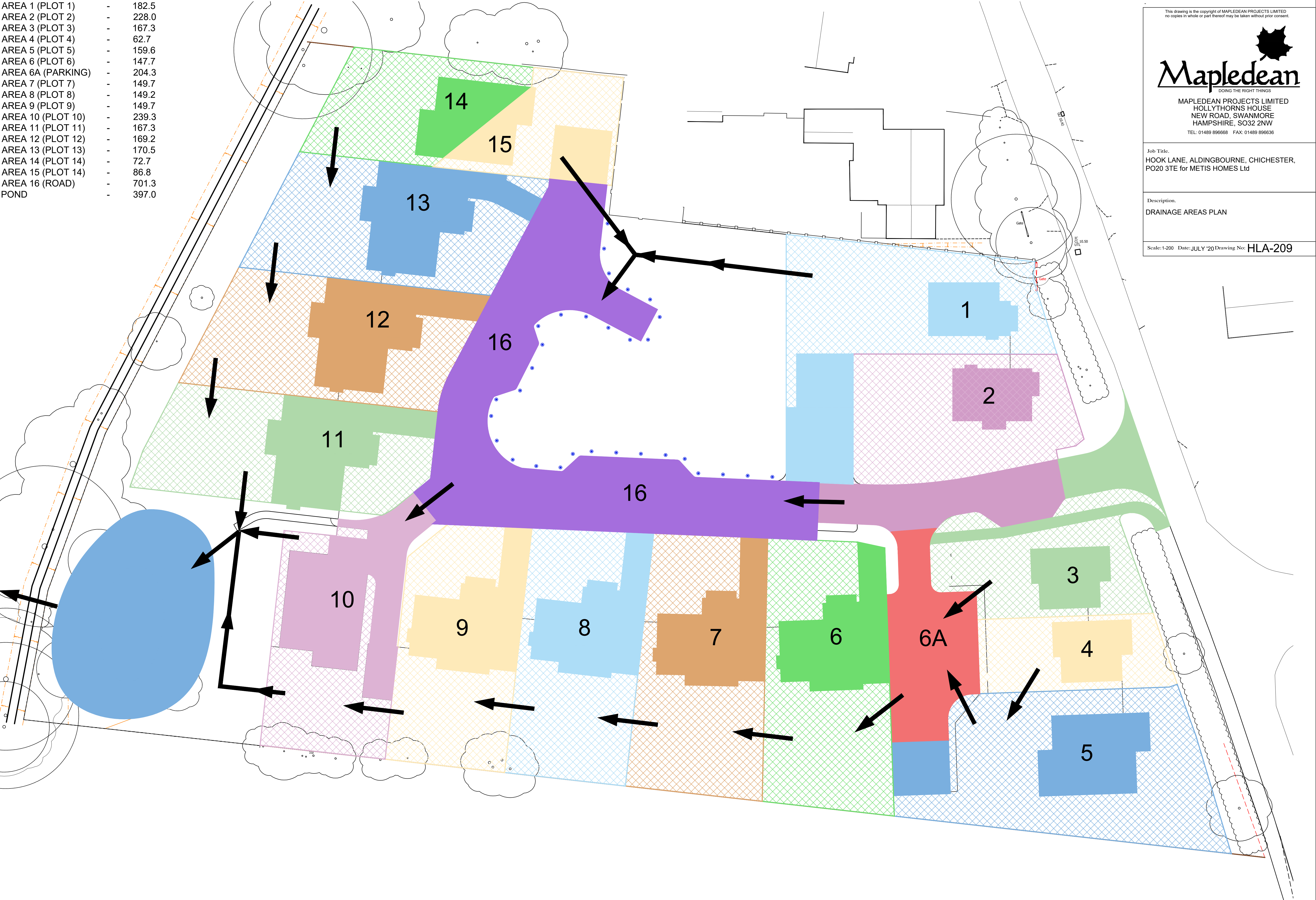
Project: Hook Lane, Westergate
Ref: GE17712
Client: Metis Homes



Location	Date	GWL (m bgl)	Comments
WS1	31/10/18	Dry	Dry to base of well at 2.21m bgl
WS1	20/11/18	0.77	-
WS1	17/12/18	0.73	-
WS1	21/01/19	1.30	-
WS1	22/02/19	1.40	-
WS1	19/03/19	0.99	-
WS2	31/10/18	Dry	Dry to base of well at 1.99m bgl
WS2	20/11/18	0.69	-
WS2	17/12/18	0.60	-
WS2	21/01/19	0.00	-
WS2	22/02/19	0.00	-
WS2	19/03/19	-	Well not located
WS4	31/10/18	2.24	Base of well at 2.33m bgl
WS4	20/11/18	1.08	-
WS4	17/12/18	0.89	-
WS4	21/01/19	1.49	-
WS4	22/02/19	1.08	-
WS4	19/03/19	1.35	-

DRAINAGE - IMPERMEABLE AREAS (m²)

AREA 1 (PLOT 1)	-	182.5
AREA 2 (PLOT 2)	-	228.0
AREA 3 (PLOT 3)	-	167.3
AREA 4 (PLOT 4)	-	62.7
AREA 5 (PLOT 5)	-	159.6
AREA 6 (PLOT 6)	-	147.7
AREA 6A (PARKING)	-	204.3
AREA 7 (PLOT 7)	-	149.7
AREA 8 (PLOT 8)	-	149.2
AREA 9 (PLOT 9)	-	149.7
AREA 10 (PLOT 10)	-	239.3
AREA 11 (PLOT 11)	-	167.3
AREA 12 (PLOT 12)	-	169.2
AREA 13 (PLOT 13)	-	170.5
AREA 14 (PLOT 14)	-	72.7
AREA 15 (PLOT 14)	-	86.8
AREA 16 (ROAD)	-	701.3
POND	-	397.0



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Mapledean
DOING THE RIGHT THINGS

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Job Title:
HOOK LANE, ALDINGBOURNE, CHICHESTER,
PO20 3TE for METIS HOMES Ltd

Description:
DRAINAGE AREAS PLAN

Scale: 1:200 Date: JULY '20 Drawing No: HLA-209

LEGEND

S1

EXISTING FOUL DRAIN

SURFACE WATER MANHOLE (SWMH)/
INSPECTION CHAMBER / ACCESS
CHAMBER/HYDROBRAKE
(SEE SCHEDULE FOR DETAILS).

RWP

RE

RAIN WATER DOWNPIPE (LOCATION AS
ARCHITECTS DRGS).

RODDING EYE.

F1

IC

FOUL WATER MANHOLE (FWMH)/
INSPECTION CHAMBER / ACCESS
CHAMBER (SEE SCHEDULE FOR DETAILS).
315Ø INSPECTION CHAMBER.
DEPTH TO INVERT = 0.6m

SVP/SS/CG

SOIL VENT PIPE / STUB STACK/
CAPPED GULLY
(LOCATION AS ARCHITECTS DRGS).

SITE BOUNDARY

??..??

??..??

EXISTING GROUND LEVEL

PROPOSED LEVEL

SA?

SOAKAWAY

DROP KERB

HALF BATTERED KERB (HB2)

BULL NOSED KERB (BN25)

BULL NOSED KERB (BNO)

EDGE FLAT KERB

CDM REGULATIONS 2015

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ACTIVITY	HAZARD	CONTROL

NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERIENCE OF A COMPETENT CONTRACTOR.

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SOAKAWAY SCHEDULE					
REF	SHAPE	SIZE	DEPTH	INVERT OF INCOMING DRAIN	INVERT OF CRATES
SA1		4.0mx7.0m+6.0mx4.0m	400mm	10.16	9.96
SA2	RECTANGLE	2.0m x 9.5m	400mm	10.00	9.80
SA3	RECTANGLE	5.0m x 3.5m	400mm	9.95	9.75
SA4	RECTANGLE	2.5m x 7.0m	400mm	9.95	9.75
SA5	RECTANGLE	3.5m x 12.0m	400mm	9.95	9.75
SA6A	RECTANGLE	5.0m x 10.5.0m	400mm	9.97	9.77
SA6	RECTANGLE	6.0m x 7.0m	400mm	9.91	9.71
SA7	RECTANGLE	6.0m x 7.0m	400mm	9.90	9.70
SA8	RECTANGLE	6.0m x 7.0m	400mm	9.89	9.69
SA9	RECTANGLE	6.0m x 7.0m	400mm	9.88	9.68
SA10	RECTANGLE	16.0m x 3.5m	400mm	9.86	9.66
SA11		7.0mx5.5m+3.0mx3.0m	400mm	9.98	9.78
SA12		3mx2m+5mx7m+3mx2m	400mm	9.99	9.79
SA13		10.0mx3.5m+4.0mx3.0m	400mm	10.00	9.80
SA14	RECTANGLE	2.0m x 9.5m	400mm	10.10	9.90
SA15	RECTANGLE	2.0m x 16.0m	400mm	10.00	9.80
SA16		26.0mx8.0m+26.0mx4.0m	400mm	9.89	9.79

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DRAWING

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THIS STAMP IS NOT RED

Revision	Date	Description	By
P6	13.08.20	UPDATED/DETAILS ADDED AS REQUESTED BY DRAINAGE ENGINEEG.	PJM
P5	17.07.20	AMENDS TO LA COMMENTS	CH
P4	03.10.19	SURFACE WATER AMENDS	CH
P3	01.08.19	F1 TO F6 UPDATED, F7 REMOVED	JH
P2	19.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM
P1	15.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM

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ace

engineering

UKAS

18001

Client

MAPLEDEAN PROJECTS LIMITED

Architect

Project Title

HOOK LANE,
ALDINGBOURNE, WEST SUSSEX.

Drawing Title

DRAINAGE LAYOUT

Scale 1:250 Paper Size A1 Date JUNE 2019 Drawn By PJM Checked By CH

Project No. AAL156 Drawing No. 501 Revision P6

ARUN DISTRICT COUNCIL AL07020DC



Bright Plan Civils 2 West Barn Norton Lane Chichester PO20 3AF	File: D1898 Flow Model V1.pfd Network: S1 Dan Lytton -	Page 1 Hook Lane Aldingbourne Surface Water Flow Model
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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	250.0
Additional Flow (%)	10	Minimum Velocity (m/s)	0.75
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.400
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
130	0.003	5.00	10.650	450	493413.900	104637.612	0.600
129	0.003	5.00	10.650	450	493425.135	104639.776	0.490
128	0.004	5.00	10.455	450	493424.436	104651.604	0.315
127	0.003	5.00	10.650	450	493423.115	104646.304	0.550
126	0.003	5.00	10.650	450	493411.675	104643.807	0.670
125			10.650	450	493408.609	104643.138	0.891
124	0.002	5.00	10.700	450	493416.007	104627.848	0.600
123	0.002	5.00	10.700	450	493426.949	104629.669	0.550
122	0.001	5.00	10.700	450	493426.719	104636.260	0.600
121	0.001	5.00	10.700	450	493415.726	104635.875	0.710
120			10.700	450	493411.201	104635.717	0.943
119	0.004	5.00	10.650	450	493428.457	104613.114	0.500
118	0.004	5.00	10.650	450	493413.568	104624.632	0.500
117	0.004	5.00	10.650	450	493413.972	104612.608	0.650
116			10.650	450	493409.718	104612.459	0.889
115	0.004	5.00	10.650	450	493401.378	104622.161	0.600
114			10.600	450	493406.271	104622.331	0.839
113		5.00	10.700	450	493404.067	104641.400	0.700
112	0.020	5.00	10.700	450	493400.446	104641.281	0.720
111			10.700	450	493401.940	104641.326	0.730
110			10.700	450	493402.061	104637.866	0.920
109		5.00	10.700	450	493409.882	104629.117	0.700
108			10.700	450	493410.000	104625.600	0.760
107		5.00	10.700	450	493407.283	104623.431	0.700
106			10.700	450	493407.213	104625.506	0.770
105		5.00	10.700	450	493402.414	104627.772	0.680
104			10.700	450	493402.499	104625.348	0.780
103	0.003	5.00	10.700	450	493385.415	104626.399	0.685
102	0.004	5.00	10.800	450	493388.378	104639.216	0.675
101	0.004	5.00	10.800	450	493393.876	104639.392	0.725
100	0.004	5.00	10.600	450	493394.308	104625.876	0.665
99			10.600	450	493394.442	104622.066	0.690
98			10.600	450	493392.012	104617.619	0.690
97			10.600	450	493389.978	104617.847	0.863
96	0.002	5.00	11.000	450	493350.306	104700.955	0.580
95	0.002	5.00	10.950	450	493339.002	104702.223	0.605
94	0.003	5.00	10.850	450	493331.125	104695.003	0.575
93			10.850	450	493329.483	104695.864	0.941
92	0.003	5.00	10.650	450	493370.192	104627.205	0.615
91	0.004	5.00	10.800	450	493373.867	104639.852	0.675
90	0.004	5.00	10.800	450	493379.366	104639.725	0.725



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
89	0.004	5.00	10.600	450	493379.043	104626.197	0.665
88		5.00	10.600	450	493383.419	104618.582	0.640
87			10.600	450	493378.892	104619.090	0.700
86			10.600	450	493376.518	104619.356	0.863
85		5.00	10.600	450	493327.848	104695.253	0.450
84	0.003	5.00	10.750	450	493331.683	104683.484	0.630
83	0.003	5.00	10.800	450	493342.120	104676.572	0.550
82	0.004	5.00	10.800	450	493347.493	104681.899	0.613
81	0.004	5.00	10.800	450	493348.064	104686.987	0.664
80	0.003	5.00	10.650	450	493331.713	104690.271	0.590
79			10.700	450	493325.596	104690.957	0.700
78			10.700	450	493324.950	104689.724	0.890
77	0.003	5.00	10.600	450	493354.778	104629.026	0.550
76	0.004	5.00	10.750	450	493359.569	104641.212	0.640
75	0.004	5.00	10.800	450	493365.033	104640.582	0.740
74	0.004	5.00	10.700	450	493363.486	104627.148	0.770
73		5.00	10.700	450	493369.959	104620.092	0.750
72			10.700	450	493362.785	104620.897	0.810
71			10.700	450	493359.907	104621.219	0.963
70	0.004	5.00	10.500	450	493358.941	104696.286	0.450
69	0.004	5.00	10.600	450	493357.758	104685.801	0.575
68			10.650	450	493364.993	104680.374	0.834
67	0.005	5.00	10.700	450	493414.415	104667.503	0.500
66	0.004	5.00	10.700	450	493411.848	104657.623	0.500
65	0.004	5.00	10.700	450	493403.213	104657.623	0.583
64	0.004	5.00	10.700	450	493403.213	104667.503	0.600
63			10.700	450	493398.343	104666.882	0.890
62	0.006	5.00	10.850	450	493385.080	104659.420	0.480
61			10.850	450	493385.080	104668.841	0.550
60	0.004	5.00	10.850	450	493412.859	104675.443	0.470
59	0.004	5.00	10.850	450	493412.859	104668.841	0.530
58	0.004	5.00	10.850	450	493398.343	104668.841	0.670
57	0.004	5.00	10.850	450	493398.343	104675.986	0.670
56			10.850	450	493396.203	104675.986	0.880
55	0.003	5.00	10.650	450	493325.376	104669.345	0.550
54	0.003	5.00	10.800	450	493335.815	104662.436	0.550
53	0.004	5.00	10.800	450	493341.187	104667.761	0.613
52	0.004	5.00	10.800	450	493341.757	104672.849	0.670
51	0.003	5.00	10.700	450	493325.406	104676.133	0.664
50		5.00	10.700	450	493320.493	104681.221	0.550
49			10.700	450	493318.247	104676.936	0.710
48			10.700	450	493317.894	104673.792	0.902
47	0.003	5.00	10.650	450	493339.986	104629.462	0.650
46	0.003	5.00	10.700	450	493338.620	104638.669	0.540
45	0.003	5.00	10.700	450	493344.774	104641.635	0.610
44	0.003	5.00	10.800	450	493350.238	104641.005	0.760
43	0.003	5.00	10.700	450	493348.691	104627.571	0.790
42			10.700	450	493348.244	104623.584	0.963
41		5.00	10.700	450	493353.348	104621.955	0.500
40			10.700	450	493351.067	104622.211	0.522
39			10.700	450	493348.673	104622.479	0.963
38	0.010	5.00	10.700	450	493411.986	104653.837	0.600



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
37			10.700	450	493398.343	104656.257	0.700
36		5.00	10.700	450	493398.343	104657.782	0.700
35		5.00	10.750	450	493386.603	104675.986	0.540
34		5.00	10.750	450	493380.582	104679.800	0.700
33			10.750	450	493383.140	104679.689	0.750
32			10.750	450	493382.980	104675.986	0.850
31			10.750	450	493382.130	104656.257	0.860
30			10.750	450	493379.572	104656.367	0.934
29		5.00	10.700	450	493316.309	104665.316	0.720
28	0.003	5.00	10.800	450	493320.142	104655.093	0.500
27	0.003	5.00	10.800	450	493330.581	104648.184	0.500
26	0.004	5.00	10.800	450	493335.953	104653.509	0.613
25	0.004	5.00	10.850	450	493336.523	104658.597	0.720
24	0.003	5.00	10.700	450	493320.264	104662.789	0.690
23			10.700	450	493316.078	104663.257	0.720
22			10.700	450	493315.944	104662.067	0.911
21		5.00	10.700	450	493342.113	104623.200	0.770
20	0.006	5.00	10.700	450	493325.148	104625.103	0.830
19			10.700	450	493315.109	104626.229	0.840
18			10.700	450	493315.618	104630.773	0.954
17	0.006	5.00	10.700	450	493335.162	104632.479	0.500
16	0.006	5.00	10.700	450	493336.050	104643.626	0.607
15	0.006	5.00	10.700	450	493320.909	104645.324	0.715
14			10.700	450	493318.836	104645.557	0.954
13	0.070	5.00	10.700	450	493353.964	104656.721	0.625
12			10.700	450	493350.236	104656.882	0.638
11			10.700	450	493337.617	104645.282	0.696
10		5.00	10.700	450	493317.357	104646.276	0.500
9			10.700	450	493317.499	104647.539	0.850
8		5.00	10.700	450	493313.919	104652.647	0.670
7			10.700	450	493313.758	104651.210	0.730
6			10.700	450	493313.397	104647.989	0.850
5			10.430	450	493306.395	104648.756	0.590
4			10.000	1200	493306.086	104645.711	0.366
3	0.040	5.00	10.170	1200	493298.262	104637.156	0.440
2			10.230	1200	493296.021	104637.579	0.500
1			10.000	1200	493293.935	104637.972	0.300



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
49.001	2	1	2.123	0.600	9.730	9.700	0.030	70.8	150	5.08	69.8
49.000	3	2	2.281	0.600	9.730	9.730	0.000	0.0	150	5.05	70.0
1.005	5	4	3.061	0.600	9.840	9.830	0.010	306.1	150	6.68	61.7
1.004	6	5	7.044	0.600	9.850	9.840	0.010	704.4	150	6.59	62.1
1.003	9	6	4.127	0.600	9.850	9.850	0.000	0.0	150	6.28	63.5
3.001	7	6	3.241	0.600	9.970	9.850	0.120	27.0	150	5.04	70.0
3.000	8	7	1.446	0.600	10.030	9.970	0.060	24.1	150	5.01	70.2
1.002	11	9	20.244	0.600	10.004	9.936	0.068	297.7	150	6.18	64.0
2.000	10	9	1.271	0.600	10.200	10.061	0.139	9.1	100	5.01	70.2
1.001	12	11	17.141	0.600	10.062	10.004	0.058	295.5	150	5.60	66.9
1.000	13	12	3.731	0.600	10.075	10.062	0.013	287.0	150	5.11	69.6
30.002	15	14	2.086	0.600	9.985	9.960	0.025	83.4	100	5.68	66.5
30.001	16	15	15.236	0.600	10.093	9.985	0.108	141.1	100	5.64	66.7
30.000	17	16	11.182	0.600	10.200	10.093	0.107	104.5	100	5.25	68.8
19.002	19	18	4.572	0.600	9.860	9.860	0.000	0.0	150	6.13	64.2
19.001	20	19	10.102	0.600	9.870	9.860	0.010	1010.2	150	6.03	64.7
19.000	21	20	17.071	0.600	9.930	9.870	0.060	284.5	150	5.48	67.5
10.004	23	22	1.198	0.600	9.980	9.980	0.000	0.0	150	5.89	65.4
12.000	29	23	2.072	0.600	9.980	9.980	0.000	0.0	150	5.05	70.0
10.003	24	23	4.212	0.600	10.010	10.000	0.010	421.2	100	5.86	65.5
11.000	28	24	7.697	0.600	10.300	10.010	0.290	26.5	100	5.09	69.8
10.002	25	24	16.791	0.600	10.130	10.010	0.120	139.9	100	5.67	66.5
10.001	26	25	5.120	0.600	10.187	10.130	0.057	89.8	100	5.24	68.9
10.000	27	26	7.564	0.600	10.300	10.187	0.113	66.9	100	5.13	69.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
49.001	1.197	21.1	8.3	0.350	0.150	0.040	0.0
49.000	0.750	13.3	8.3	0.290	0.350	0.040	0.0
1.005	0.569	10.1	12.9	0.440	0.020	0.070	0.0
1.004	0.371	6.6	13.0	0.700	0.440	0.070	0.0
1.003	0.750	13.3	13.3	0.700	0.700	0.070	0.0
3.001	1.945	34.4	0.0	0.580	0.700	0.000	0.0
3.000	2.059	36.4	0.0	0.520	0.580	0.000	0.0
1.002	0.577	10.2	13.3	0.546	0.614	0.070	0.0
2.000	2.571	20.2	0.0	0.400	0.539	0.000	0.0
1.001	0.579	10.2	14.0	0.488	0.546	0.070	0.0
1.000	0.588	10.4	14.5	0.475	0.488	0.070	0.0
30.002	0.843	6.6	3.6	0.615	0.640	0.018	0.0
30.001	0.645	5.1	2.4	0.507	0.615	0.012	0.0
30.000	0.752	5.9	1.2	0.400	0.507	0.006	0.0
19.002	0.750	13.3	1.1	0.690	0.690	0.006	0.0
19.001	0.308	5.4	1.2	0.680	0.690	0.006	0.0
19.000	0.591	10.4	0.0	0.620	0.680	0.000	0.0
10.004	0.750	13.3	3.3	0.570	0.570	0.017	0.0
12.000	0.750	13.3	0.0	0.570	0.570	0.000	0.0
10.003	0.369	2.9	3.3	0.590	0.600	0.017	0.0
11.000	1.504	11.8	0.6	0.400	0.590	0.003	0.0
10.002	0.648	5.1	2.2	0.620	0.590	0.011	0.0
10.001	0.812	6.4	1.4	0.513	0.620	0.007	0.0
10.000	0.942	7.4	0.6	0.400	0.513	0.003	0.0



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
13.002	31	30	2.560	0.600	9.890	9.890	0.000	0.0	150	6.64	61.9
13.001	37	31	16.213	0.600	10.000	9.890	0.110	147.4	150	5.60	66.9
15.002	32	31	19.747	0.600	9.900	9.890	0.010	1974.7	150	6.58	62.1
16.000	35	32	3.623	0.600	10.210	9.900	0.310	11.7	150	5.02	70.1
15.001	33	32	3.706	0.600	10.000	9.900	0.100	37.1	150	5.07	69.9
15.000	34	33	2.560	0.600	10.050	10.000	0.050	51.2	150	5.03	70.1
13.000	38	37	13.856	0.600	10.100	10.000	0.100	138.6	150	5.27	68.7
14.000	36	37	1.525	0.600	10.000	10.000	0.000	0.0	150	5.03	70.1
48.001	40	39	2.409	0.600	10.178	9.880	0.298	8.1	150	5.05	70.0
48.000	41	40	2.295	0.600	10.200	10.178	0.022	104.3	150	5.04	70.0
25.003	43	42	4.012	0.600	9.910	9.880	0.030	133.7	150	5.65	66.6
26.000	47	43	8.908	0.600	10.000	9.910	0.090	99.0	100	5.19	69.1
25.002	44	43	13.523	0.600	10.040	9.910	0.130	104.0	100	5.57	67.0
25.001	45	44	5.500	0.600	10.090	10.040	0.050	110.0	100	5.27	68.7
25.000	46	45	6.831	0.600	10.160	10.090	0.070	97.6	100	5.15	69.4
4.004	49	48	3.164	0.600	9.990	9.990	0.000	0.0	150	6.04	64.7
4.003	51	49	7.204	0.600	10.036	9.990	0.046	156.6	100	5.97	65.0
6.000	50	49	4.838	0.600	10.150	9.990	0.160	30.2	150	5.04	70.0
5.000	55	51	6.788	0.600	10.100	10.036	0.064	106.1	100	5.15	69.4
4.002	52	51	16.678	0.600	10.130	10.036	0.094	177.4	100	5.77	66.0
4.001	53	52	5.120	0.600	10.187	10.130	0.057	89.8	100	5.29	68.6
4.000	54	53	7.564	0.600	10.250	10.187	0.063	120.1	100	5.18	69.2
17.003	57	56	2.140	0.600	10.180	10.160	0.020	107.0	100	5.75	66.1
17.002	58	57	7.145	0.600	10.180	10.180	0.000	0.0	100	5.70	66.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
13.002	0.750	13.3	1.8	0.710	0.710	0.010	0.0
13.001	0.825	14.6	2.0	0.550	0.710	0.010	0.0
15.002	0.218	3.8	0.0	0.700	0.710	0.000	0.0
16.000	2.963	52.4	0.0	0.390	0.700	0.000	0.0
15.001	1.658	29.3	0.0	0.600	0.700	0.000	0.0
15.000	1.409	24.9	0.0	0.550	0.600	0.000	0.0
13.000	0.852	15.0	2.0	0.450	0.550	0.010	0.0
14.000	0.750	13.3	0.0	0.550	0.550	0.000	0.0
48.001	3.565	63.0	0.0	0.372	0.670	0.000	0.0
48.000	0.983	17.4	0.0	0.350	0.372	0.000	0.0
25.003	0.867	15.3	3.0	0.640	0.670	0.015	0.0
26.000	0.773	6.1	0.6	0.550	0.690	0.003	0.0
25.002	0.753	5.9	1.8	0.660	0.690	0.009	0.0
25.001	0.732	5.8	1.2	0.510	0.660	0.006	0.0
25.000	0.778	6.1	0.6	0.440	0.510	0.003	0.0
4.004	0.750	13.3	3.3	0.560	0.560	0.017	0.0
4.003	0.612	4.8	3.3	0.564	0.610	0.017	0.0
6.000	1.837	32.5	0.0	0.400	0.560	0.000	0.0
5.000	0.746	5.9	0.6	0.450	0.564	0.003	0.0
4.002	0.574	4.5	2.2	0.570	0.564	0.011	0.0
4.001	0.812	6.4	1.4	0.513	0.570	0.007	0.0
4.000	0.700	5.5	0.6	0.450	0.513	0.003	0.0
17.003	0.743	5.8	4.3	0.570	0.590	0.022	0.0
17.002	0.750	5.9	3.6	0.570	0.570	0.018	0.0



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
17.001	61	58	13.263	0.600	10.300	10.180	0.120	110.5	100	5.54	67.2
18.001	59	58	14.516	0.600	10.320	10.180	0.140	103.7	100	5.47	67.6
18.000	60	59	6.602	0.600	10.380	10.320	0.060	110.0	100	5.15	69.4
17.000	62	61	9.421	0.600	10.370	10.300	0.070	134.6	100	5.24	68.9
35.002	64	63	4.909	0.600	10.100	10.050	0.050	98.2	100	5.82	65.7
36.000	67	64	11.202	0.600	10.200	10.100	0.100	112.0	100	5.26	68.8
35.001	65	64	9.880	0.600	10.117	10.100	0.017	581.2	100	5.72	66.3
35.000	66	65	8.635	0.600	10.200	10.117	0.083	104.0	100	5.19	69.1
42.001	69	68	9.044	0.600	10.025	10.000	0.025	361.8	100	5.86	65.6
42.000	70	69	10.552	0.600	10.050	10.025	0.025	422.1	100	5.48	67.5
31.003	72	71	2.896	0.600	9.890	9.890	0.000	0.0	150	5.66	66.6
31.002	74	72	6.290	0.600	9.930	9.890	0.040	157.3	100	5.60	66.9
33.000	73	72	7.219	0.600	9.950	9.890	0.060	120.3	150	5.13	69.5
32.000	77	74	8.908	0.600	10.050	9.930	0.120	74.2	100	5.17	69.3
31.001	75	74	13.523	0.600	10.060	9.930	0.130	104.0	100	5.42	67.8
31.000	76	75	5.500	0.600	10.110	10.060	0.050	110.0	100	5.13	69.5
7.004	79	78	1.392	0.600	10.000	10.000	0.000	0.0	150	6.00	64.9
9.000	85	79	4.850	0.600	10.150	10.000	0.150	32.3	150	5.05	70.0
7.003	80	79	6.155	0.600	10.060	10.000	0.060	102.6	100	5.97	65.0
8.000	84	80	6.787	0.600	10.120	10.060	0.060	113.1	100	5.16	69.3
7.002	81	80	16.678	0.600	10.136	10.060	0.076	219.4	100	5.83	65.7
7.001	82	81	5.120	0.600	10.187	10.136	0.051	100.4	100	5.29	68.6
7.000	83	82	7.566	0.600	10.250	10.187	0.063	120.1	100	5.18	69.2
27.003	87	86	2.389	0.600	9.900	9.900	0.000	0.0	150	5.69	66.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
17.001	0.731	5.7	1.2	0.450	0.570	0.006	0.0
18.001	0.755	5.9	1.6	0.430	0.570	0.008	0.0
18.000	0.732	5.8	0.8	0.370	0.430	0.004	0.0
17.000	0.661	5.2	1.2	0.380	0.450	0.006	0.0
35.002	0.776	6.1	3.3	0.500	0.550	0.017	0.0
36.000	0.726	5.7	1.0	0.400	0.500	0.005	0.0
35.001	0.312	2.5	1.6	0.483	0.500	0.008	0.0
35.000	0.753	5.9	0.8	0.400	0.483	0.004	0.0
42.001	0.399	3.1	1.6	0.475	0.550	0.008	0.0
42.000	0.368	2.9	0.8	0.350	0.475	0.004	0.0
31.003	0.750	13.3	3.0	0.660	0.660	0.015	0.0
31.002	0.611	4.8	3.0	0.670	0.710	0.015	0.0
33.000	0.915	16.2	0.0	0.600	0.660	0.000	0.0
32.000	0.894	7.0	0.6	0.450	0.670	0.003	0.0
31.001	0.753	5.9	1.6	0.640	0.670	0.008	0.0
31.000	0.732	5.8	0.8	0.540	0.640	0.004	0.0
7.004	0.750	13.3	3.3	0.550	0.550	0.017	0.0
9.000	1.776	31.4	0.0	0.300	0.550	0.000	0.0
7.003	0.759	6.0	3.3	0.490	0.600	0.017	0.0
8.000	0.722	5.7	0.6	0.530	0.490	0.003	0.0
7.002	0.515	4.0	2.2	0.564	0.490	0.011	0.0
7.001	0.767	6.0	1.4	0.513	0.564	0.007	0.0
7.000	0.700	5.5	0.6	0.450	0.513	0.003	0.0
27.003	0.750	13.3	3.0	0.550	0.550	0.015	0.0



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
27.002	89	87	7.109	0.600	9.935	9.900	0.035	203.1	100	5.63	66.7
29.000	88	87	4.555	0.600	9.960	9.900	0.060	75.9	150	5.07	69.9
28.000	92	89	8.908	0.600	10.035	9.935	0.100	89.1	100	5.18	69.2
27.001	90	89	13.532	0.600	10.075	9.935	0.140	96.7	100	5.41	67.9
27.000	91	90	5.500	0.600	10.125	10.075	0.050	110.0	100	5.13	69.5
34.002	94	93	1.854	0.600	10.275	10.100	0.175	10.6	100	5.61	66.9
34.001	95	94	10.685	0.600	10.345	10.275	0.070	152.6	100	5.59	66.9
34.000	96	95	11.375	0.600	10.420	10.345	0.075	151.7	100	5.30	68.5
20.004	98	97	2.047	0.600	9.910	9.910	0.000	0.0	150	5.89	65.4
20.003	99	98	5.068	0.600	9.910	9.910	0.000	0.0	150	5.84	65.6
22.003	104	99	8.700	0.600	9.920	9.910	0.010	870.0	150	5.73	66.2
20.002	100	99	3.812	0.600	9.935	9.910	0.025	152.5	100	5.52	67.3
21.000	103	100	8.908	0.600	10.015	9.935	0.080	111.4	100	5.20	69.1
20.001	101	100	13.523	0.600	10.075	9.935	0.140	96.6	100	5.41	67.9
20.000	102	101	5.501	0.600	10.125	10.075	0.050	110.0	100	5.13	69.5
22.002	106	104	4.717	0.600	9.930	9.920	0.010	471.7	150	5.29	68.6
24.000	105	104	2.425	0.600	10.020	9.920	0.100	24.3	150	5.02	70.1
22.001	108	106	2.789	0.600	9.940	9.930	0.010	278.9	150	5.12	69.5
23.000	107	106	2.076	0.600	10.000	9.930	0.070	29.7	100	5.02	70.1
22.000	109	108	3.519	0.600	10.000	9.940	0.060	58.6	150	5.04	70.0
45.001	111	110	3.462	0.600	9.970	9.970	0.000	0.0	150	5.11	69.6
45.000	113	111	2.128	0.600	10.000	9.970	0.030	70.9	150	5.03	70.1
46.000	112	111	1.495	0.600	9.980	9.970	0.010	149.5	150	5.03	70.1
47.000	115	114	4.896	0.600	10.050	10.000	0.050	97.9	100	5.11	69.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
27.002	0.536	4.2	3.0	0.565	0.600	0.015	0.0
29.000	1.155	20.4	0.0	0.490	0.550	0.000	0.0
28.000	0.815	6.4	0.6	0.515	0.565	0.003	0.0
27.001	0.782	6.1	1.6	0.625	0.565	0.008	0.0
27.000	0.732	5.8	0.8	0.575	0.625	0.004	0.0
34.002	2.388	18.8	1.4	0.475	0.650	0.007	0.0
34.001	0.620	4.9	0.8	0.505	0.475	0.004	0.0
34.000	0.622	4.9	0.4	0.480	0.505	0.002	0.0
20.004	0.750	13.3	2.9	0.540	0.540	0.015	0.0
20.003	0.750	13.3	2.9	0.540	0.540	0.015	0.0
22.003	0.333	5.9	0.0	0.630	0.540	0.000	0.0
20.002	0.620	4.9	3.0	0.565	0.590	0.015	0.0
21.000	0.728	5.7	0.6	0.585	0.565	0.003	0.0
20.001	0.782	6.1	1.6	0.625	0.565	0.008	0.0
20.000	0.732	5.8	0.8	0.575	0.625	0.004	0.0
22.002	0.456	8.1	0.0	0.620	0.630	0.000	0.0
24.000	2.053	36.3	0.0	0.530	0.630	0.000	0.0
22.001	0.597	10.5	0.0	0.610	0.620	0.000	0.0
23.000	1.422	11.2	0.0	0.600	0.670	0.000	0.0
22.000	1.316	23.2	0.0	0.550	0.610	0.000	0.0
45.001	0.750	13.3	4.2	0.580	0.580	0.020	0.0
45.000	1.195	21.1	0.0	0.550	0.580	0.000	0.0
46.000	0.819	14.5	4.2	0.570	0.580	0.020	0.0
47.000	0.777	6.1	0.8	0.500	0.500	0.004	0.0



Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
43.001	117	116	4.257	0.600	10.000	9.950	0.050	85.1	100	5.39	68.0
43.000	119	117	14.494	0.600	10.150	10.000	0.150	96.6	100	5.31	68.5
44.000	118	117	12.031	0.600	10.150	10.000	0.150	80.2	100	5.23	68.9
37.002	121	120	4.528	0.600	9.990	9.950	0.040	113.2	100	5.51	67.4
38.000	124	121	8.032	0.600	10.100	9.990	0.110	73.0	100	5.15	69.4
37.001	122	121	11.000	0.600	10.100	9.990	0.110	100.0	100	5.40	68.0
37.000	123	122	6.595	0.600	10.150	10.100	0.050	131.9	100	5.16	69.3
39.002	126	125	3.138	0.600	9.980	9.950	0.030	104.6	150	5.40	68.0
41.000	130	126	6.582	0.600	10.050	9.980	0.070	94.0	100	5.14	69.4
39.001	127	126	11.709	0.600	10.100	9.980	0.120	97.6	150	5.35	68.2
39.000	129	127	6.833	0.600	10.160	10.100	0.060	113.9	100	5.16	69.3
40.000	128	127	5.462	0.600	10.140	10.100	0.040	136.6	150	5.11	69.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
43.001	0.834	6.6	2.4	0.550	0.600	0.012	0.0
43.000	0.782	6.1	0.8	0.400	0.550	0.004	0.0
44.000	0.860	6.8	0.8	0.400	0.550	0.004	0.0
37.002	0.722	5.7	1.2	0.610	0.650	0.006	0.0
38.000	0.902	7.1	0.4	0.500	0.610	0.002	0.0
37.001	0.769	6.0	0.6	0.500	0.610	0.003	0.0
37.000	0.668	5.2	0.4	0.450	0.500	0.002	0.0
39.002	0.982	17.4	3.2	0.520	0.550	0.016	0.0
41.000	0.793	6.2	0.6	0.500	0.570	0.003	0.0
39.001	1.017	18.0	2.0	0.400	0.520	0.010	0.0
39.000	0.720	5.7	0.6	0.390	0.450	0.003	0.0
40.000	0.858	15.2	0.8	0.165	0.400	0.004	0.0

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m ³ /ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Summer CV	0.750	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	0	0	0
100	40	10	0



Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	9.730	Product Number	CTL-SHE-0072-2000-0650-2000
Design Depth (m)	0.650	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 3 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	1.00	Main Channel Length (m)	14.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.620	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

4

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	212.5	212.5	0.550	306.0	306.0

Node 13 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	26.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.790	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

30

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	260.0	260.0	0.400	260.0	364.0	0.401	0.0	364.0

Node 36 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	9.500
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.800	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	88	Main Channel n	0.600

Inlets

63

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	19.0	19.0	0.400	19.0	19.0	0.401	0.0	19.0

Node 35 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.960	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

56



Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	52.0	52.0	0.400	52.0	72.8	0.401	0.0	72.8

Node 34 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	16.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.800	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

68

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	32.0	32.0	0.400	32.0	44.8	0.401	0.0	44.8

Node 85 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	9.500
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.900	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

93

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	19.0	19.0	0.400	19.0	28.5	0.401	0.0	28.5

Node 50 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.800	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

78

Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	47.1	0.0

Node 29 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	8.500
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.790	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

48

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	47.0	47.0	0.400	47.0	65.8	0.401	0.0	65.8



Node 8 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	9.500
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.780	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

22

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	47.5	47.5	0.400	47.5	66.5	0.401	0.0	66.5

Node 105 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.770	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

110

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	52.5	52.5	0.400	52.5	73.5	0.401	0.0	73.5

Node 109 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	6.500
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.750	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

120

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	17.5	17.5	0.400	17.5	24.5	0.401	0.0	24.5

Node 113 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	8.650
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.750	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

125

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	17.5	17.5	0.400	17.5	24.5	0.401	0.0	24.5

Node 107 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	11.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.750	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600



Inlets

116 | 114

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	42.0	42.0	0.400	42.0	58.8	0.401	0.0	58.8

Node 10 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	16.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.730	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

18 | 14

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	56.0	56.0	0.330	56.0	78.4	0.331	0.0	78.4

Node 21 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	7.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.730	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

39 | 42

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	42.0	42.0	0.350	42.0	58.8	0.351	0.0	58.8

Node 41 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	7.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.730	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

71

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	42.0	42.0	0.360	42.0	58.8	0.361	0.0	58.8

Node 73 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	7.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.730	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

86



Bright Plan Civils 2 West Barn Norton Lane Chichester PO20 3AF	File: D1898 Flow Model V1.pfd Network: S1 Dan Lytton -	Page 13 Hook Lane Aldingbourne Surface Water Flow Model
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Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	42.0	42.0	0.370	42.0	58.8	0.371	0.0	58.8

Node 88 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00504	Porosity	0.95	Main Channel Length (m)	7.000
Side Inf Coefficient (m/hr)	0.00504	Invert Level (m)	9.730	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.600

Inlets

97

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	42.0	42.0	0.380	42.0	58.8	0.381	0.0	58.8

Approval Settings

Node Size	✓	Maximum Full Bore Velocity (m/s)	3.000
Node Losses	✓	Proportional Velocity	✓
Link Size	✓	Return Period (years)	
Minimum Diameter (mm)	150	Minimum Proportional Velocity (m/s)	0.750
Link Length	✓	Maximum Proportional Velocity (m/s)	3.000
Maximum Length (m)	100.000	Surcharged Depth	✓
Coordinates	✓	Return Period (years)	
Accuracy (m)	1.000	Maximum Surcharged Depth (m)	0.100
Crossings	✓	Flooding	✓
Cover Depth	✓	Return Period (years)	30
Minimum Cover Depth (m)		Time to Half Empty	x
Maximum Cover Depth (m)	3.000	Discharge Rates	✓
Backdrops	✓	1 year (l/s)	
Minimum Backdrop Height (m)		30 year (l/s)	
Maximum Backdrop Height (m)	1.500	100 year (l/s)	
Full Bore Velocity	✓	Discharge Volume	✓
Minimum Full Bore Velocity (m/s)		100 year 360 minute (m ³)	

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 15 minute summer	268.706	76.035
30 year 30 minute summer	174.929	49.499
30 year 60 minute summer	116.589	30.811
30 year 120 minute summer	70.438	18.615
30 year 180 minute summer	53.298	13.715
30 year 240 minute summer	41.604	10.995
30 year 360 minute summer	31.221	8.034
30 year 480 minute summer	24.324	6.428
30 year 600 minute summer	19.756	5.404
30 year 720 minute summer	17.490	4.687
30 year 960 minute summer	14.215	3.743
30 year 1440 minute summer	10.161	2.723
100 year 15 minute summer	348.738	98.681
100 year 30 minute summer	228.965	64.789
100 year 60 minute summer	153.288	40.510



Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 120 minute summer	92.562	24.461
100 year 180 minute summer	69.806	17.964
100 year 240 minute summer	54.269	14.342
100 year 360 minute summer	40.484	10.418
100 year 480 minute summer	31.414	8.302
100 year 600 minute summer	25.431	6.956
100 year 720 minute summer	22.452	6.017
100 year 960 minute summer	18.166	4.784
100 year 1440 minute summer	12.896	3.456
100 year +40% CC +10% A 15 minute summer	488.233	138.153
100 year +40% CC +10% A 30 minute summer	320.551	90.705
100 year +40% CC +10% A 60 minute summer	214.603	56.713
100 year +40% CC +10% A 120 minute summer	129.587	34.246
100 year +40% CC +10% A 180 minute summer	97.729	25.149
100 year +40% CC +10% A 240 minute summer	75.977	20.078
100 year +40% CC +10% A 360 minute summer	56.677	14.585
100 year +40% CC +10% A 480 minute summer	43.979	11.622
100 year +40% CC +10% A 600 minute summer	35.604	9.738
100 year +40% CC +10% A 720 minute summer	31.433	8.424
100 year +40% CC +10% A 960 minute summer	25.432	6.697
100 year +40% CC +10% A 1440 minute summer	18.055	4.839

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	130	10	10.077	0.027	1.0	0.0069	0.0000	OK
15 minute summer	129	10	10.188	0.028	1.0	0.0079	0.0000	OK
15 minute summer	128	11	10.170	0.030	1.3	0.0122	0.0000	OK
15 minute summer	127	10	10.143	0.043	3.3	0.0115	0.0000	OK
15 minute summer	126	11	10.042	0.062	5.2	0.0154	0.0000	OK
120 minute summer	125	104	10.012	0.253	2.2	0.0402	0.0000	OK
15 minute summer	124	10	10.121	0.021	0.7	0.0047	0.0000	OK
15 minute summer	123	10	10.175	0.025	0.7	0.0057	0.0000	OK
15 minute summer	122	11	10.127	0.027	1.0	0.0052	0.0000	OK
15 minute summer	121	11	10.032	0.042	1.9	0.0079	0.0000	OK
240 minute summer	120	172	9.825	0.069	0.6	0.0004	0.0000	OK
15 minute summer	119	11	10.181	0.031	1.3	0.0100	0.0000	OK
15 minute summer	118	11	10.180	0.030	1.3	0.0095	0.0000	OK
15 minute summer	117	11	10.061	0.061	3.9	0.0172	0.0000	OK
120 minute summer	116	134	9.864	0.103	1.8	0.0164	0.0000	OK
15 minute summer	115	11	10.083	0.033	1.3	0.0096	0.0000	OK
120 minute summer	114	134	9.864	0.103	0.6	0.0164	0.0000	OK
120 minute summer	113	104	10.012	0.012	1.5	0.0020	0.0000	OK
15 minute summer	112	10	10.069	0.089	6.6	0.0636	0.0000	OK
15 minute summer	111	10	10.052	0.082	6.6	0.0130	0.0000	OK
960 minute summer	110	990	9.949	0.169	1.7	0.0270	0.0000	OK
240 minute summer	109	172	9.826	-0.174	0.4	0.0000	0.0000	OK
15 minute summer	108	13	10.026	0.086	3.6	0.0137	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	130	41.000	126	1.0	0.291	0.156	0.0222	
15 minute summer	129	39.000	127	1.0	0.391	0.171	0.0170	
15 minute summer	128	40.000	127	1.3	0.401	0.086	0.0180	
15 minute summer	127	39.001	126	3.2	0.587	0.178	0.0642	
15 minute summer	126	39.002	125	5.1	0.797	0.293	0.0200	
120 minute summer	125	Flow through pond	113	0.8	0.008	0.072	4.2826	
15 minute summer	124	38.000	121	0.7	0.336	0.094	0.0172	
15 minute summer	123	37.000	122	0.7	0.421	0.125	0.0103	
15 minute summer	122	37.001	121	1.0	0.397	0.158	0.0266	
15 minute summer	121	37.002	120	1.9	0.626	0.333	0.0137	
240 minute summer	120	Flow through pond	109	0.4	0.006	0.027	1.2012	
15 minute summer	119	43.000	117	1.3	0.380	0.212	0.0513	
15 minute summer	118	44.000	117	1.3	0.392	0.193	0.0418	
15 minute summer	117	43.001	116	3.9	0.823	0.593	0.0201	
120 minute summer	116	Flow through pond	107	1.4	0.007	0.060	4.3192	
15 minute summer	115	47.000	114	1.3	0.600	0.213	0.0106	
120 minute summer	114	Flow through pond	107	1.4	0.007	0.060	4.3192	
120 minute summer	113	45.000	111	-0.7	-0.196	-0.033	0.0079	
120 minute summer	113	Infiltration		0.0				
15 minute summer	112	46.000	111	6.6	0.633	0.453	0.0155	
15 minute summer	111	45.001	110	4.4	0.537	0.334	0.0285	
960 minute summer	110	Flow through pond	105	0.8	0.003	0.025	8.7030	
240 minute summer	109	22.000	108	0.0	0.000	0.000	0.0024	
240 minute summer	109	Infiltration		0.0				
15 minute summer	108	22.001	106	2.0	-0.284	0.189	0.0300	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	107	130	9.864	-0.136	1.4	0.0000	0.0000	OK
15 minute summer	106	14	10.020	0.090	4.9	0.0144	0.0000	OK
960 minute summer	105	975	9.949	-0.071	0.8	0.0000	0.0000	OK
15 minute summer	104	14	10.015	0.095	3.2	0.0151	0.0000	OK
15 minute summer	103	10	10.043	0.028	1.0	0.0069	0.0000	OK
15 minute summer	102	10	10.158	0.033	1.3	0.0091	0.0000	OK
15 minute summer	101	11	10.120	0.045	2.6	0.0122	0.0000	OK
15 minute summer	100	11	10.026	0.091	4.8	0.0255	0.0000	OK
15 minute summer	99	14	10.014	0.104	5.1	0.0166	0.0000	OK
15 minute summer	98	14	9.997	0.087	5.3	0.0138	0.0000	OK
120 minute summer	97	140	9.835	0.098	2.1	0.0156	0.0000	OK
15 minute summer	96	10	10.445	0.025	0.7	0.0056	0.0000	OK
15 minute summer	95	11	10.382	0.037	1.3	0.0082	0.0000	OK
15 minute summer	94	11	10.301	0.026	2.2	0.0068	0.0000	OK
720 minute summer	93	450	9.999	0.089	0.3	0.0142	0.0000	OK
15 minute summer	92	10	10.061	0.026	1.0	0.0068	0.0000	OK
15 minute summer	91	10	10.158	0.033	1.3	0.0091	0.0000	OK
15 minute summer	90	11	10.120	0.045	2.6	0.0122	0.0000	OK
15 minute summer	89	11	10.035	0.100	4.9	0.0278	0.0000	OK
120 minute summer	88	140	9.835	-0.125	1.1	0.0000	0.0000	OK
15 minute summer	87	11	9.978	0.078	4.8	0.0124	0.0000	OK
120 minute summer	86	134	9.836	0.099	2.2	0.0157	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	107	23.000	106	0.0	0.000	0.000	0.0036	
120 minute summer	107	Infiltration		0.0				
15 minute summer	106	22.002	104	3.2	0.288	0.401	0.0538	
960 minute summer	105	24.000	104	0.0	0.000	0.000	0.0019	
960 minute summer	105	Infiltration		0.0				
15 minute summer	104	22.003	99	3.0	0.238	0.502	0.1077	
15 minute summer	103	21.000	100	1.0	0.231	0.169	0.0411	
15 minute summer	102	20.000	101	1.3	0.463	0.227	0.0156	
15 minute summer	101	20.001	100	2.6	0.484	0.423	0.0741	
15 minute summer	100	20.002	99	4.8	0.676	0.976	0.0287	
15 minute summer	99	20.003	98	5.3	0.449	0.400	0.0598	
15 minute summer	98	20.004	97	5.5	0.599	0.411	0.0186	
120 minute summer	97	Flow through pond	88	1.1	0.004	0.033	4.0648	
15 minute summer	96	34.000	95	0.6	0.324	0.133	0.0231	
15 minute summer	95	34.001	94	1.3	0.617	0.264	0.0224	
15 minute summer	94	34.002	93	2.2	1.486	0.118	0.0028	
720 minute summer	93	Flow through pond	85	0.3	0.005	0.025	1.7020	
15 minute summer	92	28.000	89	1.0	0.228	0.151	0.0419	
15 minute summer	91	27.000	90	1.3	0.463	0.227	0.0156	
15 minute summer	90	27.001	89	2.6	0.463	0.423	0.0762	
15 minute summer	89	27.002	87	4.8	0.648	1.131	0.0510	
120 minute summer	88	29.000	87	0.0	0.000	0.000	0.0136	
120 minute summer	88	Infiltration		0.0				
15 minute summer	87	27.003	86	4.3	0.546	0.324	0.0188	
120 minute summer	86	Flow through pond	73	1.2	0.004	0.036	4.0871	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	85	450	9.999	-0.151	0.3	0.0000	0.0000	OK
15 minute summer	84	10	10.148	0.028	1.0	0.0071	0.0000	OK
15 minute summer	83	10	10.278	0.028	1.0	0.0076	0.0000	OK
15 minute summer	82	11	10.229	0.042	2.3	0.0123	0.0000	OK
15 minute summer	81	11	10.210	0.074	3.5	0.0208	0.0000	OK
15 minute summer	80	11	10.144	0.084	5.4	0.0220	0.0000	OK
15 minute summer	79	11	10.084	0.084	5.3	0.0133	0.0000	OK
960 minute summer	78	780	9.909	0.099	0.5	0.0157	0.0000	OK
15 minute summer	77	10	10.075	0.025	1.0	0.0067	0.0000	OK
15 minute summer	76	10	10.142	0.032	1.3	0.0092	0.0000	OK
15 minute summer	75	11	10.106	0.046	2.6	0.0124	0.0000	OK
15 minute summer	74	11	10.021	0.091	4.9	0.0239	0.0000	OK
120 minute summer	73	132	9.836	-0.114	1.2	0.0000	0.0000	OK
15 minute summer	72	11	9.969	0.079	4.8	0.0126	0.0000	OK
120 minute summer	71	132	9.836	0.099	2.2	0.0157	0.0000	OK
15 minute summer	70	11	10.103	0.053	1.3	0.0178	0.0000	OK
15 minute summer	69	11	10.093	0.068	2.6	0.0203	0.0000	OK
120 minute summer	68	128	9.880	0.064	1.2	0.0102	0.0000	OK
15 minute summer	67	11	10.236	0.036	1.6	0.0130	0.0000	OK
15 minute summer	66	11	10.232	0.032	1.3	0.0101	0.0000	OK
15 minute summer	65	11	10.202	0.085	2.6	0.0252	0.0000	OK
15 minute summer	64	11	10.181	0.081	5.4	0.0237	0.0000	OK
120 minute summer	63	84	10.029	0.220	2.5	0.0349	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	85	9.000	79	0.0	0.000	0.000	0.0052	
720 minute summer	85	Infiltration		0.0				
15 minute summer	84	8.000	80	1.0	0.254	0.171	0.0298	
15 minute summer	83	7.000	82	1.0	0.392	0.176	0.0187	
15 minute summer	82	7.001	81	2.2	0.489	0.373	0.0240	
15 minute summer	81	7.002	80	3.5	0.536	0.874	0.1107	
15 minute summer	80	7.003	79	5.3	0.761	0.896	0.0432	
15 minute summer	79	7.004	78	5.3	0.603	0.400	0.0122	
960 minute summer	78	Flow through pond	50	0.5	0.005	0.004	4.6500	
15 minute summer	77	32.000	74	1.0	0.247	0.138	0.0399	
15 minute summer	76	31.000	75	1.3	0.458	0.227	0.0158	
15 minute summer	75	31.001	74	2.6	0.481	0.439	0.0745	
15 minute summer	74	31.002	72	4.8	0.674	0.998	0.0445	
120 minute summer	73	33.000	72	0.0	0.000	0.000	0.0221	
120 minute summer	73	Infiltration		0.0				
15 minute summer	72	31.003	71	4.3	0.540	0.326	0.0232	
120 minute summer	71	Flow through pond	41	1.2	0.004	0.037	4.0862	
15 minute summer	70	42.000	69	1.3	0.260	0.437	0.0521	
15 minute summer	69	42.001	68	2.5	0.516	0.800	0.0438	
120 minute summer	68	Flow through pond	34	0.8	0.009	0.077	2.1993	
15 minute summer	67	36.000	64	1.6	0.373	0.281	0.0525	
15 minute summer	66	35.000	65	1.3	0.303	0.220	0.0399	
15 minute summer	65	35.001	64	2.5	0.364	1.034	0.0687	
15 minute summer	64	35.002	63	5.3	0.828	0.878	0.0316	
120 minute summer	63	Flow through pond	36	1.0	0.007	0.098	4.0527	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	62	10	10.414	0.044	2.0	0.0182	0.0000	OK
15 minute summer	61	12	10.362	0.062	2.0	0.0098	0.0000	OK
15 minute summer	60	11	10.412	0.032	1.3	0.0106	0.0000	OK
15 minute summer	59	12	10.370	0.050	2.6	0.0154	0.0000	OK
15 minute summer	58	12	10.351	0.171	5.4	0.0477	0.0000	SURCHARGED
15 minute summer	57	11	10.286	0.106	6.3	0.0295	0.0000	SURCHARGED
360 minute summer	56	296	10.089	0.119	1.5	0.0189	0.0000	OK
15 minute summer	55	12	10.138	0.038	1.0	0.0101	0.0000	OK
15 minute summer	54	10	10.278	0.028	1.0	0.0076	0.0000	OK
15 minute summer	53	10	10.229	0.042	2.3	0.0121	0.0000	OK
15 minute summer	52	11	10.197	0.067	3.6	0.0185	0.0000	OK
15 minute summer	51	11	10.137	0.101	5.3	0.0252	0.0000	SURCHARGED
720 minute summer	50	735	9.909	-0.241	0.5	0.0000	0.0000	OK
15 minute summer	49	12	10.077	0.087	5.1	0.0139	0.0000	OK
120 minute summer	48	132	9.938	0.140	2.4	0.0222	0.0000	OK
15 minute summer	47	10	10.027	0.027	1.0	0.0068	0.0000	OK
15 minute summer	46	10	10.187	0.027	1.0	0.0073	0.0000	OK
15 minute summer	45	10	10.132	0.042	2.0	0.0108	0.0000	OK
15 minute summer	44	11	10.089	0.049	2.9	0.0117	0.0000	OK
15 minute summer	43	11	9.973	0.063	4.8	0.0147	0.0000	OK
960 minute summer	42	585	9.831	0.094	0.5	0.0149	0.0000	OK
120 minute summer	41	132	9.836	-0.364	1.2	0.0000	0.0000	OK
15 minute summer	40	1	10.178	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	62	17.000	61	2.0	0.627	0.380	0.0373	
15 minute summer	61	17.001	58	1.9	0.277	0.324	0.0854	
15 minute summer	60	18.000	59	1.3	0.459	0.226	0.0196	
15 minute summer	59	18.001	58	2.6	0.393	0.434	0.0850	
15 minute summer	58	17.002	57	5.1	0.658	0.874	0.0559	
15 minute summer	57	17.003	56	6.2	0.821	1.070	0.0156	
360 minute summer	56	Flow through pond	35	0.8	0.005	0.024	6.1190	
15 minute summer	55	5.000	51	0.9	0.232	0.162	0.0357	
15 minute summer	54	4.000	53	1.0	0.395	0.176	0.0186	
15 minute summer	53	4.001	52	2.3	0.528	0.355	0.0220	
15 minute summer	52	4.002	51	3.6	0.524	0.789	0.1114	
15 minute summer	51	4.003	49	5.1	0.672	1.067	0.0543	
720 minute summer	50	6.000	49	0.0	0.000	0.000	0.0061	
720 minute summer	50	Infiltration		0.0				
15 minute summer	49	4.004	48	5.1	0.570	0.387	0.0285	
120 minute summer	48	Flow through pond	29	0.7	0.004	0.020	6.4339	
15 minute summer	47	26.000	43	1.0	0.290	0.159	0.0303	
15 minute summer	46	25.000	45	1.0	0.405	0.159	0.0165	
15 minute summer	45	25.001	44	1.9	0.549	0.330	0.0190	
15 minute summer	44	25.002	43	2.9	0.636	0.482	0.0606	
15 minute summer	43	25.003	42	4.8	0.726	0.310	0.0263	
960 minute summer	42	Flow through pond	21	0.4	0.005	0.013	3.8806	
120 minute summer	41	48.000	40	0.0	0.000	0.000	0.0000	
120 minute summer	41	Infiltration		0.0				
15 minute summer	40	48.001	39	0.0	0.000	0.000	0.0000	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	39	585	9.831	0.094	0.0	0.0149	0.0000	OK
15 minute summer	38	10	10.150	0.050	3.3	0.0244	0.0000	OK
15 minute summer	37	11	10.039	0.039	3.2	0.0062	0.0000	OK
120 minute summer	36	84	10.030	0.029	1.5	0.0048	0.0000	OK
360 minute summer	35	296	10.089	-0.121	0.8	0.0000	0.0000	OK
120 minute summer	34	130	9.880	-0.170	0.8	0.0000	0.0000	OK
15 minute summer	33	1	10.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	32	13	9.942	0.042	0.5	0.0067	0.0000	OK
30 minute summer	31	20	9.941	0.051	2.0	0.0081	0.0000	OK
720 minute summer	30	720	9.916	0.100	1.4	0.0159	0.0000	OK
120 minute summer	29	132	9.939	-0.041	1.8	0.0000	0.0000	OK
15 minute summer	28	10	10.320	0.020	1.0	0.0055	0.0000	OK
15 minute summer	27	10	10.325	0.025	1.0	0.0068	0.0000	OK
15 minute summer	26	10	10.230	0.043	2.3	0.0124	0.0000	OK
15 minute summer	25	11	10.191	0.061	3.6	0.0166	0.0000	OK
15 minute summer	24	11	10.128	0.118	5.4	0.0289	0.0000	SURCHARGED
15 minute summer	23	11	10.041	0.061	5.4	0.0096	0.0000	OK
120 minute summer	22	128	9.839	0.049	1.3	0.0078	0.0000	OK
960 minute summer	21	585	9.831	-0.099	0.4	0.0000	0.0000	OK
15 minute summer	20	11	9.930	0.060	2.0	0.0183	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	39	Flow through pond	21	0.4	0.005	0.013	3.8806	
15 minute summer	38	13.000	37	3.2	0.750	0.216	0.0602	
15 minute summer	37	13.001	31	2.2	0.521	0.149	0.0696	
120 minute summer	36	14.000	37	0.5	-0.263	0.039	0.0032	
120 minute summer	36	Infiltration		0.0				
360 minute summer	35	16.000	32	0.0	0.000	0.000	0.0033	
360 minute summer	35	Infiltration		0.0				
120 minute summer	34	15.000	33	0.0	0.000	0.000	0.0000	
120 minute summer	34	Infiltration		0.0				
15 minute summer	33	15.001	32	0.0	0.000	0.000	0.0076	
15 minute summer	32	15.002	31	-0.5	-0.164	-0.130	0.0917	
30 minute summer	31	13.002	30	1.8	0.408	0.134	0.0112	
720 minute summer	30	Flow through pond	13	-1.1	-0.002	-0.017	27.8503	
120 minute summer	29	12.000	23	-1.1	-0.345	-0.082	0.0065	
120 minute summer	29	Infiltration		0.0				
15 minute summer	28	11.000	24	1.0	0.309	0.083	0.0342	
15 minute summer	27	10.000	26	1.0	0.419	0.131	0.0177	
15 minute summer	26	10.001	25	2.3	0.551	0.354	0.0211	
15 minute summer	25	10.002	24	3.6	0.499	0.700	0.1080	
15 minute summer	24	10.003	23	5.4	0.711	1.860	0.0298	
15 minute summer	23	10.004	22	2.9	0.499	0.217	0.0069	
120 minute summer	22	Flow through pond	8	1.0	0.007	0.032	2.4491	
960 minute summer	21	19.000	20	0.0	0.000	0.000	0.0116	
960 minute summer	21	Infiltration		0.0				
15 minute summer	20	19.001	19	1.9	0.304	0.347	0.0638	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	19	11	9.916	0.056	1.9	0.0089	0.0000	OK
240 minute summer	18	224	9.878	0.132	0.5	0.0211	0.0000	OK
15 minute summer	17	10	10.240	0.040	2.0	0.0158	0.0000	OK
15 minute summer	16	11	10.158	0.065	4.0	0.0233	0.0000	OK
15 minute summer	15	11	10.071	0.086	5.9	0.0281	0.0000	OK
240 minute summer	14	228	9.879	0.133	1.5	0.0211	0.0000	OK
720 minute summer	13	720	9.916	-0.159	2.6	0.0000	0.0000	OK
15 minute summer	12	1	10.062	0.000	0.0	0.0000	0.0000	OK
15 minute summer	11	1	10.004	0.000	0.0	0.0000	0.0000	OK
240 minute summer	10	228	9.877	-0.323	1.1	0.0000	0.0000	OK
15 minute summer	9	1	9.850	0.000	0.0	0.0000	0.0000	OK
120 minute summer	8	130	9.839	-0.191	1.0	0.0000	0.0000	OK
15 minute summer	7	1	9.970	0.000	0.0	0.0000	0.0000	OK
15 minute summer	6	1	9.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	5	1	9.840	0.000	0.0	0.0000	0.0000	OK
960 minute summer	4	765	9.686	0.052	0.5	0.0584	0.0000	OK
960 minute summer	3	765	9.686	-0.044	1.2	0.0000	0.0000	OK
15 minute summer	2	1	9.730	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	9.700	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	19	19.002	18	1.9	0.389	0.140	0.0219	
240 minute summer	18	Flow through pond	10	1.1	0.005	0.074	7.4201	
15 minute summer	17	30.000	16	2.0	0.475	0.334	0.0463	
15 minute summer	16	30.001	15	3.9	0.619	0.766	0.0957	
15 minute summer	15	30.002	14	5.8	0.874	0.879	0.0138	
240 minute summer	14	Flow through pond	10	1.1	0.005	0.074	7.4201	
720 minute summer	13	1.000	12	0.0	0.000	0.000	0.0000	
720 minute summer	13	Infiltration		0.2				
15 minute summer	12	1.001	11	0.0	0.000	0.000	0.0000	
15 minute summer	11	1.002	9	0.0	0.000	0.000	0.0000	
240 minute summer	10	2.000	9	0.0	0.000	0.000	0.0000	
240 minute summer	10	Infiltration		0.0				
15 minute summer	9	1.003	6	0.0	0.000	0.000	0.0000	
120 minute summer	8	3.000	7	0.0	0.000	0.000	0.0000	
120 minute summer	8	Infiltration		0.0				
15 minute summer	7	3.001	6	0.0	0.000	0.000	0.0000	
15 minute summer	6	1.004	5	0.0	0.000	0.000	0.0000	
15 minute summer	5	1.005	4	0.0	0.000	0.000	0.0000	
960 minute summer	4	Flow through pond	3	-0.5	-0.001	-0.003	12.7483	
960 minute summer	3	49.000	2	0.0	0.000	0.000	0.0000	
960 minute summer	3	Infiltration		0.2				
15 minute summer	2	Hydro-Brake®	1	0.0				0.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	130	10	10.081	0.031	1.3	0.0079	0.0000	OK
15 minute summer	129	10	10.192	0.032	1.3	0.0090	0.0000	OK
15 minute summer	128	10	10.174	0.034	1.7	0.0139	0.0000	OK
15 minute summer	127	10	10.149	0.049	4.2	0.0131	0.0000	OK
15 minute summer	126	11	10.052	0.072	6.7	0.0180	0.0000	OK
120 minute summer	125	76	10.036	0.277	3.1	0.0441	0.0000	OK
15 minute summer	124	10	10.124	0.024	0.9	0.0054	0.0000	OK
15 minute summer	123	10	10.178	0.028	0.9	0.0066	0.0000	OK
15 minute summer	122	11	10.131	0.031	1.3	0.0059	0.0000	OK
15 minute summer	121	11	10.040	0.050	2.5	0.0093	0.0000	OK
120 minute summer	120	112	9.851	0.094	1.2	0.0008	0.0000	OK
15 minute summer	119	10	10.186	0.036	1.7	0.0113	0.0000	OK
15 minute summer	118	10	10.184	0.034	1.7	0.0108	0.0000	OK
15 minute summer	117	11	10.072	0.072	5.0	0.0203	0.0000	OK
180 minute summer	116	184	9.912	0.151	1.5	0.0240	0.0000	OK
15 minute summer	115	10	10.088	0.038	1.7	0.0110	0.0000	OK
180 minute summer	114	184	9.912	0.151	0.5	0.0240	0.0000	OK
120 minute summer	113	76	10.036	0.036	2.1	0.0059	0.0000	OK
15 minute summer	112	10	10.082	0.102	8.5	0.0732	0.0000	OK
15 minute summer	111	10	10.062	0.092	8.4	0.0146	0.0000	OK
1440 minute summer	110	900	10.022	0.242	1.8	0.0385	0.0000	OK
120 minute summer	109	110	9.851	-0.149	0.7	0.0000	0.0000	OK
15 minute summer	108	12	10.010	0.070	0.7	0.0111	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	130	41.000	126	1.3	0.314	0.204	0.0266	
15 minute summer	129	39.000	127	1.3	0.426	0.225	0.0205	
15 minute summer	128	40.000	127	1.7	0.425	0.111	0.0217	
15 minute summer	127	39.001	126	4.2	0.625	0.231	0.0783	
15 minute summer	126	39.002	125	6.6	0.852	0.383	0.0245	
120 minute summer	125	Flow through pond	113	1.4	0.008	0.133	4.6871	
15 minute summer	124	38.000	121	0.9	0.415	0.123	0.0211	
15 minute summer	123	37.000	122	0.9	0.451	0.164	0.0126	
15 minute summer	122	37.001	121	1.3	0.426	0.208	0.0327	
15 minute summer	121	37.002	120	2.5	0.671	0.440	0.0169	
120 minute summer	120	Flow through pond	109	0.7	0.008	0.046	1.6278	
15 minute summer	119	43.000	117	1.7	0.395	0.271	0.0616	
15 minute summer	118	44.000	117	1.7	0.407	0.247	0.0501	
15 minute summer	117	43.001	116	4.9	0.865	0.753	0.0243	
180 minute summer	116	Flow through pond	107	1.0	0.005	0.046	6.2393	
15 minute summer	115	47.000	114	1.7	0.639	0.273	0.0128	
180 minute summer	114	Flow through pond	107	1.0	0.005	0.046	6.2393	
120 minute summer	113	45.000	111	1.6	0.316	0.074	0.0117	
120 minute summer	113	Infiltration		0.0				
15 minute summer	112	46.000	111	8.4	0.701	0.583	0.0180	
15 minute summer	111	45.001	110	5.5	0.579	0.415	0.0329	
1440 minute summer	110	Flow through pond	105	0.9	0.002	0.028	12.3124	
120 minute summer	109	22.000	108	0.0	0.000	0.000	0.0074	
120 minute summer	109	Infiltration		0.0				
15 minute summer	108	22.001	106	-0.7	-0.273	-0.066	0.0245	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	107	188	9.912	-0.088	1.0	0.0000	0.0000	OK
15 minute summer	106	12	10.010	0.080	1.4	0.0127	0.0000	OK
1440 minute summer	105	900	10.022	0.002	0.9	0.0004	0.0000	OK
15 minute summer	104	12	10.010	0.090	1.9	0.0143	0.0000	OK
15 minute summer	103	12	10.057	0.042	1.3	0.0104	0.0000	OK
15 minute summer	102	10	10.163	0.038	1.7	0.0105	0.0000	OK
15 minute summer	101	10	10.127	0.052	3.4	0.0140	0.0000	OK
15 minute summer	100	11	10.055	0.120	6.1	0.0335	0.0000	SURCHARGED
15 minute summer	99	12	10.010	0.100	5.8	0.0159	0.0000	OK
15 minute summer	98	12	9.992	0.082	4.9	0.0130	0.0000	OK
180 minute summer	97	228	9.880	0.143	1.9	0.0228	0.0000	OK
15 minute summer	96	10	10.448	0.028	0.9	0.0064	0.0000	OK
15 minute summer	95	11	10.387	0.042	1.8	0.0095	0.0000	OK
15 minute summer	94	11	10.305	0.030	2.9	0.0079	0.0000	OK
120 minute summer	93	128	10.029	0.120	1.4	0.0190	0.0000	OK
15 minute summer	92	11	10.072	0.037	1.3	0.0094	0.0000	OK
15 minute summer	91	10	10.163	0.038	1.7	0.0105	0.0000	OK
15 minute summer	90	10	10.127	0.052	3.4	0.0140	0.0000	OK
15 minute summer	89	11	10.068	0.133	6.3	0.0371	0.0000	SURCHARGED
180 minute summer	88	196	9.880	-0.080	1.0	0.0000	0.0000	OK
15 minute summer	87	11	9.985	0.085	5.9	0.0136	0.0000	OK
180 minute summer	86	408	9.881	0.144	1.9	0.0229	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	107	23.000	106	0.0	0.000	0.000	0.0033	
180 minute summer	107	Infiltration		0.0				
15 minute summer	106	22.002	104	-1.4	-0.236	-0.172	0.0485	
1440 minute summer	105	24.000	104	0.0	0.000	0.000	0.0019	
1440 minute summer	105	Infiltration		0.0				
15 minute summer	104	22.003	99	-1.9	-0.220	-0.317	0.1020	
15 minute summer	103	21.000	100	1.2	0.234	0.203	0.0488	
15 minute summer	102	20.000	101	1.7	0.491	0.291	0.0188	
15 minute summer	101	20.001	100	3.3	0.500	0.538	0.0808	
15 minute summer	100	20.002	99	5.8	0.749	1.195	0.0298	
15 minute summer	99	20.003	98	4.9	0.441	0.371	0.0565	
15 minute summer	98	20.004	97	4.9	0.576	0.368	0.0173	
180 minute summer	97	Flow through pond	88	1.0	0.004	0.028	5.8544	
15 minute summer	96	34.000	95	0.9	0.348	0.175	0.0281	
15 minute summer	95	34.001	94	1.7	0.660	0.347	0.0275	
15 minute summer	94	34.002	93	2.9	1.590	0.156	0.0034	
120 minute summer	93	Flow through pond	85	0.8	0.007	0.075	2.2524	
15 minute summer	92	28.000	89	1.3	0.230	0.202	0.0464	
15 minute summer	91	27.000	90	1.7	0.491	0.291	0.0188	
15 minute summer	90	27.001	89	3.3	0.486	0.538	0.0809	
15 minute summer	89	27.002	87	5.9	0.765	1.413	0.0531	
180 minute summer	88	29.000	87	0.0	0.000	0.000	0.0125	
180 minute summer	88	Infiltration		0.0				
15 minute summer	87	27.003	86	5.2	0.582	0.390	0.0212	
180 minute summer	86	Flow through pond	73	1.0	0.004	0.030	5.8758	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	85	124	10.030	-0.120	0.8	0.0000	0.0000	OK
15 minute summer	84	11	10.168	0.048	1.3	0.0122	0.0000	OK
15 minute summer	83	10	10.283	0.033	1.3	0.0087	0.0000	OK
15 minute summer	82	12	10.255	0.068	3.0	0.0198	0.0000	OK
15 minute summer	81	12	10.247	0.111	4.5	0.0312	0.0000	SURCHARGED
15 minute summer	80	11	10.166	0.106	6.2	0.0277	0.0000	SURCHARGED
15 minute summer	79	12	10.090	0.090	6.1	0.0143	0.0000	OK
180 minute summer	78	400	9.952	0.142	2.2	0.0225	0.0000	OK
15 minute summer	77	10	10.079	0.029	1.3	0.0077	0.0000	OK
15 minute summer	76	10	10.148	0.038	1.7	0.0107	0.0000	OK
15 minute summer	75	10	10.113	0.053	3.4	0.0142	0.0000	OK
15 minute summer	74	11	10.057	0.127	6.3	0.0333	0.0000	SURCHARGED
180 minute summer	73	188	9.881	-0.069	1.0	0.0000	0.0000	OK
15 minute summer	72	11	9.978	0.088	6.1	0.0140	0.0000	OK
180 minute summer	71	192	9.881	0.144	1.9	0.0229	0.0000	OK
15 minute summer	70	11	10.115	0.065	1.7	0.0219	0.0000	OK
15 minute summer	69	11	10.105	0.080	3.2	0.0239	0.0000	OK
180 minute summer	68	188	9.912	0.096	1.0	0.0153	0.0000	OK
15 minute summer	67	10	10.242	0.042	2.1	0.0149	0.0000	OK
15 minute summer	66	11	10.242	0.042	1.7	0.0135	0.0000	OK
15 minute summer	65	11	10.238	0.121	3.4	0.0358	0.0000	SURCHARGED
15 minute summer	64	11	10.210	0.110	6.6	0.0321	0.0000	SURCHARGED
180 minute summer	63	104	10.050	0.240	2.2	0.0382	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	85	9.000	79	0.0	0.000	0.000	0.0175	
120 minute summer	85	Infiltration		0.0				
15 minute summer	84	8.000	80	1.1	0.260	0.200	0.0391	
15 minute summer	83	7.000	82	1.3	0.403	0.230	0.0289	
15 minute summer	82	7.001	81	2.8	0.502	0.467	0.0346	
15 minute summer	81	7.002	80	4.1	0.542	1.001	0.1305	
15 minute summer	80	7.003	79	6.1	0.786	1.027	0.0469	
15 minute summer	79	7.004	78	6.1	0.632	0.462	0.0135	
180 minute summer	78	Flow through pond	50	1.1	0.005	0.010	6.5688	
15 minute summer	77	32.000	74	1.3	0.248	0.181	0.0432	
15 minute summer	76	31.000	75	1.7	0.485	0.291	0.0190	
15 minute summer	75	31.001	74	3.3	0.494	0.558	0.0816	
15 minute summer	74	31.002	72	6.1	0.779	1.268	0.0475	
180 minute summer	73	33.000	72	0.0	0.000	0.000	0.0203	
180 minute summer	73	Infiltration		0.0				
15 minute summer	72	31.003	71	5.3	0.578	0.397	0.0263	
180 minute summer	71	Flow through pond	41	1.0	0.004	0.031	5.8746	
15 minute summer	70	42.000	69	1.6	0.265	0.550	0.0638	
15 minute summer	69	42.001	68	3.2	0.552	1.013	0.0515	
180 minute summer	68	Flow through pond	34	0.7	0.007	0.066	3.1768	
15 minute summer	67	36.000	64	2.1	0.392	0.363	0.0610	
15 minute summer	66	35.000	65	1.7	0.311	0.282	0.0474	
15 minute summer	65	35.001	64	3.0	0.388	1.239	0.0773	
15 minute summer	64	35.002	63	6.5	0.842	1.067	0.0361	
180 minute summer	63	Flow through pond	36	1.7	0.007	0.159	4.4195	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	62	12	10.421	0.051	2.6	0.0207	0.0000	OK
15 minute summer	61	12	10.412	0.112	2.6	0.0178	0.0000	SURCHARGED
15 minute summer	60	12	10.426	0.046	1.7	0.0151	0.0000	OK
15 minute summer	59	12	10.425	0.105	3.4	0.0326	0.0000	SURCHARGED
15 minute summer	58	12	10.393	0.213	6.2	0.0593	0.0000	SURCHARGED
15 minute summer	57	12	10.304	0.124	7.3	0.0346	0.0000	SURCHARGED
180 minute summer	56	212	10.145	0.175	2.8	0.0278	0.0000	OK
15 minute summer	55	12	10.171	0.071	1.3	0.0191	0.0000	OK
15 minute summer	54	10	10.283	0.033	1.3	0.0087	0.0000	OK
15 minute summer	53	12	10.255	0.068	3.0	0.0197	0.0000	OK
15 minute summer	52	12	10.247	0.117	4.6	0.0327	0.0000	SURCHARGED
15 minute summer	51	12	10.170	0.134	6.0	0.0333	0.0000	SURCHARGED
180 minute summer	50	404	9.952	-0.198	1.1	0.0000	0.0000	OK
15 minute summer	49	12	10.084	0.094	5.9	0.0150	0.0000	OK
180 minute summer	48	180	9.997	0.198	2.2	0.0316	0.0000	OK
15 minute summer	47	10	10.031	0.031	1.3	0.0078	0.0000	OK
15 minute summer	46	10	10.191	0.031	1.3	0.0084	0.0000	OK
15 minute summer	45	10	10.140	0.050	2.6	0.0128	0.0000	OK
15 minute summer	44	11	10.098	0.058	3.8	0.0139	0.0000	OK
15 minute summer	43	11	9.983	0.073	6.2	0.0172	0.0000	OK
120 minute summer	42	132	9.869	0.132	3.0	0.0211	0.0000	OK
180 minute summer	41	188	9.881	-0.319	1.0	0.0000	0.0000	OK
15 minute summer	40	1	10.178	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	62	17.000	61	2.6	0.657	0.500	0.0555	
15 minute summer	61	17.001	58	2.1	0.310	0.369	0.1038	
15 minute summer	60	18.000	59	1.7	0.483	0.291	0.0374	
15 minute summer	59	18.001	58	2.9	0.431	0.486	0.1136	
15 minute summer	58	17.002	57	5.9	0.756	1.004	0.0559	
15 minute summer	57	17.003	56	7.3	0.935	1.248	0.0161	
180 minute summer	56	Flow through pond	35	1.4	0.005	0.045	8.8805	
15 minute summer	55	5.000	51	1.1	0.236	0.181	0.0469	
15 minute summer	54	4.000	53	1.3	0.424	0.230	0.0287	
15 minute summer	53	4.001	52	2.9	0.551	0.462	0.0345	
15 minute summer	52	4.002	51	3.8	0.539	0.846	0.1305	
15 minute summer	51	4.003	49	5.9	0.754	1.228	0.0557	
180 minute summer	50	6.000	49	0.0	0.000	0.000	0.0151	
180 minute summer	50	Infiltration		0.0				
15 minute summer	49	4.004	48	5.9	0.598	0.445	0.0312	
180 minute summer	48	Flow through pond	29	0.6	0.003	0.018	9.0631	
15 minute summer	47	26.000	43	1.3	0.312	0.209	0.0364	
15 minute summer	46	25.000	45	1.3	0.431	0.208	0.0203	
15 minute summer	45	25.001	44	2.5	0.581	0.434	0.0236	
15 minute summer	44	25.002	43	3.8	0.686	0.634	0.0737	
15 minute summer	43	25.003	42	6.3	0.778	0.408	0.0323	
120 minute summer	42	Flow through pond	21	1.5	0.005	0.050	5.4086	
180 minute summer	41	48.000	40	0.0	0.000	0.000	0.0000	
180 minute summer	41	Infiltration		0.0				
15 minute summer	40	48.001	39	0.0	0.000	0.000	0.0000	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	39	134	9.869	0.132	0.1	0.0210	0.0000	OK
15 minute summer	38	10	10.157	0.057	4.3	0.0281	0.0000	OK
15 minute summer	37	10	10.045	0.045	4.3	0.0071	0.0000	OK
180 minute summer	36	104	10.050	0.050	1.7	0.0080	0.0000	OK
180 minute summer	35	196	10.145	-0.065	1.4	0.0000	0.0000	OK
180 minute summer	34	188	9.912	-0.138	0.7	0.0000	0.0000	OK
15 minute summer	33	1	10.000	0.000	0.0	0.0000	0.0000	OK
720 minute summer	32	720	9.960	0.060	0.0	0.0096	0.0000	OK
720 minute summer	31	720	9.960	0.070	1.1	0.0111	0.0000	OK
720 minute summer	30	735	9.960	0.144	1.8	0.0229	0.0000	OK
180 minute summer	29	180	9.997	0.017	1.6	0.0029	0.0000	OK
15 minute summer	28	10	10.322	0.022	1.3	0.0062	0.0000	OK
15 minute summer	27	10	10.328	0.028	1.3	0.0078	0.0000	OK
15 minute summer	26	12	10.241	0.054	3.0	0.0158	0.0000	OK
15 minute summer	25	11	10.235	0.105	4.7	0.0284	0.0000	SURCHARGED
15 minute summer	24	11	10.150	0.140	6.5	0.0345	0.0000	SURCHARGED
15 minute summer	23	11	10.046	0.066	6.4	0.0105	0.0000	OK
180 minute summer	22	244	9.866	0.076	1.2	0.0121	0.0000	OK
120 minute summer	21	164	9.869	-0.061	1.5	0.0000	0.0000	OK
15 minute summer	20	11	9.938	0.068	2.6	0.0205	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	39	Flow through pond	21	1.5	0.005	0.050	5.4086	
15 minute summer	38	13.000	37	4.3	0.807	0.283	0.0732	
15 minute summer	37	13.001	31	2.8	0.564	0.193	0.0841	
180 minute summer	36	14.000	37	1.6	0.354	0.120	0.0069	
180 minute summer	36	Infiltration		0.0				
180 minute summer	35	16.000	32	0.0	0.000	0.000	0.0092	
180 minute summer	35	Infiltration		0.0				
180 minute summer	34	15.000	33	0.0	0.000	0.000	0.0000	
180 minute summer	34	Infiltration		0.0				
15 minute summer	33	15.001	32	0.0	0.000	0.000	0.0099	
720 minute summer	32	15.002	31	0.0	-0.014	-0.010	0.1446	
720 minute summer	31	13.002	30	1.0	0.342	0.078	0.0206	
720 minute summer	30	Flow through pond	13	-1.4	-0.002	-0.022	38.7661	
180 minute summer	29	12.000	23	-1.0	-0.335	-0.075	0.0062	
180 minute summer	29	Infiltration		0.0				
15 minute summer	28	11.000	24	1.3	0.280	0.108	0.0351	
15 minute summer	27	10.000	26	1.3	0.452	0.172	0.0228	
15 minute summer	26	10.001	25	3.0	0.575	0.466	0.0312	
15 minute summer	25	10.002	24	4.2	0.545	0.818	0.1314	
15 minute summer	24	10.003	23	6.4	0.831	2.213	0.0309	
15 minute summer	23	10.004	22	3.4	0.526	0.258	0.0078	
180 minute summer	22	Flow through pond	8	0.7	0.005	0.024	3.6707	
120 minute summer	21	19.000	20	0.0	0.000	0.000	0.0390	
120 minute summer	21	Infiltration		0.0				
15 minute summer	20	19.001	19	2.4	0.325	0.432	0.0738	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	19	11	9.922	0.062	2.4	0.0099	0.0000	OK
480 minute summer	18	416	9.920	0.174	0.5	0.0276	0.0000	OK
15 minute summer	17	10	10.246	0.046	2.6	0.0183	0.0000	OK
15 minute summer	16	11	10.198	0.105	5.1	0.0377	0.0000	SURCHARGED
15 minute summer	15	10	10.098	0.113	7.1	0.0369	0.0000	SURCHARGED
480 minute summer	14	384	9.919	0.173	1.2	0.0275	0.0000	OK
720 minute summer	13	735	9.960	-0.115	3.3	0.0000	0.0000	OK
15 minute summer	12	1	10.062	0.000	0.0	0.0000	0.0000	OK
15 minute summer	11	1	10.004	0.000	0.0	0.0000	0.0000	OK
480 minute summer	10	392	9.919	-0.281	0.8	0.0000	0.0000	OK
15 minute summer	9	1	9.850	0.000	0.0	0.0000	0.0000	OK
180 minute summer	8	244	9.866	-0.164	0.7	0.0000	0.0000	OK
15 minute summer	7	1	9.970	0.000	0.0	0.0000	0.0000	OK
15 minute summer	6	1	9.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	5	1	9.840	0.000	0.0	0.0000	0.0000	OK
720 minute summer	4	735	9.707	0.073	0.9	0.0828	0.0000	OK
720 minute summer	3	735	9.707	-0.023	1.9	0.0000	0.0000	OK
15 minute summer	2	1	9.730	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	9.700	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	19	19.002	18	2.3	0.421	0.175	0.0254	
480 minute summer	18	Flow through pond	10	0.8	0.005	0.054	9.6290	
15 minute summer	17	30.000	16	2.5	0.495	0.431	0.0627	
15 minute summer	16	30.001	15	4.6	0.631	0.907	0.1192	
15 minute summer	15	30.002	14	6.9	0.894	1.050	0.0155	
480 minute summer	14	Flow through pond	10	0.8	0.005	0.054	9.6290	
720 minute summer	13	1.000	12	0.0	0.000	0.000	0.0000	
720 minute summer	13	Infiltration		0.2				
15 minute summer	12	1.001	11	0.0	0.000	0.000	0.0000	
15 minute summer	11	1.002	9	0.0	0.000	0.000	0.0000	
480 minute summer	10	2.000	9	0.0	0.000	0.000	0.0000	
480 minute summer	10	Infiltration		0.0				
15 minute summer	9	1.003	6	0.0	0.000	0.000	0.0000	
180 minute summer	8	3.000	7	0.0	0.000	0.000	0.0000	
180 minute summer	8	Infiltration		0.0				
15 minute summer	7	3.001	6	0.0	0.000	0.000	0.0000	
15 minute summer	6	1.004	5	0.0	0.000	0.000	0.0000	
15 minute summer	5	1.005	4	0.0	0.000	0.000	0.0000	
720 minute summer	4	Flow through pond	3	-0.9	-0.001	-0.004	17.6013	
720 minute summer	3	49.000	2	0.0	0.000	0.000	0.0000	
720 minute summer	3	Infiltration		0.2				
15 minute summer	2	Hydro-Brake®	1	0.0				0.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	130	38	10.093	0.043	1.3	0.0117	0.0000	OK
15 minute summer	129	10	10.201	0.041	2.0	0.0120	0.0000	OK
15 minute summer	128	10	10.183	0.043	2.6	0.0190	0.0000	OK
15 minute summer	127	10	10.162	0.062	6.5	0.0174	0.0000	OK
60 minute summer	126	38	10.093	0.113	7.0	0.0291	0.0000	OK
60 minute summer	125	38	10.091	0.332	7.0	0.0528	0.0000	OK
15 minute summer	124	11	10.129	0.029	1.3	0.0067	0.0000	OK
15 minute summer	123	10	10.185	0.035	1.3	0.0084	0.0000	OK
15 minute summer	122	10	10.139	0.039	2.0	0.0076	0.0000	OK
15 minute summer	121	11	10.056	0.066	3.9	0.0126	0.0000	OK
120 minute summer	120	128	10.033	0.276	1.8	0.0064	0.0000	OK
15 minute summer	119	10	10.195	0.045	2.6	0.0151	0.0000	OK
15 minute summer	118	10	10.193	0.043	2.6	0.0143	0.0000	OK
15 minute summer	117	11	10.130	0.130	7.7	0.0382	0.0000	SURCHARGED
360 minute summer	116	472	10.017	0.256	1.5	0.0406	0.0000	OK
15 minute summer	115	10	10.099	0.049	2.6	0.0149	0.0000	OK
360 minute summer	114	472	10.017	0.256	0.5	0.0406	0.0000	OK
60 minute summer	113	38	10.090	0.090	5.0	0.0144	0.0000	OK
15 minute summer	112	10	10.114	0.134	13.2	0.1031	0.0000	OK
60 minute summer	111	38	10.089	0.119	8.8	0.0189	0.0000	OK
240 minute summer	110	168	10.039	0.259	5.8	0.0412	0.0000	OK
120 minute summer	109	128	10.033	0.033	1.7	0.0054	0.0000	OK
120 minute summer	108	124	10.039	0.099	2.2	0.0157	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	130	41.000	126	1.3	0.315	0.209	0.0365	
15 minute summer	129	39.000	127	2.0	0.486	0.349	0.0277	
15 minute summer	128	40.000	127	2.6	0.466	0.170	0.0304	
15 minute summer	127	39.001	126	6.5	0.693	0.361	0.1096	
60 minute summer	126	39.002	125	7.0	0.862	0.403	0.0492	
60 minute summer	125	Flow through pond	113	4.1	0.010	0.379	5.5867	
15 minute summer	124	38.000	121	1.3	0.387	0.184	0.0296	
15 minute summer	123	37.000	122	1.3	0.495	0.248	0.0174	
15 minute summer	122	37.001	121	1.9	0.474	0.322	0.0457	
15 minute summer	121	37.002	120	3.9	0.741	0.684	0.0237	
120 minute summer	120	Flow through pond	109	0.9	0.005	0.061	4.6510	
15 minute summer	119	43.000	117	2.6	0.425	0.418	0.0815	
15 minute summer	118	44.000	117	2.6	0.440	0.381	0.0663	
15 minute summer	117	43.001	116	7.6	0.968	1.154	0.0321	
360 minute summer	116	Flow through pond	107	1.0	0.005	0.042	10.4177	
15 minute summer	115	47.000	114	2.6	0.713	0.421	0.0176	
360 minute summer	114	Flow through pond	107	1.0	0.005	0.042	10.4177	
60 minute summer	113	45.000	111	4.6	-0.410	0.218	0.0277	
60 minute summer	113	Infiltration		0.0				
15 minute summer	112	46.000	111	13.1	0.849	0.906	0.0230	
60 minute summer	111	45.001	110	8.8	0.688	0.668	0.0442	
240 minute summer	110	Flow through pond	105	2.9	0.005	0.090	13.1865	
120 minute summer	109	22.000	108	-1.7	0.279	-0.072	0.0258	
120 minute summer	109	Infiltration		0.0				
120 minute summer	108	22.001	106	-1.5	0.132	-0.144	0.0357	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	107	472	10.017	0.017	1.0	0.0027	0.0000	OK
120 minute summer	106	124	10.036	0.106	3.0	0.0169	0.0000	OK
240 minute summer	105	168	10.039	0.019	2.9	0.0032	0.0000	OK
120 minute summer	104	68	10.039	0.119	6.5	0.0189	0.0000	OK
15 minute summer	103	12	10.135	0.120	2.0	0.0306	0.0000	SURCHARGED
15 minute summer	102	12	10.217	0.092	2.6	0.0267	0.0000	OK
15 minute summer	101	12	10.209	0.134	5.0	0.0374	0.0000	SURCHARGED
15 minute summer	100	12	10.127	0.192	8.3	0.0559	0.0000	SURCHARGED
120 minute summer	99	68	10.034	0.124	7.3	0.0196	0.0000	OK
120 minute summer	98	136	10.025	0.115	7.3	0.0183	0.0000	OK
120 minute summer	97	134	10.023	0.286	7.2	0.0454	0.0000	OK
15 minute summer	96	11	10.455	0.035	1.3	0.0083	0.0000	OK
15 minute summer	95	11	10.399	0.054	2.6	0.0125	0.0000	OK
15 minute summer	94	10	10.314	0.039	4.5	0.0107	0.0000	OK
360 minute summer	93	304	10.113	0.203	1.0	0.0323	0.0000	OK
15 minute summer	92	12	10.159	0.124	2.0	0.0330	0.0000	SURCHARGED
15 minute summer	91	12	10.240	0.115	2.6	0.0332	0.0000	SURCHARGED
15 minute summer	90	12	10.231	0.156	4.9	0.0436	0.0000	SURCHARGED
15 minute summer	89	12	10.152	0.217	8.1	0.0630	0.0000	SURCHARGED
120 minute summer	88	134	10.023	0.063	4.5	0.0101	0.0000	OK
120 minute summer	87	136	10.022	0.122	4.8	0.0195	0.0000	OK
120 minute summer	86	132	10.023	0.286	4.8	0.0454	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	107	23.000	106	-0.8	-0.171	-0.070	0.0090	
360 minute summer	107	Infiltration		0.0				
120 minute summer	106	22.002	104	3.0	0.264	0.373	0.0665	
240 minute summer	105	24.000	104	1.3	0.364	0.035	0.0162	
240 minute summer	105	Infiltration		0.0				
120 minute summer	104	22.003	99	5.5	0.370	0.927	0.1326	
15 minute summer	103	21.000	100	1.7	0.237	0.294	0.0697	
15 minute summer	102	20.000	101	2.4	0.525	0.419	0.0423	
15 minute summer	101	20.001	100	4.4	0.600	0.713	0.1058	
15 minute summer	100	20.002	99	8.1	1.035	1.662	0.0298	
120 minute summer	99	20.003	98	7.3	0.514	0.548	0.0744	
120 minute summer	98	20.004	97	7.2	0.659	0.544	0.0293	
120 minute summer	97	Flow through pond	88	4.5	0.005	0.130	11.5439	
15 minute summer	96	34.000	95	1.3	0.387	0.266	0.0385	
15 minute summer	95	34.001	94	2.6	0.727	0.533	0.0382	
15 minute summer	94	34.002	93	4.5	1.758	0.240	0.0048	
360 minute summer	93	Flow through pond	85	0.5	0.006	0.046	3.7634	
15 minute summer	92	28.000	89	1.6	0.244	0.254	0.0697	
15 minute summer	91	27.000	90	2.4	0.510	0.424	0.0430	
15 minute summer	90	27.001	89	4.2	0.555	0.688	0.1059	
15 minute summer	89	27.002	87	8.0	1.019	1.895	0.0554	
120 minute summer	88	29.000	87	4.5	0.563	0.220	0.0509	
120 minute summer	88	Infiltration		0.0				
120 minute summer	87	27.003	86	4.8	0.564	0.359	0.0368	
120 minute summer	86	Flow through pond	73	3.9	0.005	0.118	11.5351	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	85	288	10.113	-0.037	0.5	0.0000	0.0000	OK
15 minute summer	84	12	10.256	0.136	2.0	0.0359	0.0000	SURCHARGED
15 minute summer	83	12	10.415	0.165	2.0	0.0461	0.0000	SURCHARGED
15 minute summer	82	12	10.411	0.224	4.3	0.0677	0.0000	SURCHARGED
15 minute summer	81	12	10.391	0.255	5.5	0.0744	0.0000	SURCHARGED
15 minute summer	80	12	10.250	0.190	8.3	0.0516	0.0000	SURCHARGED
15 minute summer	79	12	10.105	0.105	8.1	0.0167	0.0000	OK
240 minute summer	78	480	10.059	0.249	2.9	0.0396	0.0000	OK
15 minute summer	77	12	10.139	0.089	2.0	0.0249	0.0000	OK
15 minute summer	76	12	10.224	0.114	2.6	0.0338	0.0000	SURCHARGED
15 minute summer	75	12	10.214	0.154	5.0	0.0429	0.0000	SURCHARGED
15 minute summer	74	12	10.133	0.203	8.2	0.0553	0.0000	SURCHARGED
120 minute summer	73	132	10.023	0.073	3.9	0.0116	0.0000	OK
120 minute summer	72	136	10.022	0.132	4.2	0.0210	0.0000	OK
120 minute summer	71	134	10.022	0.285	3.9	0.0454	0.0000	OK
15 minute summer	70	11	10.166	0.116	2.6	0.0412	0.0000	SURCHARGED
15 minute summer	69	11	10.145	0.120	4.9	0.0374	0.0000	SURCHARGED
960 minute summer	68	1050	10.059	0.242	0.4	0.0386	0.0000	OK
15 minute summer	67	12	10.324	0.124	3.3	0.0469	0.0000	SURCHARGED
15 minute summer	66	12	10.371	0.171	2.6	0.0573	0.0000	SURCHARGED
15 minute summer	65	12	10.357	0.240	4.5	0.0745	0.0000	SURCHARGED
15 minute summer	64	12	10.296	0.196	9.3	0.0601	0.0000	SURCHARGED
60 minute summer	63	38	10.090	0.280	7.1	0.0445	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	85	9.000	79	0.0	0.000	0.000	0.0133	
360 minute summer	85	Infiltration		0.0				
15 minute summer	84	8.000	80	1.5	0.269	0.273	0.0531	
15 minute summer	83	7.000	82	1.8	0.411	0.325	0.0592	
15 minute summer	82	7.001	81	3.3	0.512	0.549	0.0401	
15 minute summer	81	7.002	80	5.1	0.655	1.267	0.1305	
15 minute summer	80	7.003	79	8.1	1.038	1.363	0.0482	
15 minute summer	79	7.004	78	8.1	0.698	0.612	0.0161	
240 minute summer	78	Flow through pond	50	1.5	0.005	0.013	11.3731	
15 minute summer	77	32.000	74	1.7	0.246	0.235	0.0677	
15 minute summer	76	31.000	75	2.5	0.504	0.427	0.0430	
15 minute summer	75	31.001	74	4.3	0.550	0.727	0.1058	
15 minute summer	74	31.002	72	8.1	1.030	1.681	0.0492	
120 minute summer	73	33.000	72	3.5	0.523	0.218	0.0898	
120 minute summer	73	Infiltration		0.0				
120 minute summer	72	31.003	71	3.9	0.523	0.295	0.0476	
120 minute summer	71	Flow through pond	41	2.0	0.005	0.064	11.5261	
15 minute summer	70	42.000	69	2.4	0.310	0.839	0.0826	
15 minute summer	69	42.001	68	4.9	0.650	1.549	0.0625	
960 minute summer	68	Flow through pond	34	0.2	0.005	0.021	7.6178	
15 minute summer	67	36.000	64	2.7	0.411	0.478	0.0876	
15 minute summer	66	35.000	65	2.1	0.335	0.360	0.0676	
15 minute summer	65	35.001	64	4.3	0.545	1.740	0.0773	
15 minute summer	64	35.002	63	9.2	1.171	1.503	0.0378	
60 minute summer	63	Flow through pond	36	5.1	0.010	0.478	5.1266	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	62	12	10.580	0.210	3.9	0.0910	0.0000	FLOOD RISK
15 minute summer	61	12	10.554	0.254	3.0	0.0403	0.0000	FLOOD RISK
15 minute summer	60	12	10.593	0.213	2.6	0.0739	0.0000	FLOOD RISK
15 minute summer	59	12	10.586	0.266	4.2	0.0864	0.0000	FLOOD RISK
15 minute summer	58	12	10.525	0.345	8.2	0.0999	0.0000	SURCHARGED
15 minute summer	57	12	10.361	0.181	10.1	0.0526	0.0000	SURCHARGED
360 minute summer	56	264	10.220	0.250	2.7	0.0398	0.0000	OK
15 minute summer	55	12	10.265	0.165	2.0	0.0461	0.0000	SURCHARGED
15 minute summer	54	12	10.417	0.167	2.0	0.0465	0.0000	SURCHARGED
15 minute summer	53	12	10.412	0.225	4.3	0.0683	0.0000	SURCHARGED
15 minute summer	52	12	10.394	0.264	5.4	0.0765	0.0000	SURCHARGED
15 minute summer	51	12	10.260	0.224	8.1	0.0578	0.0000	SURCHARGED
240 minute summer	50	480	10.059	-0.091	1.5	0.0000	0.0000	OK
15 minute summer	49	12	10.100	0.110	7.9	0.0175	0.0000	OK
240 minute summer	48	148	10.041	0.242	2.9	0.0385	0.0000	OK
15 minute summer	47	10	10.039	0.039	2.0	0.0102	0.0000	OK
15 minute summer	46	10	10.199	0.039	2.0	0.0110	0.0000	OK
15 minute summer	45	11	10.158	0.068	4.0	0.0181	0.0000	OK
15 minute summer	44	11	10.127	0.087	5.9	0.0214	0.0000	OK
15 minute summer	43	11	10.006	0.096	9.6	0.0234	0.0000	OK
480 minute summer	42	496	10.005	0.268	1.5	0.0426	0.0000	OK
120 minute summer	41	134	10.022	-0.178	2.0	0.0000	0.0000	OK
15 minute summer	40	1	10.178	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	62	17.000	61	3.0	0.676	0.582	0.0737	
15 minute summer	61	17.001	58	2.8	0.356	0.485	0.1038	
15 minute summer	60	18.000	59	1.9	0.505	0.330	0.0517	
15 minute summer	59	18.001	58	3.6	0.461	0.608	0.1136	
15 minute summer	58	17.002	57	8.1	1.036	1.376	0.0559	
15 minute summer	57	17.003	56	10.1	1.290	1.730	0.0166	
360 minute summer	56	Flow through pond	35	1.4	0.005	0.043	12.6033	
15 minute summer	55	5.000	51	1.5	0.233	0.257	0.0531	
15 minute summer	54	4.000	53	1.8	0.419	0.325	0.0592	
15 minute summer	53	4.001	52	3.2	0.569	0.507	0.0401	
15 minute summer	52	4.002	51	5.0	0.641	1.112	0.1305	
15 minute summer	51	4.003	49	7.9	1.012	1.648	0.0564	
240 minute summer	50	6.000	49	0.0	0.000	0.000	0.0180	
240 minute summer	50	Infiltration		0.0				
15 minute summer	49	4.004	48	7.9	0.663	0.595	0.0375	
240 minute summer	48	Flow through pond	29	1.4	0.004	0.040	11.0160	
15 minute summer	47	26.000	43	2.0	0.354	0.325	0.0469	
15 minute summer	46	25.000	45	2.0	0.468	0.323	0.0289	
15 minute summer	45	25.001	44	3.9	0.616	0.674	0.0354	
15 minute summer	44	25.002	43	5.8	0.771	0.980	0.1013	
15 minute summer	43	25.003	42	9.7	0.862	0.630	0.0449	
480 minute summer	42	Flow through pond	21	0.7	0.005	0.024	10.7906	
120 minute summer	41	48.000	40	0.0	0.000	0.000	0.0000	
120 minute summer	41	Infiltration		0.0				
15 minute summer	40	48.001	39	0.0	0.000	0.000	0.0000	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	39	488	10.004	0.267	0.0	0.0424	0.0000	OK
15 minute summer	38	10	10.173	0.073	6.6	0.0382	0.0000	OK
60 minute summer	37	38	10.075	0.075	7.2	0.0119	0.0000	OK
60 minute summer	36	38	10.088	0.088	5.1	0.0141	0.0000	OK
360 minute summer	35	264	10.220	0.010	1.4	0.0017	0.0000	OK
960 minute summer	34	1050	10.059	0.008	0.2	0.0014	0.0000	OK
720 minute summer	33	720	10.063	0.063	0.3	0.0100	0.0000	OK
720 minute summer	32	720	10.063	0.163	0.4	0.0259	0.0000	SURCHARGED
720 minute summer	31	720	10.063	0.173	2.0	0.0275	0.0000	SURCHARGED
720 minute summer	30	720	10.063	0.247	3.3	0.0393	0.0000	OK
240 minute summer	29	148	10.041	0.061	2.1	0.0098	0.0000	OK
15 minute summer	28	10	10.328	0.028	2.0	0.0081	0.0000	OK
15 minute summer	27	12	10.404	0.104	2.0	0.0302	0.0000	SURCHARGED
15 minute summer	26	12	10.399	0.212	4.3	0.0641	0.0000	SURCHARGED
15 minute summer	25	12	10.376	0.246	5.7	0.0691	0.0000	SURCHARGED
15 minute summer	24	11	10.217	0.207	8.9	0.0528	0.0000	SURCHARGED
15 minute summer	23	12	10.057	0.077	8.7	0.0123	0.0000	OK
240 minute summer	22	248	10.033	0.244	2.7	0.0387	0.0000	OK
480 minute summer	21	488	10.004	0.074	0.9	0.0118	0.0000	OK
480 minute summer	20	512	10.004	0.134	0.8	0.0426	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute summer	39	Flow through pond	21	0.7	0.005	0.024	10.7906	
15 minute summer	38	13.000	37	6.5	0.905	0.434	0.1002	
60 minute summer	37	13.001	31	7.2	0.686	0.492	0.1723	
60 minute summer	36	14.000	37	4.9	0.510	0.371	0.0149	
60 minute summer	36	Infiltration		0.0				
360 minute summer	35	16.000	32	0.5	0.063	0.009	0.0326	
360 minute summer	35	Infiltration		0.0				
960 minute summer	34	15.000	33	-0.2	-0.073	-0.010	0.0095	
960 minute summer	34	Infiltration		0.0				
720 minute summer	33	15.001	32	-0.3	-0.019	-0.009	0.0456	
720 minute summer	32	15.002	31	0.4	-0.025	0.111	0.3476	
720 minute summer	31	13.002	30	1.9	0.402	0.142	0.0451	
720 minute summer	30	Flow through pond	13	-1.6	-0.002	-0.024	64.2460	
240 minute summer	29	12.000	23	1.4	-0.368	0.109	0.0136	
240 minute summer	29	Infiltration		0.0				
15 minute summer	28	11.000	24	2.0	0.345	0.168	0.0369	
15 minute summer	27	10.000	26	1.8	0.449	0.245	0.0592	
15 minute summer	26	10.001	25	3.6	0.595	0.564	0.0401	
15 minute summer	25	10.002	24	5.5	0.701	1.078	0.1314	
15 minute summer	24	10.003	23	8.7	1.118	3.020	0.0323	
15 minute summer	23	10.004	22	4.6	0.581	0.350	0.0096	
240 minute summer	22	Flow through pond	8	1.4	0.004	0.045	11.2223	
480 minute summer	21	19.000	20	-0.9	-0.131	-0.081	0.2153	
480 minute summer	21	Infiltration		0.0				
480 minute summer	20	19.001	19	-0.6	0.184	-0.119	0.1715	

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 95.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	19	488	10.004	0.144	0.6	0.0229	0.0000	OK
480 minute summer	18	488	10.004	0.258	0.6	0.0410	0.0000	OK
15 minute summer	17	12	10.406	0.206	3.9	0.0872	0.0000	FLOOD RISK
15 minute summer	16	12	10.366	0.273	6.9	0.1030	0.0000	SURCHARGED
15 minute summer	15	11	10.157	0.172	10.1	0.0593	0.0000	SURCHARGED
480 minute summer	14	504	10.004	0.258	1.8	0.0410	0.0000	OK
720 minute summer	13	720	10.063	-0.012	5.0	0.0000	0.0000	OK
15 minute summer	12	1	10.062	0.000	0.0	0.0000	0.0000	OK
15 minute summer	11	1	10.004	0.000	0.0	0.0000	0.0000	OK
480 minute summer	10	488	10.004	-0.196	1.1	0.0000	0.0000	OK
240 minute summer	9	260	9.857	0.007	0.0	0.0012	0.0000	OK
240 minute summer	8	248	10.034	0.004	1.4	0.0007	0.0000	OK
240 minute summer	7	248	9.974	0.004	0.0	0.0006	0.0000	OK
240 minute summer	6	248	9.858	0.008	0.0	0.0013	0.0000	OK
240 minute summer	5	264	9.846	0.006	0.0	0.0009	0.0000	OK
720 minute summer	4	720	9.747	0.113	1.4	0.1279	0.0000	OK
720 minute summer	3	720	9.747	0.017	2.9	0.0552	0.0000	OK
720 minute summer	2	720	9.745	0.015	0.1	0.0167	0.0000	OK
15 minute summer	1	1	9.700	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute summer	19	19.002	18	-0.6	0.245	-0.049	0.0795	
480 minute summer	18	Flow through pond	10	1.1	0.005	0.076	14.1437	
15 minute summer	17	30.000	16	3.3	0.525	0.554	0.0875	
15 minute summer	16	30.001	15	6.6	0.838	1.293	0.1192	
15 minute summer	15	30.002	14	10.0	1.273	1.504	0.0161	
480 minute summer	14	Flow through pond	10	1.1	0.005	0.076	14.1437	
720 minute summer	13	1.000	12	0.0	0.000	0.000	0.0000	
720 minute summer	13	Infiltration		0.2				
15 minute summer	12	1.001	11	0.0	0.000	0.000	0.0000	
15 minute summer	11	1.002	9	0.0	0.000	0.000	0.0000	
480 minute summer	10	2.000	9	0.0	0.000	0.000	0.0000	
480 minute summer	10	Infiltration		0.1				
240 minute summer	9	1.003	6	0.0	-0.069	-0.001	0.0013	
240 minute summer	8	3.000	7	0.0	0.316	0.001	0.0002	
240 minute summer	8	Infiltration		0.0				
240 minute summer	7	3.001	6	0.0	0.183	0.001	0.0008	
240 minute summer	6	1.004	5	0.0	0.094	0.004	0.0019	
240 minute summer	5	1.005	4	0.0	0.172	0.002	0.0004	
720 minute summer	4	Flow through pond	3	-1.4	-0.001	-0.007	26.7652	
720 minute summer	3	49.000	2	0.1	0.115	0.009	0.0023	
720 minute summer	3	Infiltration		0.2				
720 minute summer	2	Hydro-Brake®	1	0.1				2.0



104720mN

104720mN

104680mN

104680mN

104640mN

104620mN

104620mN

1:250 @ A1
1:500 @ A3

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NOTES

- This drawing is to be read in conjunction with all other Bright Plan Civils drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
- Bright Plan Civils accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.
- Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.
- Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

- DRAINAGE FLOW MODEL KEY-**
- Proposed Surface Water Drain/Sewer
87
IL9.900
4500
 - Proposed Surface Water Manhole (Node; Invert Level; Manhole Size)
IL9.800
 - Proposed Crate Soakaway (Crate Invert)
91+
IL9.800
Proposed Soakaway Incoming/Outgoing Pipe (Incoming/Outgoing Invert)
3
IL9.730
Proposed Flow Control Chamber (Node; Invert Level; Controlled Discharge Rate)
2
IL9.730
2.0%
 - Soakaway Effective Invert Level due to Groundwater Peak (Crate IL, Effective IL)
IL9.650
Eff. IL (7.30)

FLOW MODEL DRAWING IS BASED ON DRAINAGE LAYOUT AND DRAINAGE DETAILS DRAWINGS BY ARCH ASSOCIATES; WITH FURTHER INFORMATION TO INFORM MODEL ON GROUNDWATER LEVELS, SOAKAGE RATES, AND IMPERMEABLE AREAS PROVIDED BY AQUACALLIUS AND MAPLEDEAN PROJECTS LTD.

SOAKAWAY CRATES ARE MODELLED AT MINIMUM LEVEL OF 9.73mOD DUE TO GROUNDWATER LEVELS, WITH EFFECTIVE STORAGE VOLUME ABOVE GROUNDWATER LEVEL USED.

Refer to Arch Associates drawings for further information on general arrangement and drainage details for construction. In addition, refer to Architects drawings for further information on plot internal detailing, service points and threshold drainage details. Architect to finalise all drainage connection points & threshold drainage requirements.

FOR INFORMATION

THIS DRAWING IS A SUPPORTING PLAN FOR THE DRAINAGE STRATEGY. IT IS ONLY SCHEMATIC IN NATURE AND NOT TO BE USED FOR CONSTRUCTION.

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Drawing Status FOR PLANNING

Client Mapledean Projects Limited

Project Hook Lane Aidingbourne

Drawing Title 1D Hydraulic Model Supporting Plan

Scale 1:250 Date 2020.1 Drawn By DJL Checked By MJA

Drawing No. D1898-001

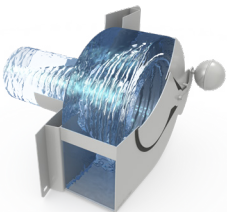
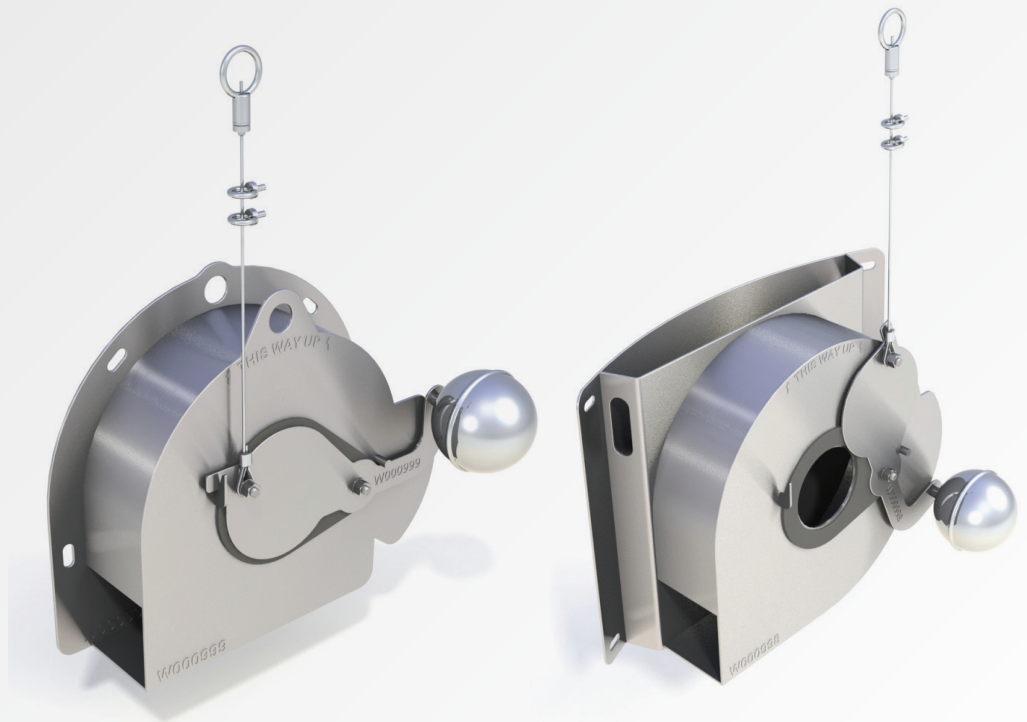
A1

ACO Q-Brake Flow Control System

PRODUCT DATASHEET

- ▶ Custom built to suit the site requirements
- ▶ Available from 2-100 l/s and up to 3m design head
- ▶ Manufactured from grade 304 stainless steel
- ▶ All parts welded to BS 4872
- ▶ Available with curved or flat back
- ▶ Attenuation volume required reduced
- ▶ Larger* clear opening, reduces risk of blockage

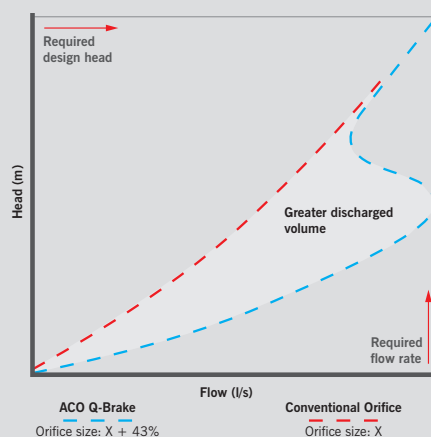
*Larger than traditional orifice plates



ACO Q-Brake

Discharge characteristics

ACO Q-Brake is a horizontal vortex flow control designed to prevent downstream flooding by controlling the release of storm water before it discharges into the water environment.



Designed to regulate storm water flows from 2 -100 litres per second, ACO Q-Brake is tailored to the specific performance requirements of the application providing optimum efficiency within the drainage system.

ACO Q-Plates can be used for larger sizes Both this and ACO Q-Brake can be supplied with a durable plastic chamber, ACO Q-Chamber.

- ▶ ACO Q-Brake is available as a model in both microdrainage & causeway flow hydraulic design software
- ▶ ACO Q-Brake has many water authority approvals



ACO Q-Chamber

ACO Q-Chamber is a new durable bespoke prefabricated chamber designed to house ACO Q-Brake, as well as ACO Q-Plate. It combines easy-handling and simple installation with a fully-welded plastic, durable construction.

Key benefits

- ▶ Easy transportation and installation
 - ▶ Minimise working time in a confined space
 - ▶ All plastic interfaces fully welded, watertight and spark tested
 - ▶ Available in a structured wall HDPE plastic chamber with a solid HDPE baseplate
 - ▶ Bespoke fabrication of chambers with inlets and outlets in twin-wall pipe for simple connection
 - ▶ Chambers available in*:
Diameters 900mm – 2100mm
Height 1000mm – 3500mm
- *other dimensions available on special request

Parameters to quote:

ACO Q-Brake: Design head (m) & Flow rate (l/s)

ACO Q-Chamber: Depth to invert / Diameter of the chamber / Number of pipe connections / Diameters of pipe connections



**Storm Water Management System comprising:
ACO Q-Brake, ACO Q-Chamber and ACO StormBrixx**

ACO Q-Brake and ACO Q-Chamber are manufactured to order, each specifically optimised for the design parameters of the project. For our dedicated stormwater management team, please contact: uk-swc@aco.co.uk Tel: **01462 816666**

ACO Technologies plc

ACO Business Park, Hitchin Road, Shefford, Bedfordshire SG17 5TE
Tel: 01462 816666 Fax: 01462 815895
e-mail: technologies@aco.co.uk website: www.aco.co.uk



For more information on orifice plates and geocellular tanks visit www.aco.co.uk

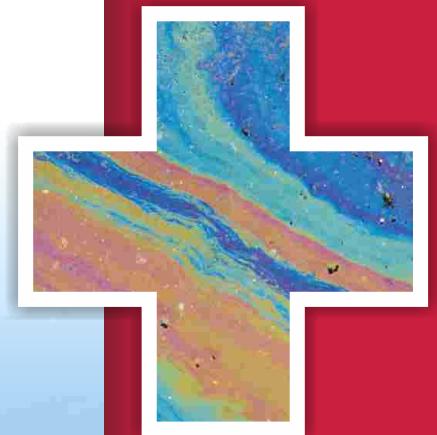


NAYLOR
ENVIRONMENTAL

**SMART⁺
sponge[®]**

**Oil Filtration & Pathogen
Reduction Products**

**Solutions
for Water
Framework
Directive
Compliance**



**The smarter
solution to deal
with hydrocarbon
pollution and
comply with the
Water Framework
Directive**

- Treats stormwater & urban run-off
- Removes hydrocarbons
- Destroys bacteria
- Filters heavy metals
- Allows solid waste recycling
- Complies with the Water Framework Directive
- Complies with Bathing Water Directive

email: environmental@naylor.co.uk web: www.naylor.co.uk



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Used Oil Facts

- It is estimated that a quarter of a billion gallons of used oil is generated each year in the UK from industry and motor vehicles
- The fate of much of this used oil is unknown but a large proportion is presumably disposed of improperly
- 1 in 5 households carry out a do-it-yourself oil change
- The oil from a single oil change (1 gallon) can contaminate 1 million gallons of drinking water - a year's supply of water for 50 people
- Oil contributes to 20% of all UK water pollution incidents
- Used oil is a useful substance that, when recovered, can be used as a fuel and saves resources

Used Oils Impact on the Environment

- 10 litres of oil from one car can pollute a lake the size of two football pitches
- Used motor oil contains toxic substances such as toluene, lead, cadmium and benzene
- Oil films prevent replenishment of dissolved oxygen, impair photosynthesis and block sunlight
- Sump oil accounts for 40% of oil pollution of the nation's harbours and waterways
- Concentrations of 50 to 100 parts per million of used oil can foul sewage treatment plants
- Oil dumped on land reduces soil productivity
- Many industrialised countries, worldwide, recover a greater portion of their used oil as fuel and lubricants than the United Kingdom

A large, vibrant background image showing a close-up of oil pollution. It features swirling patterns of blue, purple, green, and yellow, with dark, irregular shapes representing oil droplets and debris. A small, rusted metal object is visible on the right side.

*It is estimated that a
**quarter
of a billion
gallons**
of used oil is generated each
year in the UK from industry
and motor vehicles*

THE **SMARTER** SOLUTION TO: Treat surface water pollution

"A revolutionary new product that is taking the global surface water market by storm"

Smart Sponge®

- Treats stormwater & urban run-off
- Removes hydrocarbons
- Destroys bacteria
- Filters heavy metals & sediment

Smart Sponge® was developed for the oil industry, the Smart Sponge® is based on patented polymer technologies and is the only non-toxic, fully recyclable filtration system that destroys bacteria and absorbs hydrocarbons on contact. Contaminated stormwater run-off, known as 'non-point source pollution', is a major source of contamination for lakes, streams, rivers, estuaries, coastal waters and even groundwater and forms part of the focus for the Water Framework Directive and Bathing Water Directive.

Smart Sponge® is a proprietary combination of synthetic polymers with a unique molecular structure that is chemically selective to hydrocarbons. Smart Sponge® fully encapsulates recovered oil, preventing absorbed oil from leaching and is also capable of removing low levels of oil from water, thereby successfully removing sheen. The spent product is able to be used within a Waste for Energy process as it produces between 10,000 - 18,000 BTU per pound, thereby creating a closed-loop solution with no resultant waste product.

THE **SMARTER** SOLUTION TO: Spill kits

The **Smart Sponge**® technology, **Smart Sponge**® is **NOT** a spill kit

"Smart Sponge® has the capacity to absorb up to five times its own weight (depending on the type of oil contaminant) and remove up to 95% of the hydrocarbons present in stormwater run-off."

Absorbent **VS** Adsorbent

The **Smart Sponge**® proprietary blend of polymers is oleophilic – an absorbent, which means that hydrocarbons are bonded within its chemical matrix. Therefore, absorption is permanent and saturated product cannot be washed off, squeezed out, or leached from the material during subsequent rain events.

Once absorbed, those pollutants are transformed into a stable solid for easy recycling, providing a closed-loop solution to water pollution. Traditional adsorbents lack this absorbent characteristic. Instead they feature an adsorbent capability that merely attracts hydrocarbons to their surface, but cannot prevent them from leaching back into the environment.

Smart Sponge® Key Features:

- Chemically selective to hydrocarbons
- Removes surface sheen
- Transforms pollutants into a stable solid
- Non-leaching
- Fully recyclable



Smart Sponge® - a proprietary polymer technology unique in its ability to effectively remove, absorb and retain hydrocarbons from flowing or static water. **Smart Sponge**® technology maximises the effectiveness of its oil-absorbing polymers by forming them into an extremely porous structure that allows effective, long-lasting absorption, without clogging or channelling, which is common among any other filtration media in a powder, particulate or fibre form.

Oil contributes to 20% of all UK water pollution incidents.



The **Smart Sponge**® polymers are also hydrophobic and oleophilic - allowing water to pass through while hydrocarbons are absorbed. The structure is so effective, that even as it swells with contaminants, high flow rates and filtering capabilities are still maintained. Field and laboratory tests have confirmed the **Smart Sponge**® capacity to absorb 2-4 times its own weight or more (depending on the type of oil contaminant) and remove up to 95% of the hydrocarbons present in stormwater run-off.

THE **SMARTER** SOLUTION TO: Support infrastructure

Wiltshire Council Gully Trials Case Study

"Wiltshire Council is always seeking ways of improving its service to the community while at the same time remaining as kind to the environment as possible. So when Wiltshire Council was introduced to the Smart Sponge® technology (SST) with its synthetic polymers used for removing hydrocarbons and oil derivatives from surface water, we decided to trial the product.

The various tests demonstrated just how the technology built into the Smart Sponge® system offered an easy solution to the problem many local authorities face when dealing with gullywaste and the ever-increasing costs associated with its disposal. Currently Wiltshire Council disposes of gully waste by way of landfill, which has environmental and cost implications.

Wiltshire Council undertook its own year long trials that clearly show that financial savings can be made by reducing the volume of contaminated waste as the Smart Sponge® transforms captured pollutants into a solid waste for recycling as a Waste to Fuel energy or as landfill waste. In addition this also had a significant reduction in environmental impact!



Water quality samples and weight of SS were taken every three months from each test gully over a 12 month period. Eight road gullies and one interceptor had PAH values averaging 8500ppm. **The PAH levels have decreased over this 12 month period to under 1ppm.** To date, the trial has clearly proven that SS reduces the level of PAH in contaminated surface water run-off, far exceeding EU legislations criteria. In the future, Wiltshire Council is aiming to recycle the spent SS as a waste to fuel energy, which burns at 10 - 18,000 BTU per pound. In the immediate future we are installing Smart Sponge technology in all of the depots we use to tip out gully waste.



Brian Lanham Weather and Drainage Manager

"Working alongside the Smart Sponge® team whilst investigating this product has made the decision making so much easier, and I believe we have chosen the right product for the right job."

Sarah Peterson Technical Assistant

"Smart Sponge® has shown excellent results throughout our entire trial. I have been impressed with every aspect of Smart Sponge®, especially the ease of using and maintaining the product. I am very much looking forward to the next developments involving the use of Smart Sponge® within Wiltshire."

West Lothian River Protection Trials Case Study

In February 2012, West Lothian Council decided to trial the Smart Sponge® Ultra Urban Filters at the downpipes for the A899 Road Bridge a four-lane carriageway over 700 metres long which drains runoff directly into the River Almond through four 225mm diameter pipes to see how much hydrocarbon pollution could be prevented from entering the river.

They decided to trial the Naylor Smart Sponge® Ultra Urban Filters (UUF) positioned at the base of the down pipes from the bridge - this is one of several Smart Sponge® bridge solutions that is available and was chosen to allow ground level easy access for monitoring and changeover purposes.

Four UUF units were installed in February 2012 and monitored by SAC Consulting Limited under an Environmental Monitoring Contract with West Lothian Council as part of their remit to monitor various water courses. The four units were removed in October 2013 and found to have absorbed over 48 litres of hydrocarbons from the run off into the river as well as high levels of silt & sedimentation changing the liquid contaminant into a solid waste.

The project has successfully demonstrated the ability of Smart Sponge® to absorb hydrocarbons from the runoff from the bridge and of the three treatment options available from Smart Sponge® the Ultra Urban Filter provides the greatest absorption rates whilst also intercepting detritus from the bridge deck.



Graeme Hedger Officer with West Lothian Council

"The pilot scheme has tested Smart Sponge® products in a variety of challenging locations. Evidence from the monitored trial suggests that the products are effective at intercepting and locking up hydrocarbons in runoff preventing pollution from reaching receiving watercourses helping the council meet its obligations under the European Water Framework Directive. The use of Smart Sponge® products is to be continued beyond duration of the pilot scheme in a number of the locations included in the pilot scheme."

THE **SMARTER** SOLUTION TO: Remove pathogens from stormwater

"The presence of bacteria in stormwater is a serious problem and poses significant health risks that increasingly result in the contamination of water bodies."

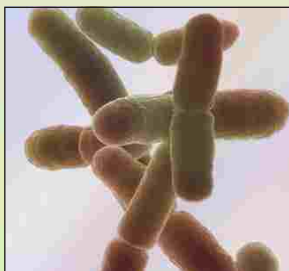
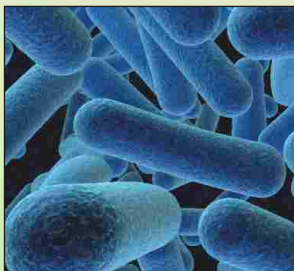
Roger Goulding - National Advisor, EA.

"We've looked at the capability of Smart Sponge® Plus to remove bacteria from urban streams and drainage affecting bathing waters. Following dramatic successes in the laboratory, field trials have shown potential for it to work....."

Smart Sponge® **PLUS**

Apart from the standard Smart Sponge® there is also Smart Sponge® **PLUS** which has all the features of being able to remove hydrocarbons as well as being the only non-toxic, fully recyclable filtration system that destroys bacteria at street level.

The presence of bacteria in stormwater is a serious problem and poses significant health risks that increasingly result in the contamination of water bodies. The greatest opportunity to reduce this bacterial count is during rain events through the control and treatment of stormwater run-off. This can be achieved by the Smart Filter® system fitted with Smart Sponge® **PLUS** which can also be adapted and used as part of a full treatment system for Combined Sewer Overflows (CSO's)



Smart Sponge® Plus's

ability to remove E.coli, Enterococci, Salmonella and many more pathogens from moving water makes it the ideal solution.

THE SMARTER SOLUTION TO:

Remove pathogens from stormwater

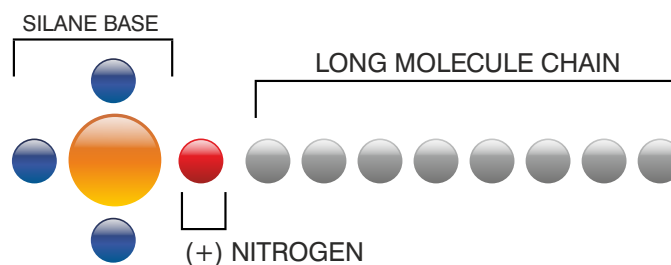
Smart Sponge® PLUS technology

Smart Sponge® PLUS for Hydrocarbons Plus Bacteria

- Smart Sponge® PLUS dramatically reduces coliform bacteria found in stormwater, industrial wastewater and municipal wastewater
- Smart Sponge® PLUS can be engineered using controlled test parameters (such as modifying flow rates and coliform bacteria concentration) to meet your performance requirements
- Smart Sponge® PLUS is designed to assist water systems to meet Total Maximum Daily Load Limits (TMDLs) for coliform bacteria
- When properly installed and maintained Smart Sponge® PLUS provides a significant reduction in coliform bacteria

Smart Sponge® PLUS – has all the features of standard Smart Sponge® as well as the dual action capability of destroying disease-causing micro-organisms from surface water such as:

- Aspergillus Niger • Trichophyton Mentagrophytes • Penicillium Pinophilum
- Chaetomium Globosum • Trichoderma Virens • Aureobasidium Pullulans
- Escherichia Coli • Salmonella • Streptococcus • Enterococci



Environment Agency laboratory tests confirmed a 99.9% removal of E. Coli and 99.5% reduction for Enterococci with a Smart Sponge® Plus treatment train, clearly demonstrating its effectiveness in achieving Log 1 and Log 2 reduction levels.

Roger Goulding - National Advisor, EA

"We've looked at the capability of Smart Sponge® Plus to remove bacteria from urban streams and drainage affecting bathing waters. Following dramatic successes in the laboratory, field trials have shown potential for it to work, if silt and sediment can be successfully removed before the treatment train."

Anti-microbial agent

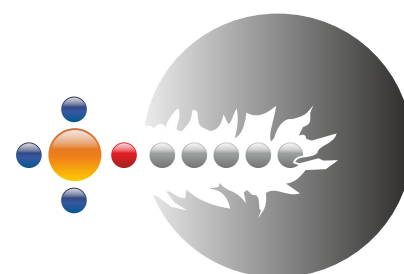
In the Smart Sponge® PLUS, the anti-microbial agent is chemically and permanently bound to the polymer surface and serves to control fungi, static odour and mildew.

The anti-microbial mechanism is based on the agent's electromagnetic interaction with the micro-organism cell membrane, causing the micro-organism disruption but no chemical or physical change in the agent.

Anti-microbial activity does not reduce the agent capability or cause its depletion and, therefore, maintains long-term effectiveness. Test results demonstrated the maximum bacterial removal rates of Smart Sponge® PLUS in both dry and wet weather sampling for fecal coliform ranged from 89.4 to 99.6 percent; and for Enterococcus, 96.2 to 99.9 percent.

Contaminants	Concentration Range	P.S.D d50	Performance	Filter bed depth
Oil & Grease	> 100ppm	-	>95%	> 100mm
	< 100ppm	-	>75%	> 100mm
Bacteria				
E.coli	1x10 ³ CFU*/100ml	-	>90%	>1.5m
Fecal Coliform	1x10 ³ CFU*/100ml	-	>90%	>0.9m
Enterococcus	1x10 ⁴ CFU*/100ml	-	>90%	>0.9m
Total Coliforms	1x10 ⁴ CFU*/100ml	-	>90%	>1.5m
TSS	100-300ppm	>15μ	>80%	>1.5m
TSS	>100ppm	>100μ	>80%	>0.6m
T. Phosphorous		>15μ	>40%	>1.5m

* Colony Forming Units



Physical inactivation of Bacteria - Rupture of the Cell Wall

THE SMARTER SOLUTION TO:

Remove hydrocarbons from carriageway run-off

"In tests, Wiltshire County Council reduced hydrocarbon concentrations in their road gullies from 8,000ppm to 1ppm"

Smart Gully® Range

The clever push fit design incorporates a finned rubber gasket ensuring a snug fit replacing the rodding bung ensuring no loss of hydraulic capacity or engineering design. Smart Gully® incorporates the unique Smart Sponge® technology that removes hydrocarbons from stormwater.

The Smart Gullies® have a Smart Gully Adaptor® already fitted and are supplied complete with a purpose designed Smart Pak® already installed and are available for both plastic and concrete gullies.

Range table (Complete Smart Gully® units)

Prod No.	Description	Dims (mm)
SGCO2	Concrete Smart Gully®	375 ID 900 deep
SGCO3	Concrete Smart Gully®	450 ID 750 deep
SGCO4	Concrete Smart Gully®	450 ID 900 deep
SGCO5	Concrete Smart Gully®	450 ID 1050 deep
SGP67004	Plastic Smart Gully®	450 ID 900 deep x 160 outlet
SGP67005	Plastic Smart Gully®	450 ID 750 deep x 160 outlet
SGP67003	Plastic Smart Gully®	450 ID 900 deep x 178 outlet
SGP67009	Plastic Smart Gully®	450 ID 750 deep x 178 outlet
SGP67002	Plastic Smart Gully®	375 ID 750 deep x 178 outlet
SGV07536	Vitrified Clay Smart Gully®	300 ID 610 deep x 100 outlet
SGV07537	Vitrified Clay Smart Gully®	300 ID 610 deep x 150 outlet
SGV07545	Vitrified Clay Smart Gully®	375 ID 760 deep x 150 outlet
SGV07556	Vitrified Clay Smart Gully®	450 ID 915 deep x 150 outlet

* all Smart Gullies® c/w 1 x Adaptor.

The special Smart Gully Adaptors® (SGA) are also available for retrofitting in existing gullies:



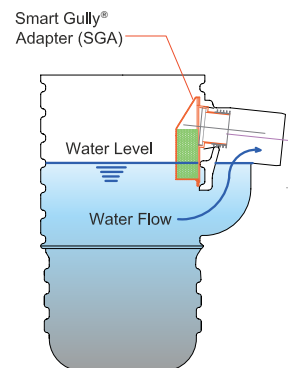
SGA - Backplate



SGA - Frontplate

Range table (Smart Gully Adaptor® units & spares)

Prod No.	Description	Dims (mm)
SGA01 - 12	Smart Gully Adaptor® (body only)	H260 x W160 x D75 Not including spigot
SGA02 - 12	Smart Gully Adaptor® c/w Smart Pak & seal	H260 x W160 x D75 Not including spigot
SGS01	Smart Seal for SGA (spare)	100 x 110 dia
SMPK66-2.5	Smart Sponge® Smart Pak refill	150 x 150 x 62.5



Naylor Smart Gully® Showing SGA inserted into rodding eye, resulting in no reduction in flow.

Smart Sponge® technology is based on its proprietary blend of synthetic polymers aimed at removal of hydrocarbons and oil derivatives from surface water.

This unique process creates a very porous structure with hydrophobic and oleophilic characteristics capable of selectively removing hydrocarbons while allowing high flow through rates for water.

As hydrocarbons are absorbed into its structure, the Smart Sponge® swells and maintains porosity and filtering capabilities.



The Smart Sponge® unique molecular structure is based on innovative polymer technologies that are chemically selective to hydrocarbons.

The SGA's have a purpose designed Smart Pak® fitted to absorb the hydrocarbons - it is specially designed to last 12 months in a worst case scenario and maintenance is simplicity itself and takes just a few seconds.

The Smart Sponge® technology transforms the pollutants into a stable solid waste for easy recycling.

Smart Sponge® waste to energy finalises the closed-loop solution with the spent Smart Sponge® creating 10,000-18,000 BTU per pound with no resulting waste product.

Smart Sponge® can also be used as an anti-microbial technology capable of destroying disease causing micro-organisms from surface water such as E.coli, Streptococcus and Enterococci to name but a few.

THE **SMARTER** SOLUTION TO:

Remove hydrocarbons from oil water interceptors

In recent tests carried out on a 'typical' MOD facility, it was shown that a 64% saving in maintenance costs could be achieved together with a 99% saving in the volume of environmental waste

Passive Skimmer / Interceptor Enhancer Range

The Smart Sponge® Passive Skimmers are installed within existing interceptors/separators (OWI's) to dramatically increase the effectiveness of the OWI (from typically 45% removal to 95% removal) whilst at the same time reducing annual maintenance costs by up to 64%.

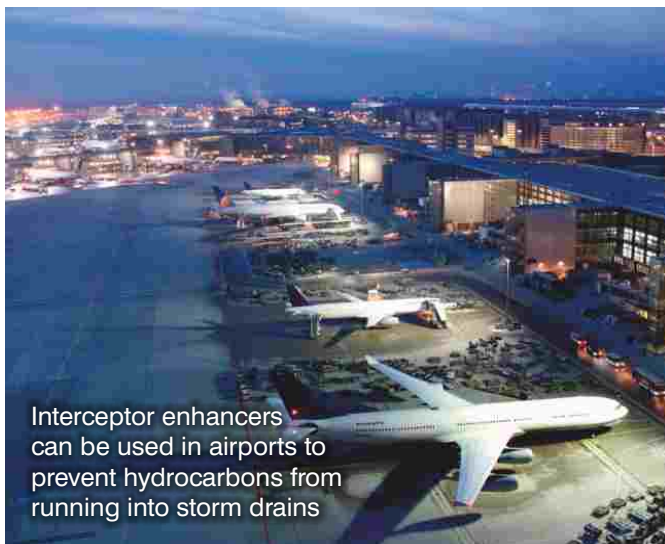
The regulations controlling the maintenance of interceptors/separators (OWI's) advise six monthly inspections and emptying and recharging with clean water when required. A new method of reducing both maintenance costs and environmental waste when servicing OWI's by the use of the Smart Sponge® Interceptor Enhancers has shown dramatic results.

The Smart Sponge® absorbs the hydrocarbon contamination and locks it into the molecular structure of the polymer, transferring the hydrocarbons into a solid waste suitable for either controlled disposal or for use as an alternative fuel. This unique ability means that instead of disposing of tonnes of contaminated liquid waste it is now possible to reduce this dramatically to a few kilos of solid waste, thus achieving dramatic savings in both cost and environmental benefits.

Range table (Interceptor Enhancers/Passive Skimmers)

Prod No.	Description	Dims (mm)
PS1313-40	Small Passive Skimmer	330 X 330
PS1818-20	Medium Passive Skimmer	457 X 457
PS2727-10	Large Passive Skimmer	686 X 686

Pack sizes: Small - 40pk, Medium - 20pk, Large - 10pk



Traditionally, maintenance of an OWI would consist of a tanker with a 2 man gang extracting the whole volume of the OWI (in the case of even a medium sized OWI this could amount to 110,000 litres or 110 tonnes) which would take many trips plus the disposal costs of the contaminated waste. The tanker would then have to re-charge the OWI to bring it back to operating condition.

Taking the same OWI as an example and now using a Smart Sponge® Passive Skimmer as a solution, this would transform the 116 tonnes of liquid waste into just 145 kg of solid waste and the maintenance procedure becomes just a 2 man job with a van. The cost and environmental benefits of this new system are obvious, particularly when many such OWI's can be serviced in a typical day.

In recent tests carried out on a 'typical' MOD facility, it was shown that a 64% saving in maintenance costs could be achieved together with a 99% saving in the volume of environmental waste – and even this 1% of remaining waste can be used as an alternative fuel as part of the Waste for Energy initiative creating a truly closed-loop system of maintenance where everyone benefits.

Deployment Guidance (Oil Water Interceptors)

		No of PS to absorb hydrocarbon		
NSB*	Area Drained	PS1313	PS1818	PS2727
1.5S	833	10	6	3
3.0S	1,666	19	11	5
4.5S	2,499	28	16	8
6.0S	3,332	38	22	10
10S	5,553	NA	36	17
12S	6,670	NA	43	20
15S	8,330	NA	NA	25
20S	11,106	NA	NA	34
25S	13,883	NA	NA	42

* Nominal Size Bypass

The Smart Sponge® Family

Smart Filter®, Smart Brake® & Smart Stop® Range

The Smart Filter®:

Specifically designed for end of pipe applications and installations through which contaminated or polluted water flows. The unique design allows the Smart Filter® to either sit inside or outside the pipe connection and will absorb hydrocarbons that pass through the system during normal conditions. The Smart Filter® is available in 2 different standard sizes and will accommodate standard pipe sizes.

Flow rates are catered for through the design of the Smart Filter®, sized to take the first flush effect plus a safety factor of 2x with any excess passing through the bypass facility.



Smart Filter®



Orifice Plate

The Smart Brake®:

Is a collaboration of design from the Smart Filter® and houses the Smart Paks within a more confined area which allows normal flow through the system. The Smart Brake's® unique design works during an event and slows the flow rate whilst absorbing any hydrocarbons present, allowing the final outfall flow to disperse reducing flooding, resulting in the contaminated flow from travelling further along a water course. The Smart Brake® will also absorb any hydrocarbons present within a normal flow, effectively acting as a Smart Filter®.



Unit showing overflow connection

The Smart Stop®:

Uses the basic principles of the Smart Filter® but houses the Smart Paks within a more confined area which allows normal flow through the system. The Smart Stop's® unique design works during an event where more hydrocarbons are present within the resulting flow and the volume of hydrocarbons are quickly absorbed within the Smart Paks which swell into the defined cage and seal the outfall pipe providing the contaminated flow from travelling further along a water course. The contaminated water is then stopped at source enabling the hydrocarbon clean up to be targeted in one area reducing the impact to the environment. The Smart Brake® will also absorb any hydrocarbons present within a normal flow, effectively acting as a Smart Filter®.

N.B. A suitable silt trap device is recommended prior to the Smart Filter® chamber to prolong the life of the Smart Sponge®. If this is impractical a silt sump is recommended within the Smart Filter® chamber.

Smart Filter® Standard Range

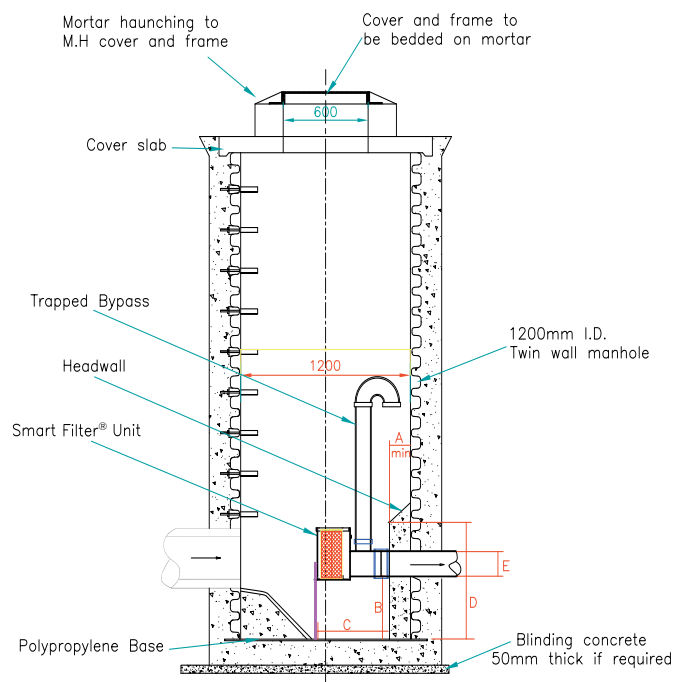
Prod No.	Description	Dims (mm)	Qty
SF01-30302	Smart Filter® c/w 2 No. 305 x 305 Std Smart Paks. 150 dia outlet for flow up to 14 l/s	360 x 330 x 330	1
SF02-38382	Smart Filter® c/w 2 No. 380 x 380 Std Smart Paks. 150 dia outlet for flow up to 22 l/s	400 x 400 x 400	1
SF01-30302P	Smart Filter® c/w 2 No. 305 x 305 Plus Smart Paks. 150 dia outlet for flow up to 14 l/s	360 x 330 x 330	1
SF02-38382P	Smart Filter® c/w 2 No. 380 x 380 Plus Smart Paks. 150 dia outlet for flow up to 22 l/s	400 x 400 x 400	1

Smart Brake® Range

Prod No.	Description	Dims (mm)	Qty
SB01-30302	Smart Brake® c/w 2 No. 305 x 305 Std Smart Paks. Specify orifice size for desired flow	360 x 330 x 330	1
SB02-38382	Smart Brake® c/w 2 No. 380 x 380 Std Smart Paks. Specify orifice size for desired flow	400 x 400 x 400	1

Smart Stop® Range

Prod No.	Description	Dims (mm)	Qty
SS01-30302	Smart Stop® c/w 2 No. 305 x 305 Std Smart Paks. 150 dia outlet for flow up to 14 l/s	360 x 330 x 330	1
SS02-38382	Smart Stop® c/w 2 No. 380 x 380 Std Smart Paks. 150 dia outlet for flow up to 22 l/s	400 x 400 x 400	1



Typical Installation showing overflow connection and silt trap.

The Smart Sponge® Family

Smart Filter® Chamber Range

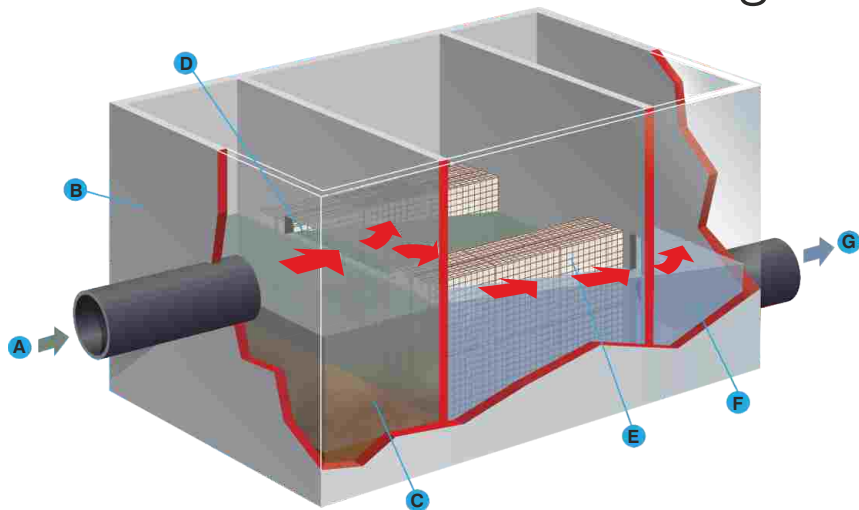


Diagram Key

- A. Inflow
- B. Lightweight composite chamber with vehicle loading capability
- C. Chamber with weir to trap sediment
- D. Flow passes through Smart Paks and through side orifices
- E. Smart Paks to absorb hydrocarbons
- F. Collection chamber with outlet to sewer
- G. Outflow

Note: Arrows show direction of water flow

Smart Filters® for Highways, Large Catchment Areas etc:

Specifically designed for extreme storm events and larger flow situations, the basic principles of the smaller Smart Filters® can be adapted to virtually any flow and also adapted to site restrictions.

The Smart Filters® come in several standard modular chamber sizes but can also be manufactured bespoke to suit specific site conditions. Contaminated wastewater enters the system into a settlement chamber and passes through an orifice into a distribution chamber and then is passed through the Smart Sponge® units (Paks) which removes up to 95% of all hydrocarbons. The cleaned water then passes through purpose designed side orifices to exit the treatment chamber via the outlet pipe.



Smaller Smart Filter® being lowered into position

Smart Filter's® Advantages:

- Treats 100% of the storm flow
- Removes 95% of hydrocarbons
- Removes heavy metals & silts
- Can cope with extreme conditions
- Shallow excavations
- Low head drop
- Modular design
- Virtually any flow catered for
- Waste product 100% recyclable
- Easy maintenance procedure

Prod No.	Description	Dimensions WxLxH	Treated Flow (l/s)	Max Flow (l/s)	380 x 380 Smart Paks	Pak Height (no.)	Aux Silt Capacity	Max Oil Capacity	Head Drop across unit
SF03.1A	Smart Filter® 44 l/s Flow, c/w 200mm dia pipes	0.8 x 1.2 x 1.2	10.9	44	4	1	190 litres	48 litres	380mm
SF03.1B	Smart Filter® 88 l/s Flow, c/w 300mm dia pipes	0.8 x 1.2 x 1.2	21.7	88	8	1	75 litres	96 litres	380mm
SF03.2A	Smart Filter® 130 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	32.6	130	12	1	210 litres	144 litres	380mm
SF03.2B	Smart Filter® 265 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	70.4	265	24	2	420 litres	288 litres	760mm
SF03.2C	Smart Filter® 350 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	94	350	32	2	75 litres	384 litres	760mm
SF03.3A	Smart Filter® 400 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	117	425	40	2	275 litres	480 litres	760mm

N.B. A suitable hydrodynamic separator (HDS) should be utilised prior to the Smart Filter® to remove the majority of silt from entering the filter. An auxiliary silt storage, is provided as a fail safe on all units. Treated Flow calculations are calculated according to first flush effect for typical storms.

The Smart Sponge® Family

Ultra-Urban® Filter Range

The Ultra-Urban® Filter with Smart Sponge® is an innovative low-cost BMP that helps meet anti-pollution requirements with effective filtration, efficient application and moderate maintenance. The Ultra-Urban® Filter absorbs oil and grease and captures trash and sediment from stormwater run-off before it enters the storm drain system. The Ultra-Urban® Filter is ideal for commercial, industrial and construction applications. The filter is available in two standard designs; one designed to clip onto the side of a catch basin in a row according to the flow (CO) and the other which is a single unit designed for typical drop-in catch basins and gullies (DI).

The Ultra-Urban® Filter, made of a high strength corrugated recycled content plastic, is designed for use in surface water drains that experience oil and grease pollution accompanied by sediment and debris. Rubbish and sediment accumulate in the upper basket chamber while oil and grease are absorbed in the filtration media.

Code	Max Flow (l/s)	Area Drained (m ²)	Oil Capacity (litres)	Silt Capacity (cm ³)	Typical Life (Years)	Media Life (Years)	Head Drop (mm)
DI1414N	17.7	1,275	21	425	2.3	1-3	790
DI1414H	12.0	860	13	230	2.1	1-3	560
DI1616N	22.7	1,635	25	510	2.1	1-3	790
DI1616H	17.0	1,225	19	285	2.1	1-3	560
DI2020N	31.5	2,260	31	850	1.9	1-3	790
DI2020H	23.3	1,675	24	480	1.9	1-3	560

N.B. The above drained areas and Min Life calculations are based on a typical 50mm rainfall with an anticipated worse case hydrocarbon contamination level of 30mg/100ml (a more typical level would be 10mg for normal use).



Sectional view of UUF showing Smart Sponge®

Performance

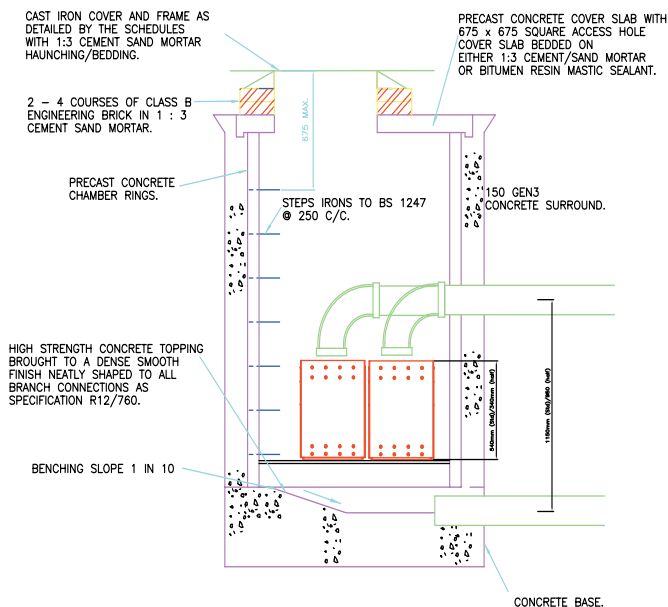
Field and laboratory tests have confirmed the capability of the Smart Sponge® to absorb, depending on the type of oil contaminant, up to 2-3 times its own weight and remove 70% to 95% of the hydrocarbons present in stormwater run-off, typically in the range of 5 to 30 mg/litre (ppm). The captured oil is permanently bound within the Smart Sponge®, eliminating leaching and allowing for easy disposal of the filtration media. Flow rates through the DI1616H filters exceed 17 l/s.

Installation

The Ultra-Urban® Filter is easily installed and installation time varies depending upon mounting devices selected. A single mounting bracket made of 16 gauge galvanised steel is required for the installation of the CO series of UUF. The Ultra-Urban® Filter should not be installed where modules obstruct the drain pipe outlet. The size of the drain should allow room for stormwater overflow. The Drain Inlet (DI) series Ultra-Urban® Filter will suspend from the drain into the catch basin through a structural plastic mount and funnel mechanism (see drawings).

Maintenance

The Ultra-Urban® Filter should be serviced as needed to remove sediment and debris, according to expected debris accumulation. The sediment and debris can be quickly vacuumed out of the modules through the opening of the drain with conventional maintenance equipment. For example, a CO installation with four to five Ultra-Urban® Filter modules can be typically serviced in 10 minutes or less. Under normal operating conditions the Ultra-Urban® Filter should be replaced every 1-3 years.



Twin Ultra Urban® Filters installed in typical chamber

Design

The Ultra-Urban® Filters can be positioned within a chamber to take run-off from any area and require a difference in invert according to the drawing above. There is a range of sizes to choose from according to the area to be drained, with additional units able to be positioned alongside one another to increase the flow capability. Units should be emptied with a standard vacuum pipe on a regular basis and changed when they weigh approximately twice the installation weight.

The Smart Sponge® Family

Line Skimmers

Line Skimmers are ideal for creating lines of hydrocarbon protection in areas such as ponds and streams as well as clarifying wells and marinas. Installation is carried out by placing the line skimmers across the water course, tied off to fixed points. The line skimmers can also be tied to one another to create longer protection booms as required. Smart Sponge® Line Skimmers are non leaching so cannot contaminate the water during replacement



Prod No.	Dry Weight		Spent Weight		Litres
LS104-10 (1.2m)	0.7kg		2.8kg		2.4Ltr
LS110-04 (3m)	1.9kg		7.6kg		9.0Ltr
LS304-04 (1.2m)	2.2kg		8.8kg		6.5Ltr
LS308-04 (2.4m)	4.4kg		17.6kg		13.0Ltr
LS408-04 (2.4m)	5.9kg		23.6kg		17.0Ltr

Line Skimmer weights before and after application

Applications

- Preserving Ecologically Sensitive Areas
- Coastal Marshlands
- Estuaries
- Grass Flats
- Fishing and Breeding Grounds
- Boat Docks and Marinas
- Marine Fueling Locations
- Clarifying Wells



Line Skimmers deployed at Linlithgow Loch

Disposal Options

As local conditions, product use and exposure can vary widely, the end user must determine the most appropriate disposal method for a spent Smart Sponge® or Smart Sponge® Plus product. However Smart Sponge® samples saturated with hydrocarbons both in the lab and in the field have been tested according to the USA EPA's Toxicity Characteristic Leaching Procedure ("TCLP"). These tests show that Smart Sponge® is a "non-leaching" (i.e., non-detect or "N.D.") product. As a result, Smart Sponge® technology can afford many cost effective and environmentally friendly disposal options. The following waste disposal and resource recovery systems are available for disposal and/or recycling of the spent Smart Sponge® products.

Waste to Energy Facilities

This is a specialised segment of the solid waste industry and within the USA this is a recognised route for used spent Smart Sponge® as an alternative fuel in the production of electricity. The spent Smart Sponge® generates between 10,000 – 18,000BTU per pound (0.45kg).

Cement Kilns

This industry has used the spent Smart Sponge® as an alternative fuel in the production process of Portland Cement. This process is considered a beneficial re-use of waste products. The BTU value of spent Smart Sponge® is consistently above the average acceptable levels set for this high temperature process.

Landfills

As mentioned above, spent Smart Sponge® products have been classified as a solid waste within the USA and have been accepted at Subtitle D Landfills. Discussions are ongoing with the Environment Agency to establish similar classification for the UK.

THE **SMARTER** SOLUTION TO: Quick Installation & Maintenance

Passive Skimmers

It is intended that proactive checks are completed on a six monthly basis, any remedial work will be managed reactively.

1. Fix a tether rope to the absorbent Passive Skimmer and record the weight in Kg
2. Fix the tether so that the Passive Skimmers can be recovered but allowing the skimmer to float freely.
3. Every 6 months withdraw the Passive Skimmer, shake off excess water and check and record weight. If weight is above trigger value replace skimmer.

Passive Skimmers are deemed spent if their weights are greater than:

Size	Dry Weight	Spent Weight
PS1313 (Small)	0.5kg 	2.0kg (approx. 2.4 litres) 
PS1818 (Medium)	0.9kg 	3.6kg (approx. 4.2 litres) 
PS2727 (Large)	1.9kg 	7.6kg (approx. 9.0 litres) 



Passive Skimmers are available in Small, Medium and Large packs
PS1313 (Small) shown

Smart Gully Adaptor®

Smart Gully Adaptor® Instructions for SGA Installation and Maintenance.



Insert the back plate into the rodding eye of the gully



Slide the front plate with Smart Pak in down onto the back plate



Back plate will lock into position on the tabs provided



Remove the front plate by sliding upward



Weigh the unit with Smart Pak in



Remove and replace spent Smart Pak



Install new Smart Pak and refit

Size	Dry Weight	Spent Weight
SMPK (150X150X62.5)	0.5kg 	1.2kg (approx. 1.4 litres) 

Smart Paks - Smart Filters®

It is intended that proactive checks are completed on a six monthly basis, any remedial work will be managed reactively.

1. Open the top of the Smart Filter® & using the plastic ties lift out the wire cage containing the Smart Paks, snip the plastic ties & remove the individual Smart Pak, shake off excess water & weigh the Smart Pak and record this on the maintenance schedule.
2. If the recorded weight is greater than twice the dry weight, replace the Smart Paks accordingly with new ones. If less than twice the weight, a changeover date can be calculated based on the relative weights.
3. Relace the Smart Paks back in the wire cages, renewing any plastic ties to hold the cages closed and slide the cage back into

Size	Dry Weight	Spent Weight	Size	Dry Weight	Spent Weight
SMPK1212-2.5	1.95kg 	4.6kg 	SMPK1515-2.5	2.9kg 	7.2kg 
SMPK1212-3	2.22kg 	5.5kg 	SMPK 1515-3	3.5kg 	8.7kg 

Smart Pak weights before and after application (assumes a non confined unit).

THE **SMARTER** SOLUTION TO: Quick Installation & Maintenance

Ultra-Urban® Filters

The Ultra-Urban® Filters can be installed as a drop in unit with a collar or as a slot in system secured to the side of the gully or inlet with brackets.

The Ultra-Urban® Filter Is Easily Installed

Installation time varies depending upon mounting devices selected. A single mounting bracket made of 16-gauge galvanised steel is required for the installation of the Curb Opening (CO) series. The Ultra-Urban® Filter should not be installed where modules obstruct the drain pipe outlet. The size of the drain should allow room for stormwater over flow. The Drain Inlet (DI) series Ultra-Urban® Filter will suspend from the drain into the catch basin through a structural plastic mount and funnel mechanism.



Low Maintenance

The Ultra-Urban® Filter should be serviced as needed to remove sediment and debris, according to expected debris accumulation. The sediment and debris can be quickly vacuumed out of the modules through the opening of the drain with conventional maintenance equipment. Under normal operating conditions the Ultra-Urban® Filter should be replaced every 1-3 years.

Prod No.	Dry Weight	Spent Weight	Litres
UUF1414N	9.1kg 	27kg 	21Ltr
UUF1414H	5.9kg 	17kg 	13Ltr
UUF1616N	10.9kg 	32kg 	25Ltr
UUF1616H	8.2kg 	24kg 	19Ltr
UUF2020N	13.6kg 	40kg 	31Ltr
UUF2020H	10kg 	30kg 	24Ltr

Solutions
for Water
Framework Directive
Compliance

Smart Sponge® & Smart Sponge® **PLUS** technology effectively and efficiently reduces the amount of coliform bacteria, debris and hydrocarbons, to keep the UK's beaches, marinas, airports regulations in compliance with Bathing Water Directive and Stormwater regulations.





**A revolutionary new product
that is taking the
global surface water market
by storm**



BRITISH WATER
expertise worldwide

**Naylor Industries plc - more
than 100 years of manufacturing
and supply to the
Construction Industry**

- Vitrified clay pipe systems for trench and trenchless installation
- Thermachem - Chemical Drainage and Industrial Ceramics
- Band-Seal couplings for the repair of and connections into existing pipelines
- Plastic Land Drainage, Twinwall Ducting Systems and Access Boxes
- Yorkshire Flowerpots, a range of frostproof plant pots

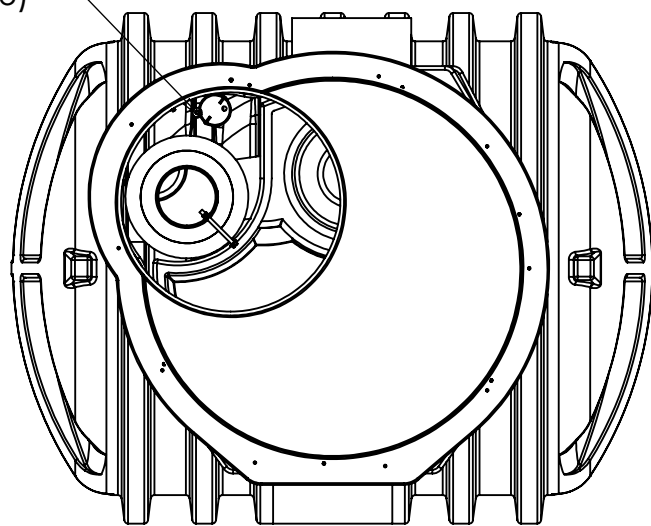


**NAYLOR
ENVIRONMENTAL**

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WEB: WWW.NAYLOR.CO.UK

Alarm Probe Tube
(see note 6)



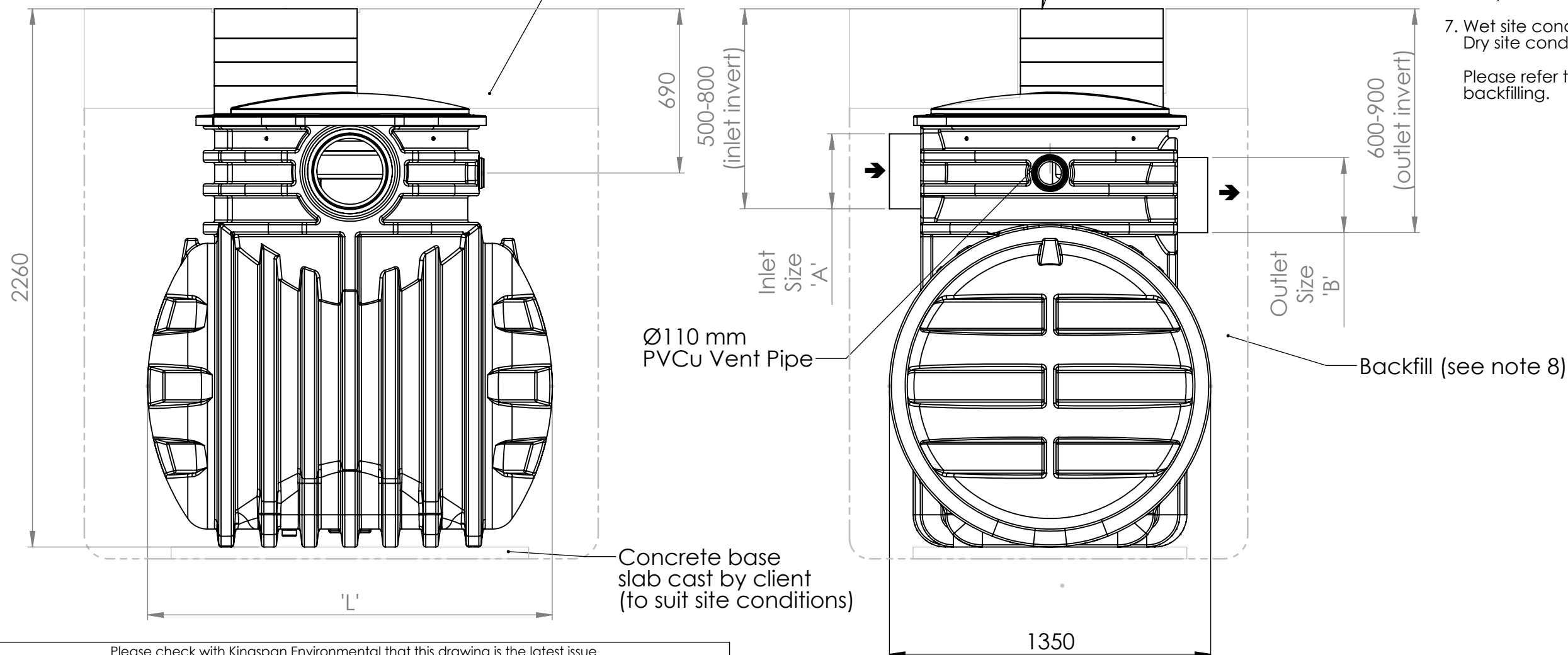
Unit Ref No	Nominal Flow	Dim L (mm)	Approx Empty Weight (kgs)	Fall across unit	Inlet Size 'A'	Outlet Size 'B'
NSBP003	3 L/s	1700	180	100	Ø160 mm Ø315 mm	Ø160 mm Ø315 mm
NSBP004	4 L/s	1700	180	100		
NSBP006	6 L/s	1700	180	100		

** Inlet/Outlet size
A must equal B**

Notes:-

1. Inlet/Outlet pipes are plain pipe Ø315 mm PVCu. The standard EN 858 states minimum connection sizes, units ordered with different sized connections are not fully compliant with the standard.
2. Extension necks for deeper inverts can be provided. These can be cut in 200 mm sections. Max 2.0m Invert recommended. Please ask our sales department for further details.
3. All units require appropriate cover and frame to suit applied loadings.
4. This drawing should be used for dimensional information only. It is essential that this drawing is read in conjunction with the installation guidelines supplied with the unit. (Copies are available from our sales dept.).
5. This drawing is also available on our website www.kingspanenv.com.
6. A Ø76 mm tube (internal) is supplied to house an oil alarm probe.
7. Wet site conditions - Concrete Backfill
Dry site conditions - Pea Shingle Backfill

Please refer to installation manual for details of correct backfilling.



Please check with Kingspan Environmental that this drawing is the latest issue

Issue	Date	Drawn by	Approved by	Description
07	15/12/11	S.Gill		CC1020
06	15/12/10	S.Gill		CC 934
05	24/03/10	S.Gill		CC817
04	24/02/10	S.Gill		CC794
03	23/02/10	S.Gill		Table Edited
02	23/09/09	S.Gill		Drawing Description Changed
01	19/03/09	S.Gill		Initial Release

Material : n/a
Finish : n/a
Weight : Kgs n/a

Tolerance : n/a
Thickness : n/a
Surface Area : n/a

Drawing : NSBP003,004 & 006 Sales Drawing

Page 1 of 1

Drg No: DSO993

All dimensions in mm

Scale: Not to scale

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001372

**NSBP003 – NSBP006 Class 1 & 2 Bypass Separator
Installation & Operation Guidelines**



Kingspan Environmental Service Contact Numbers:

GB: 0844 846 0500

NI: 028 3025 4077

IRL: 048 3025 4077

Enclosed Documents

DS0993P	NSBP003 – NSBP006 Class 1 & 2 Bypass Separator
DS1013P	NSBP003 - NSBP006 Installation Drawing
NSBEXT1zz	NSBP Neck Extension Assembly

Issue	Description	Date
04	CC1091	September 2012

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1 Introduction

- 1.1.1 These Guidelines represent Best Practice for the installation of the above Separator Units. Many years of specialist experience has led to the successful installation of thousands of separator units. It must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are appropriate for the specific ground conditions and in-service loads of each installation. Similarly, any information or advice given by our employees or agents regarding the design of an installation must be verified by a qualified specialist (e.g. Civil engineering consultant).
- 1.1.2 For guidance of Separator selection and application, please refer to the most recent issue of Environment Agency Guidelines pollution prevention guidelines No. 3 (PPG3).and BS EN 858.

1.2 Handling & Storage

- 1.2.1 Care must be taken to ensure that units are not damaged during delivery and handling on site. Please take care and place unit so that it cannot fall and become damaged
- 1.2.2 The design requirements of these products will frequently mean that the centre of gravity of the unit is "offset". Care must therefore be taken to ensure that the unit is stable when lifting. Rainwater may also collect inside units, particularly if they have been stored on site prior to installation, adding weight and increasing instability. Check units before lifting and pump out any excess water.
- 1.2.3 When lifting units, use webbing slings of a suitable specification. Do not use chains.
- 1.2.4 A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting separators, a spreader bar should be used where the slings would otherwise be at an angle > 30 degrees to the vertical.
- 1.2.5 Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.
- 1.2.6 We accept no responsibility for the selection of lifting equipment.
- 1.2.7 Whenever units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects, which may damage the unit. The units must be placed on ground, which is flat, and level and the unit orientated onto its side with even support. Do not roll separators.

1.3 Site Planning

The following points should be considered before installation of the equipment:

- 1.3.1 The discharge must have the consent of the relevant Environmental Regulator.
- 1.3.2 The installation should have Planning and Building Control approval.
- 1.3.3 Consider installing flow cut-off valves to isolate the separator in an emergency or during site cleaning operations. See Environment Agency Guidelines PPG3.
- 1.3.4 We will fit a tube to receive the alarm probe. This tube provides protection and ensures that the probe is positioned at the correct level to sense the oil build up. The tube design and probe level setting assumes the use of our standard oil alarm system and may not be suitable for other alarm supplier's equipment. The probe tube may be fitted either within the neck or within the body of the unit. It should be extended to ground level when fitted in the body of the tank and you should make provision to extend the tube to the required height before backfilling. Consult the alarm supplier's instructions for they're detailed fitting installation instructions.
- 1.3.5 Consider venting of the unit. Comply with local regulations. In the UK, comply with the following regulations. For Petrol Stations: Health and Safety Guidance Note 41 (HS(G)41). For other applications: BS8301: 1985 (obsolescent) BS EN 752 Building Drainage. Adequate ventilation should be provided to the separator. The ventilation pipe should be as short as is practicable and be terminated not less than 2.5m above paving nor less than 1m above the head of an openable window or other opening into a building within a horizontal distance of 3m. Each neck should be vented independently, we advise against joining these below ground prior to their rising as vent stacks.
- 1.3.6 Consider installation of a sampling point downstream of the separator. There is no suitable facility to effectively sample the wastewater from inside the unit.

- 1.3.7 Uncontaminated run off such as roof water should be excluded from separators. (EA Guidelines PPG3.)
- 1.3.8 Ground conditions and water table level should be assessed. If the water table will be above the base of the units at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill, and an appropriate installation method devised to avoid this.
- 1.3.9 If the discharge is to a soakaway, a porosity test should be carried out as part of the assessment of suitability for sub-soil drainage.
- 1.3.10 The separator must be installed at a level, which will allow connection to the incoming drain and a free discharge at the system outlet. The water table must be below the discharge outlet.
- 1.3.11 Do not install the unit deeper than necessary, ensure that you purchase extension shaft kits. The minimum invert depth of the unit is shown on the customer drawing.
- 1.3.12 Adequate access must be provided for routine maintenance. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation.
- 1.3.13 There must be at least 1 metre of clear, level ground all around the access covers to allow for routine maintenance.
- 1.3.14 It is essential that a mains water supply is accessible for routine cleansing and refilling after removal of waste material and liquid.
- 1.3.15 Provide electrical supply for alarm system.
- 1.3.16 Installation should only be carried out by suitably qualified and experienced contractors in accordance with current Health and Safety Regulations. Electrical work should be carried out by a qualified electrician, working to the latest edition of IEE wiring regulations.
- 1.3.17 This unit is designed to operate with gravity in and out flows. The unit is not designed to operate with a pumped influent.

2 Installation

2.1 Installation - General

- 2.1.1 When units are installed in unstable ground conditions where movement of the surrounding material and/or unit may occur, the connecting pipework should be designed to minimise the risk of damage from differential movement of the unit(s) and/or surrounding material.
- 2.1.2 For separators with burial depths greater than 1000mm from cover level to the top of the unit, specific site conditions should be taken into consideration and the backfill designed to bear any loads which may be applied during and after installation to prevent the tank being subjected to these loads.
- 2.1.3 The excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete pads should extend a minimum of 300mm horizontally beyond the unit in all directions.
- 2.1.4 In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the sidewalls of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.
- 2.1.5 In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be dewatered using suitable pumping equipment and this should continue until the installation is complete.
- 2.1.6 During installation care must be taken to ensure that the body of the unit is uniformly supported so that point loads through the unit are avoided.
- 2.1.7 The concrete Specification is not a site specific installation design.

GENERAL CONCRETE SPECIFICATION IN ACCORDANCE WITH BS EN 206-1 (BS 8500-1)		
TYPE OF MIX		(DC) DESIGN
PERMITTED TYPE OF CEMENT		BS 12 (OPC): BS 12 (RHPC): BS 4027 (SRPC)
PERMITTED TYPE OF AGGREGATE (coarse & fine)		BS 882
NOMINAL MAXIMUM SIZE OF AGGREGATE		20 mm
GRADES: C25 /30 C25 /30 C16 /20		REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS REINFORCED (EG. FOR HIGH WATER TABLE) UNREINFORCED (NORMAL CONDITIONS)
MINIMUM CEMENT CONTENT	C30 C20	270 - 280 Kg/M ³ 220 - 230 Kg/M ³
SLUMP CLASS		S1 (25mm)
RATE OF SAMPLING		READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS EN 12350-1
NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER		

- 2.1.8 Pea Shingle - 6 mm to 10 mm rounded pea shingle, offering low point loading characteristics is considered to be the most suitable material for back filling in dry ground installation. (PEASHINGLE ONLY TO BE USED IN DRY SITE CONDITIONS).

2.2 Separator Installation

2.2.1 DRY GROUND CONDITIONS

- 2.2.2 Excavate the site, allowing for a minimum clearance on all sides and base of the unit of 200mm and level the base.
- 2.2.3 Ensure that the hole is kept dry. Should any rain or surface water collect in the hole, this should be pumped out.
- 2.2.4 A base of at least 200mm of lean mix concrete should be provided.
- 2.2.5 Lower the tank in the hole using a rope sling through the lifting points provided on the tank. Under no circumstances should the sling be attached to the inlet pipe or the outlet pipe.
- 2.2.6 Position the inlet pipe in line with the incoming drain. Note that the inlet and the outlet pipes are clearly embossed on the tank. The unique profile of the base will help to level the tank, but make sure the tank is in the truly upright position in order to maintain the 25mm head difference between the inlet and outlet pipes.
- 2.2.7 After any concrete in the base has taken up its initial set (usually after one day), ballast the tank by putting approximately 0.5m depth of water into it.
- 2.2.8 Backfill the space around the tank with pea gravel or similar material (PEASHINGLE ONLY TO BE USED IN DRY SITE CONDITIONS). The backfill should be free from organic material, large stones, brick or sharp objects. Backfilling should be carried out in layers, making sure that voids are not left under and around the sides of the tank and that there are no localized stress concentrations. It is most important that the installer progressively fills the tank with water to the level above the backfill in order to stabilize pressures on the tank.
- 2.2.9 Remove any temporary covers and connect up the tank inlet and outlet pipe to your own pipework. Do not use reducers.
- 2.2.10 Backfilling can now proceed up to ground level in 300mm stages ensuring tank is ballasted in all chambers as you go.
- 2.2.11 A galvanized lockable manhole cover (600x600mm) and frame is to be fitted to suit specific site loadings, THE TANK MUST NOT BE LOAD BEARING. The top of the manhole should not be sat

below the local ground level. If necessary a further neck extension should be added to the tank to bring the cover up to ground level (see section 6).

2.2.12 Venting can be provided through the cover or a Tee piece arrangement on the outlet/inlet.

2.2.13 WET GROUND CONDITIONS

2.2.14 Excavate a hole to appropriate depth allowing at least 300mm for lean mix concrete and hard-core base. Allow for tank width plus at least 400mm with additional allowance for any necessary shuttering.

2.2.15 De-water the excavation using suitable pumping equipment. Ensure that the pump discharge does not saturate the ground in the immediate vicinity. In wet ground conditions the installer should ensure that the base is adequate to support the weight of the tank and its contents. If the base of the excavation is unstable, i.e. running sand or similar, excavate an additional 250-300mm below concrete levels and fill up with compacted hard-core. Place a sheet of polythene over the hard-core and up the sides of the excavation before putting in the concrete cradle.

2.2.16 Lay a bed of concrete (minimum 150mm thick) on top of the polythene at the base of the excavation. De-watering is to continue until you are satisfied that the concrete has cured.

2.2.17 Lower the tank onto the concrete bed, ensuring that the inlet and outlet are in the correct position. Ensure the tank is upright and then ballast it with water to a maximum of 500mm deep.

2.2.18 Haunch up the concrete bed at least 450mm all round the base, ensuring that all voids in the concrete are eliminated and at least 150mm of concrete is left below the tank base.

2.2.19 Backfill to the invert depth with concrete. Ensure that the water level inside the tank is maintained no more than 250-300mm above concrete backfill level. It is most important that the installer progressively fills the tank with water to a level above the backfill in order to stabilise pressure on the tank.

2.2.20 Backfill evenly all round the tank, consolidating in layers. The backfilling should start before the base has hardened and be a single continuous operation so that the tank has a full concrete jacket without joins.

2.2.21 DO NOT use vibrating rammers to consolidate concrete. DO NOT discharge concrete directly on to the tank. Ensure that the concrete is not too wet and that it is tamped in around the tank.

2.2.22 Align and connect pipework.

2.2.23 Build up a shell of concrete around the neck of the tank to 150-200mm thickness before completing the backfill with a suitable material. Care must be taken to avoid distortion of the neck whilst concreting this area.

2.2.24 Fit cover and frame. Apply surface finish e.g. turf

2.2.25 Do not empty tank until the concrete backfill has cured. Tanks may be left filled with water.

2.3 Pipework Connections

2.3.1 In all cases, ensure that the outlet pipework level is maintained for correct operation. (Unless specified on the order, the fall across the unit will be as per the customer drawings).

2.3.2 Small units are generally fitted with **PVCu spigots** to both the outlet and the inlet.

2.3.3 Connect using the same size PVCu socket or a suitable reducer.

2.3.4 Larger units are generally fitted with **Our GRP** manufactured sockets.

2.3.5 The connecting pipework should be pushed into the socket. Ensure that the seal is secure and watertight before backfilling the pipe.

2.3.6 Alternatively, proprietary **flex seal couplings** can be obtained to fit over the outside of the site pipework and the outside of the GRP socket. When using this connection method, please be aware that the outside GRP laminate is not perfectly regular and that you may need to use a sealant on the outside diameter of the GRP. Take care not to over tighten the coupling when connecting to the GRP and ensure that the seal is secure before backfilling the pipe. Drawing DS0185 provides the

ID of our GRP sockets. The OD is variable, as the wall thickness can be up to 15-20 mm. If purchasing a flexseal coupling for use with clay /concrete, we suggest that a size 110 mm larger than the ID is selected.

2.4 Oil Level Alarm Neck Fitting

- 2.4.1 We will fit a tube to receive the oil alarm probe. This provides protection and ensures that the probe is positioned at the correct level to sense oil build up.
- 2.4.2 See alarm supplier information and ensure that the probe is placed within the tube and can be accessed from ground level.
- 2.4.3 Continue backfilling with concrete over the tank body to the required level. Build up a shell of concrete, minimum 225mm thick, around the access shaft(s). When using pea shingle continue to back fill up to required level. Temporarily strut the access shaft to avoid distortion. Temporarily strut the access shaft to avoid distortion.
- 2.4.4 Where we supply an extension shaft to meet a deeper invert requirement, a coalescer extension tube will be required. When fitting, ensure that the tube is extended to just below the surface so that the coalescer can easily be removed. Remove the coalescer from the unit before adding the extension tube. When refitting, ensure that the coalescer is correctly inserted and fully pushed into the base fitting. This is important and you must ensure that the coalescer is correctly located before putting the unit in to operation. Reattach the bracket to the extended neck so it lines up with the hole in the coalescer. Class 2 units NSBP do not require a coalescer extension.
- 2.4.5 It is advisable to seal the joints on the extension shafts (particularly on sites with high ground water) with proprietary sealant or by GRP lamination. Temporarily strut the extension neck(s) to avoid distortion during back filling. Where more than one neck section is required to suit a deep invert, consider back-filling section by section. If the extension neck is too long, it can be trimmed using a fine-toothed saw. The original fixing hole bolting the coalescer to the neck should be sealed.
- 2.4.6 Ensure that the vent socket if cut out, is replaced elsewhere. The maximum recommended inlet invert is 2000mm (using 500mm long extension sections). If you are installing a unit deeper than this then you must make your own arrangements for removing and replacing the coalescer. Consideration must be given to the depth of lift involved.
- 2.4.7 Continue back-filling, ensuring minimum 225mm concrete thickness around the access shaft/ extension neck and alarm access tube (as applicable). When using pea shingle back fill as required.
- 2.4.8 Mains powered Alarm Systems. See alarm suppliers installation instructions. Lay 82mm diameter PVCu underground ducting between the alarm panel location and the alarm probe position. The ducting should be 500mm below ground level and fitted with a drawstring for later cable insertion. Any changes of direction should be by long radius bend. If necessary, drill a suitable hole in the access shaft adjacent to the alarm probe terminal box, to accept the ducting and seal.
- 2.4.9 In traffic areas a suitable top slab must be constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access shafts. Loads applied to covers and frames must bear on the top slab, not the access shaft.
- 2.4.10 The unit should be filled with clean water up to the invert level of the outlet pipe. Ensure the unit identification is placed/ marked inside the neck for future information. The unit is now ready for use.

2.5 Alarm Installation

- 2.5.1 Install the alarm probe and control panel, as per the Suppliers Alarm Installation Guidelines. Ensure that the probe is positioned correctly for the required storage of oil. The table below indicates the maximum volume of oil to be stored and the depth of floating oil expected in the separation chamber.

Unit	Recommended Minimum Oil Storage volumes in litres	Actual Oil Storage volume in litres	Max. (100%)Depth of floating oil (Static)
NSBP003	45 litres	107	210mm
NSBP004	60 litres	107	210mm
NSBP006	90 litres	107	210mm

3 Operation

- 3.1.1 The unit is sized on treating a defined area and rainfall (5 mm/hour) EN.858 Part 1 and using the factor provided in the Environment agency guidelines PPG3. (0.0018 = 6.5mm/hr) The unit will treat the entire flow i.e. NSBP003 will treat a flow of 3 litres per second. If the flow is greater than this then the excess flow will bypass the main treatment chamber. A NSBP003 unit will work in bypass mode over 3 and up to 30 litres per second. Flows in excess of this will back up on to the site. During a storm, the rain falls and flushes any surface debris, silt or oil into the tank. This first flush, up to the maximum rated flow is fully treated. As the severity of the storm increases, so does the rate of flow increase. The liquid entering the separator after the first flush tends to be cleaner and so, in lower risk applications, is allowed to bypass the oil separation chamber for directly discharge.
- 3.1.2 The bypass unit has three chambers. The entire flow up to the units listed flow rating is fully treated and passes through all chambers. (E.g. NSBP003 treats 3 litres per second.)
- 3.1.3 Flows in excess of this rating will bypass the separation chamber and the liquid passes untreated to the outlet chamber.
- 3.1.4 The first chamber will accumulate silt and grit. The maximum volume that can be retained is the rating x 100 e.g. a NSBP003 is capable of holding 300 litres of silt.
- 3.1.5 The second / separating chamber is sized to separate oil at the rated flow rate and to accumulate the required oil storage volume. A NSBP003 maximum oil storage volume is 45 litres. An oil probe should be positioned to detect the accumulation of oil when there is no or low flow conditions. The probe should be positioned so that the alarm operates at 90% of the rated oil storage volume.
- 3.1.6 In bypass flow conditions, the flow moves directly from the inlet to the outlet chamber avoiding the separating chamber.
- 3.1.7 Separators can be purchased either as Class 2, or as Class 1. Class 1 Bypass Separators are fitted with a removable coalescer which also includes media to further improve the discharge quality. The coalescer media requires maintenance.
- 3.1.8 Bypass Class 1 & Class 2 Separators are not effective for the removal of soluble or emulsified pollutants such as oil/detergent mixes found in vehicle wash effluents. With permission such discharges should be drained to the foul sewer. Consult our technical department for Separation equipment to meet these applications.

4 Maintenance

4.1 Waste Removal and Servicing

- 4.1.1 Separated light liquid **must** be removed from separator when the oil capacity has been reached.
- 4.1.2 An oil level alarm system is available for purchase which gives warning when the separated light liquid/water interface level reaches 90% of the maximum recommended oil storage volume.

- 4.1.3 Separators should be inspected at least every six months or more frequently if experience dictates. A log should be maintained detailing the depth of oil found, any oil volume removed and any silt removal or cleaning carried out. A specimen maintenance log is included in the appendices.
- 4.1.4 Every site is different, in respect to the amount and type of silt generated by the drain design and installation. Frequently, the construction programme itself generates large and perhaps unusual quantities of silt and grit. We do recommend that following the initial installation, an inspection of the separator contents be made to check that building rubble has not entered the unit. Further inspections at 3 and 6 months should be made so as to be able to assess the volumes of silt and oil accumulated. The inspection and emptying programme can then be defined following the first 6 months site experience. We recommend leaving a maximum interval between inspections of 6 months.
- 4.1.5 Alarm probes should be removed and cleaned with water whenever waste material is removed from the separator. Please note the alarm may alert until the liquid level is replaced.
- 4.1.6 **Separator waste is a “special waste” under the terms of The Waste Management Code of Practice. The Code imposes a duty of care on the waste producer to ensure that the Cleansing contractor is registered with the Environment Agency and that the final disposal of the waste is to a licensed facility.**
- 4.1.7 You should consider the purchase of a maintenance service, which includes bi-annual inspections, removal of oil and silt, cleaning of the alarm probe and cleaning or replacement of the coalescer (where appropriate).

4.2 Waste Removal Procedure – Oil & Silt

- 4.2.1 **Oil can only be effectively removed when there is no flow entering the unit. Isolate the unit and prevent flow from entering. Always remove the oil before attempting to remove the coalescer. If this is not done, when the coalescer is withdrawn the oil can coat the media surface and when replaced the oil may be forced through the media, contaminating the effluent.**
- 4.2.2 Remove the access cover and lower the desludging hose in to the separation chamber. Draw off the surface oil.
- 4.2.3 If removing the silt, lower the desludge hose to the base of the tank and empty the contents of the chamber. Ensure that you access and clean both compartments.
- 4.2.4 Remove the alarm probe, if fitted, clean with water and replace.
- 4.2.5 Consider the period of time that the coalescer has been installed and consider removing and inspecting (cleaning or replacing) the coalescer media. If removed, ensure that it is correctly replaced and secured into position. Replace the access covers. It is best to lower the water level to aid re-fitting.
- 4.2.6 Re-fill the separator with clean water up to the outlet level.
- 4.2.7 If an alarm is fitted, it will display an alarm condition until the separator is re-filled. Check alarm operation when unit full.

4.3 Checking the Coalescer Assembly

- 4.3.1 Coalescers, where fitted, may be cleaned periodically to maintain efficiency. Coalescers should be checked following a major incident and replaced if necessary. Please contact us if you wish to purchase the coalescer media.
- 4.3.2 Identify the type and size of separator (shown on labels inside the access neck).
- 4.3.3 Assemblies weighing less than 25 Kg may be removed by hand. Heavier assemblies should be lifted by mechanical means. Any lifting device employed must be capable of lifting:
 - 4.3.3.a In excess of the maximum assembly weight.
 - 4.3.3.b The assembly completely out of the access shaft.
 - 4.3.3.c Giving a smooth and controlled lift.
 - 4.3.3.d Swinging the assembly to one side clear of the access shaft.

Unit	Dry Weight (Kg)	Wet Weight (Kg)	Silted Weight (Kg)	Replacement Media Part No.
NSBP003	5.7 kg	≈50 kg	≈60 kg	402715
NSBP004	5.7 kg	≈50 kg	≈60 kg	402715
NSBP006	5.7 kg	≈50 kg	≈60 kg	402715

4.3.4 Ensure that the area around the access shaft is clear and that there is space to place the assembly once removed. If space is not available it will be necessary to support the assembly over the access shaft. e.g. by scaffold poles and platform.

4.3.5 Only remove the access cover when necessary to remove the assembly. Do not leave the access shaft uncovered and unattended.

4.4 Removing the coalescer assembly.

4.4.1 Undo and remove the bracket which secures the coalescer to the access shaft.

4.4.2 Lift the assembly with a smooth and steady motion. Coalescers will become lighter as water drains from the exposed media. Allow the water to drain completely. Assemblies blocked with fine silt may be very heavy.

4.4.3 Fully extract the assembly and set it down adjacent to the access shaft.

4.5 Cleaning the coalescer assembly/ Media Replacement.

4.5.1 Hose down the assembly using clean water at normal pressure. If the media is heavily contaminated with oil and silt, it may not be possible to clean it effectively by hosing. Do not allow untreated cleaning water to pass out of the unit. Continue hosing until the water runs clear.

4.5.2 To replace the media, undo the banding. Slide media off the core tube and slide new media on. Ensure all the apertures on the core tube are covered by the media. Re-secure or replace banding. Consider replacing media and banding every two years.

4.6 Replacing the coalescer assembly.

4.6.1 Position it over the access shaft.

4.6.2 Lower the assembly steadily into the access shaft ensuring that the end locates within the sump at the bottom of the tank. Re-secure the bracket.

4.6.3 Replace the access cover.

5 Connection of Extension Neck

(Option in 1800L Tanks only)

5.1.1 See the accompanying illustration.

5.1.2 Remove existing lid by unscrewing 8 screws and lifting off lid.

5.1.3 Apply mastic around flange of tank that joins to extension neck.

5.1.4 Place extension neck onto flange of the tank and screw down using 8 fixings.

5.1.5 Please refer to drawing NSBEXT1zz

5.1.6 Apply mastic to top face of extension piece that is joining to cover.

5.1.7 Place lid on top of extension neck and screw down using 8 fixings.

5.1.8 Backfill in 200mm stages with concrete (wet site) or peashingle (dry site), bracing neck during each stage until you reach the cover level.

5.1.9 For traffic area loading ensures you refer to tank installation section.

6 Emergencies

- 6.1.1 At sites where there is a high risk of spillage, spill kits containing drain seals, absorbent materials, disposal containers and other appropriate equipment should be held. In the event of a spillage on site, the material should be contained, (if a spill kit is not available, sand or soil may be used) and the Environment Agency notified immediately using the appropriate emergency hotline number listed in the Agency Guideline PPG3. Year 2012 - **0800 80 70 60**

HEALTH & SAFETY

These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following these guidelines.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by a qualified electrician.

Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Access covers should be selected with reference to the location of the unit and traffic loads to be accommodated. These are not (normally) part of the Separator supply.

When covers are removed precautions must be taken against personnel falling into the unit.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

Ensure that you are familiar with the safe working areas and accesses. Ensure that the working area is adequately lit.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

OIL ALARM SYSTEMS

PPG3 requires that the oil level alarm be fitted, tested and commissioned by a competent Installer. This is to ensure that the excessive oil probe is calibrated correctly, raising an alarm when 90% of the recommended maximum oil storage volume is reached. Should the oil level alarm fail to provide an early warning, excessive oil could pass through the separator, thus polluting the environment. This could result in substantial cleanup costs and legal action being taken under the water resources act 1991.

MAINTENANCE

The correct ongoing maintenance is essential for the proper operation of the equipment. Operators who rely on oil level alarms to prompt them to service separators between maintenance intervals run the risk of polluting should the alarms not work, hence the ongoing functional assessment of the oil alarm systems is fundamental if pollution incidents are to be avoided.

The removal of sediment and retained oil/grease should be carried out by a contractor holding the relevant permits to transport and dispose of such waste. The contractor must refer to the guidelines in this document.

SEPARATOR MAINTENANCE LOG



Site address/location
.....
Separator location
.....
Type of separator
Nominal Flow
Total capacity

Inspection/ Maintenance Date	Comments	Waste Volumes Removed (if appropriate)

Date: 17/08/2020

Site Ref

Hook lane

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

Road (attenuation)

Is discharge to: SPZ1? **N** Drinking Water Protection Area? **N**

Is site in close proximity to an area with sensitive environmental designation?
if so how close? **N** m

Is an additional treatment component required due to sensitivity? **Y**

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge **Y**

Component

- 1 Separator
 - 2 Pond
 - 3 N/A
- mitigation index
- X1 N/A
- Enhanced mitigation index
- Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.5	0.4	0.8	1.00
0.7	0.7	0.5	0.50
0	0	0	0.50
0.85	0.75	1.05	
0	0	0	1.00
0.85	0.75	1.05	
0	0	0	

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index	residual
0	0	0	

Treatments

To groundwater discharge **N**

Infiltration surface

- 1 N/A
 - 2 N/A
- Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	

Is a groundwater risk screening required?

N

Notes:

Date: 17/08/2020

Site Ref

Hook lane

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

Road

Is discharge to: SPZ1? ☐ N Drinking Water Protection Area? ☐ N

Is site in close proximity to an area with sensitive environmental designation?

☐ N

if so how close?

m

Is an additional treatment component required due to sensitivity?

☐ Y

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index
0.5	0.4	0.4

Treatments

To surface water discharge ☐ N

Component

- 1 N/A
- 2 N/A
- 3 N/A

mitigation index

X1 N/A

Enhanced mitigation index

Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	0.50
0	0	0	
0	0	0	1.00
0	0	0	
0.5	0.4	0.4	

Land Use

roads-low traffic

Hazard

low

TSS index	Metals index	HydroCar index	residual
0.5	0.4	0.4	

Treatments

To groundwater discharge ☐ Y

Infiltration surface

- 1 Separator
- 2 Soil only

Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.5	0.4	0.8	1.00
0.4	0.3	0.3	0.50
0	0	0	

Is a groundwater risk screening required?

☐ N

Notes:

Use smart sponge in gullies

Date: 17/08/2020

Site Ref

Hook lane

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

Roofs (attenuation)

Is discharge to: SPZ1? **N** Drinking Water Protection Area? **N**
Is site in close proximity to an area with sensitive environmental designation? **N**
if so how close? **m**
Is an additional treatment component required due to sensitivity? **Y**

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0.2	0.2	0.05

*2 residential roofs remove gross solids and sediments

Treatments

To surface water discharge **Y**

Component

- 1 Separator
 - 2 Pond
 - 3 N/A
- mitigation index
- X1 N/A
- Enhanced mitigation index
- Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.5	0.4	0.8	1.00
0.7	0.7	0.5	0.50
0	0	0	0.50
0.85	0.75	1.05	
0	0	0	1.00
0.85	0.75	1.05	
0	0	0	

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index	residual
0	0	0	

*2 residential roofs remove gross solids and sediments

Treatments

To groundwater discharge **N**

Infiltration surface

- 1 N/A
 - 2 N/A
- Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	

Is a groundwater risk screening required?

N

Notes:

Date: 17/08/2020

Site Ref

Hook lane

SuDS Water Quality Management CIRIA C753 Ch26

Simple Index Approach

Catchment

Roofs (infiltration)

Is discharge to: SPZ1? ☐ N Drinking Water Protection Area? ☐ N
Is site in close proximity to an area with sensitive environmental designation? ☐ N
if so how close? m
Is an additional treatment component required due to sensitivity? ☐ Y

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index
0.2	0.2	0.05

*2 residential roofs remove gross solids and sediments

Treatments

To surface water discharge ☐ N

Component
1 N/A
2 N/A
3 N/A
mitigation index
X1 N/A
Enhanced mitigation index
Residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0	0	0	1.00
0	0	0	0.50
0	0	0	0.50
0	0	0	
0	0	0	1.00
0	0	0	
0.2	0.2	0.05	

Land Use

roofs-residential

Hazard

very low

TSS index	Metals index	HydroCar index	residual
0.2	0.2	0.05	

*2 residential roofs remove gross solids and sediments

Treatments

To groundwater discharge ☐ Y

Infiltration surface
1 Soil only
2 N/A
Final residual pollution index

TSS MIndex	Metals MIndex	HydroCa MIndex	factor
0.4	0.3	0.3	1.00
0	0	0	0.50
0	0	0	

Is a groundwater risk screening required?

☐ N

Notes:

SURFACE WATER MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
S1	10.400	9.73	0.670	TO ACO DETAIL	ACO Q CHAMBER	TO ACO DETAIL	ACO Q FLOW CONTROL @ 2 L/S
S2	10.585	9.84	0.745	450ø	TYPE 3	A15 450x450	
S3	10.585	9.85	0.735	450ø	TYPE 3	A15 450x450	
S4	10.585	9.85	0.735	450ø	TYPE 3	A15 450x450	
S5	10.585	9.86	0.725	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S6	10.585	9.870	0.715	450ø	TYPE 3	A15 450x450	
S7	10.585	9.880	0.705	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S8	10.585	9.890	0.695	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S9	10.685	9.900	0.785	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S10	10.685	9.910	0.775	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S11	10.685	9.910	0.775	450ø	TYPE 3	A15 450x450	
S12	10.600	9.920	0.680	450ø	TYPE 3	D400 450x450	
S13	10.600	9.930	0.670	450ø	TYPE 3	A15 450x450	
S14	10.600	9.940	0.660	450ø	TYPE 3	A15 450x450	
S15	10.600	9.990	0.610	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S16	10.600	10.100	0.500	450ø	TYPE 3	A15 450x450	
S17	10.585	9.985	0.600	450ø	TYPE 3	A15 450x450	
S18	10.585	9.910	0.675	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S19	10.692	10.040	0.652	450ø	TYPE 3	C250 450x450	
S20	10.585	10.090	0.495	450ø	TYPE 3	A15 450x450	
S21	10.585	9.930	0.655	450ø	TYPE 3	A15 450x450	
S22	10.692	10.060	0.632	450ø	TYPE 3	C250 450x450	
S23	10.585	10.110	0.475	450ø	TYPE 3	A15 450x450	
S24	10.685	9.935	0.750	450ø	TYPE 3	A15 450x450	
S25	10.792	10.075	0.717	450ø	TYPE 3	C250 450x450	
S26	10.685	10.125	0.560	450ø	TYPE 3	A15 450x450	
S27	10.685	9.935	0.750	450ø	TYPE 3	A15 450x450	
S28	10.810	10.075	0.735	450ø	TYPE 3	C250 450x450	
S29	10.685	10.125	0.560	450ø	TYPE 3	A15 450x450	
S30	10.700	9.970	0.730	450ø	TYPE 3	B125 450x450	CATCHPIT MANHOLE
S31	10.600	9.980	0.620	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S32	10.600	10.100	0.500	450ø	TYPE 3	A15 450x450	
S33	10.500	9.860	0.640	450ø	TYPE 3	D400 450x450	
S34	10.825	9.880	0.945	450ø	TYPE 3	A15 450x450	
S35	10.765	9.890	0.875	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S36	10.700	10.000	0.700	450ø	TYPE 3	B125 450x450	
S37	10.700	10.050	0.650	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S38	10.700	10.100	0.600	450ø	TYPE 3	A15 450x450	
S39	10.700	10.200	0.500	450ø	TYPE 3	A15 450x450	
S40	10.700	9.900	0.800	450ø	TYPE 3	A15 450x450	
S41	10.700	10.180	0.520	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S42	10.700	10.180	0.520	450ø	TYPE 3	A15 450x450	
S43	10.700	10.320	0.380	450ø	TYPE 3	A15 450x450	
S44	10.700	9.950	0.750	450ø	TYPE 3	A15 450x450	
S45	10.745	9.97	0.775	450ø	TYPE 3	A15 450x450	
S46	10.745	9.980	0.765	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S47	10.745	9.990	0.755	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S48	10.745	10.000	0.745	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S49	10.745	10.275	0.470	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S50	10.745	10.345	0.400	450ø	TYPE 3	A15 450x450	
S51	10.745	10.010	0.735	450ø	TYPE 3	A15 450x450	
S52	10.798	10.136	0.662	450ø	TYPE 3	A15 450x450	
S53	10.745	10.187	0.558	450ø	TYPE 3	A15 450x450	
S54	10.745	10.036	0.709	450ø	TYPE 3	A15 450x450	
S55	10.798	10.136	0.662	450ø	TYPE 3	C250 450x450	
S56	10.745	10.187	0.558	450ø	TYPE 3	A15 450x450	
S57	10.745	10.060	0.685	450ø	TYPE 3	A15 450x450	
S58	10.798	10.136	0.662	450ø	TYPE 3	C250 450x450	
S59	10.745	10.187	0.558	450ø	TYPE 3	A15 450x450	
S60	10.600	10.025	0.575	450ø	TYPE 3	D400 450x450	CATCHPIT MANHOLE
S61	10.600	10.000	0.600	450ø	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S62	10.550	9.800	0.750	450ø	TYPE 3	D400 450x450	
S63	10.600	10.000	0.600	450ø	TYPE 3	D400 450x450	CATCHPIT MANHOLE

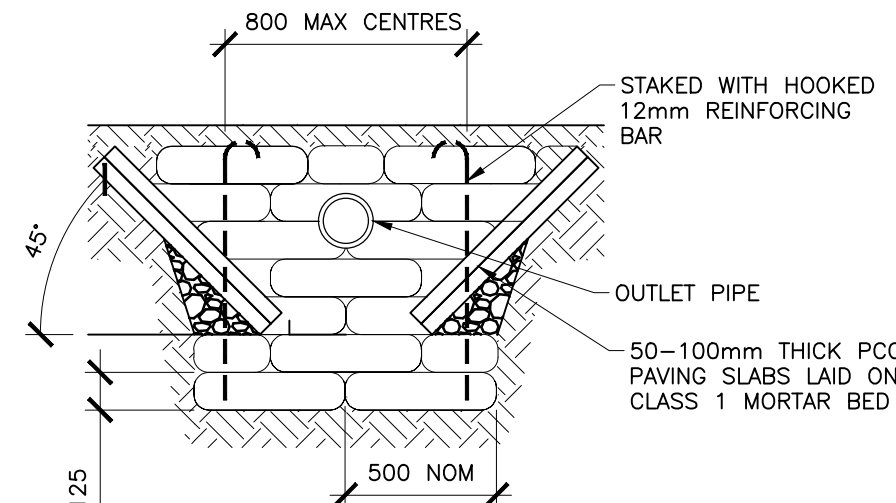
FOUL MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
F1	10.700	8.495	2.205	450ø	TYPE 3	A15 450x450	
F1ø	10.600	8.657	1.943	450ø	TYPE 3	D400 450x450	
F2	10.740	8.772	1.968	450ø	TYPE 3	D400 450x450	
F3	10.800	8.994	1.806	450ø	TYPE 3	D400 450x450	
F4	10.700	9.203	1.497	450ø	TYPE 3	D400 450x450	
F5	10.750	9.277	1.473	450ø	TYPE 3	D400 450x450	
F6	10.750	9.400	1.350	450ø	TYPE 3	D400 450x450	
F7	NOT REQUIRED						
F8	10.600	9.913	0.687	450ø	TYPE 3	A15 450x450	

SOAKAWAYS OPERATION AND MAINTENANCE REQUIREMENTS		
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
REGULAR MAINTENANCE	INSPECT FOR SEDIMENT AND DEBRIS IN PRE-TREATMENT COMPONENTS AND FLOOR OF INSPECTION TUBE OR CHAMBER AND INSIDE OF CONCRETE MANHOLE RINGS	ANNUALLY
	CLEANING OF GUTTERS AND ANY FILTERS ON DOWNPIPES	ANNUALLY (OR AS REQUIRED BASED ON INSPECTIONS)
	TRIMMING ANY ROOTS THAT MAY BE CAUSING BLOCKAGES	ANNUALLY (OR AS REQUIRED)
OCCASIONAL MAINTENANCE	REMOVE SEDIMENT & DEBRIS FROM PRE-TREATMENT COMPONENTS AND FLOOR OF INSPECTION TUBE OR CHAMBER AND INSIDE OF CONCRETE MANHOLE RINGS	AS REQUIRED, BASED ON INSPECTION
REMEDIAL ACTIONS	RECONSTRUCT SOAKAWAY AND/OR REPLACE OR CLEAN VOID FILL, IF PERFORMANCE DETERIORATES OR FAILURE OCCURS	AS REQUIRED
	REPLACEMENT OF CLOGGED GEOTEXTILE (WILL REQUIRE RECONSTRUCTION OF SOAKAWAY)	AS REQUIRED
MONITORING	INSPECT SILT TRAPS AND NOTE RATE OF SEDIMENT ACCUMULATION	MONTHLY IN THE FIRST YEAR AND THEN ANNUALLY
	CHECK SOAKAWAY TO ENSURE EMPTYING IS OCCURRING	ANNUALLY

CDM REGULATIONS 2015		
ARCH ASSOCIATES HAVE CONSIDERED AND, WHERE REASONABLY PRACTICABLE, AVOIDED FORESEEABLE RISKS IN THE PREPARATION OF THE DESIGN SHOWN ON THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.		
ACTIVITY	HAZARD	CONTROL
NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERTISE OF A COMPETENT CONTRACTOR		

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 - THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS.
 - THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.
 - MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.
 - IT IS THE CONTRACTORS SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL. NO CLAIM RESULTING FROM ABNORMAL TIP REQUIREMENTS WILL BE ENTERTAINED.

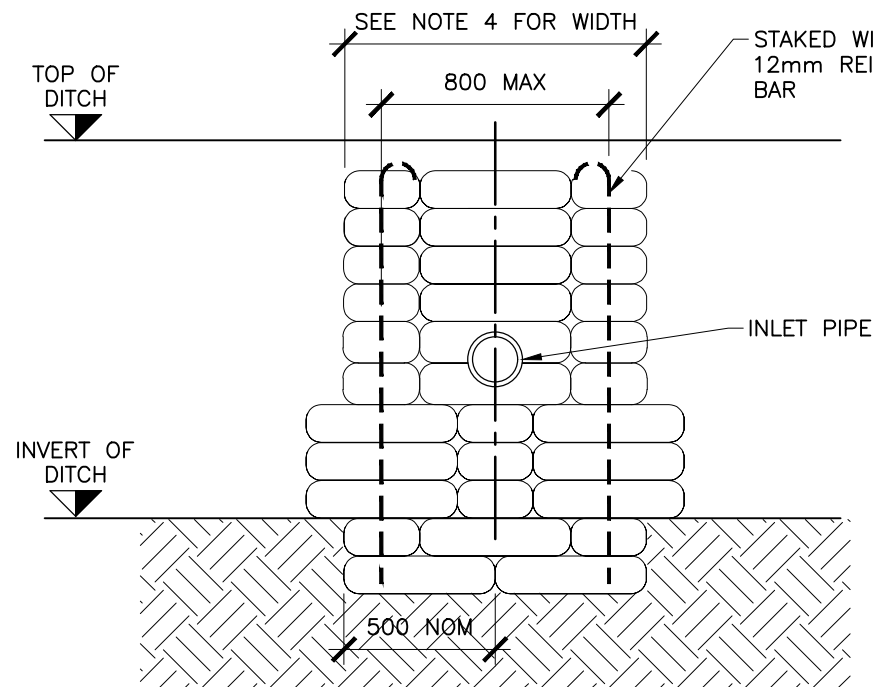
SUDS OPERATION & MAINTENANCE		
GENERAL		
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	REMOVE SEDIMENT & DEBRIS FROM PRE-TREATMENT DEVICES & FLOOR OF INSPECTION TUBE OR CHAMBER	ANNUALLY
	CLEANING OF ANY GUTTERS & ANY FILTERS ON DOWNPIPES	ANNUALLY
	TRIMMING ANY ROOTS THAT MAY BE CAUSING BLOCKAGES	ANNUALLY (OR AS REQUIRED).
MONITORING	INSPECT SILT TRAPS AND NOTE RATE OF SEDIMENT ACCUMULATION	MONTHLY IN THE FIRST YEAR & THEN ANNUALLY



ELEVATION OF HEADWALL OUTLET INTO & OUT OF POND (WITH SUMP)
(1:25)

HEADWALL NOTES.

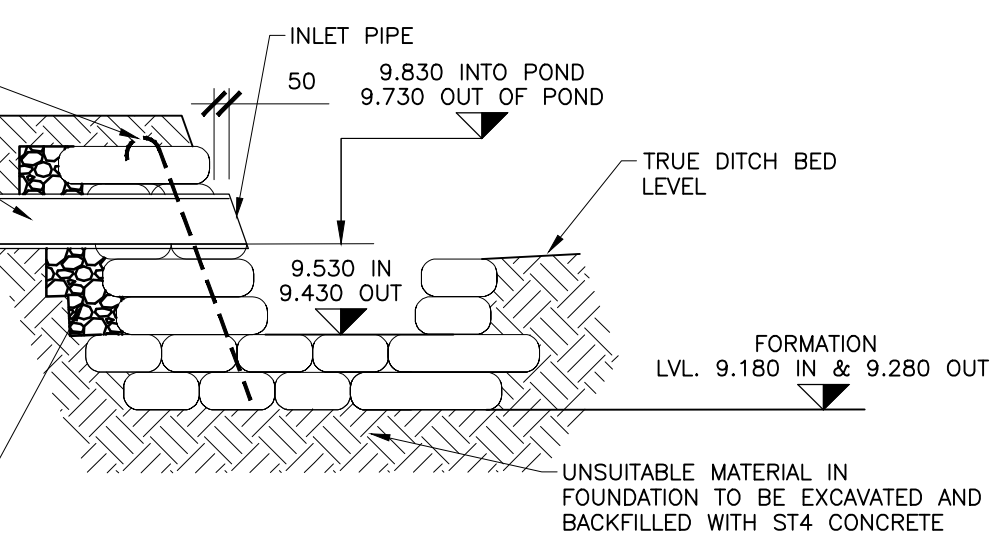
- BAGS SHALL BE OF HESSIAN OR CANVAS AND SHALL BE OF A SIZE TO PROVIDE A WALL THICKNESS OF 500mm.
- CONCRETE BAGWORK TO BE THREE QUARTER FILLED WITH 25mm SLUMP ST4 CONCRETE IMMEDIATELY PRIOR TO PLACING WITH THE ENDS SEWN.
- THE BAGS SHALL BE PLACED IN A MODIFIED FLEMISH BOND SO AS TO BREAK JOINT WITH THE MOUTHS AWAY FROM THE SURFACE AND BE TAMPED INTO POSITION TO FORM A RECTANGULAR BLOCK.
- EXTENT OF OUTLET PROTECTION TO BE THE GREATER OF 1500mm OR PIPE DIAMETER + 1200mm SPANNING THE OUTLET PIPE.



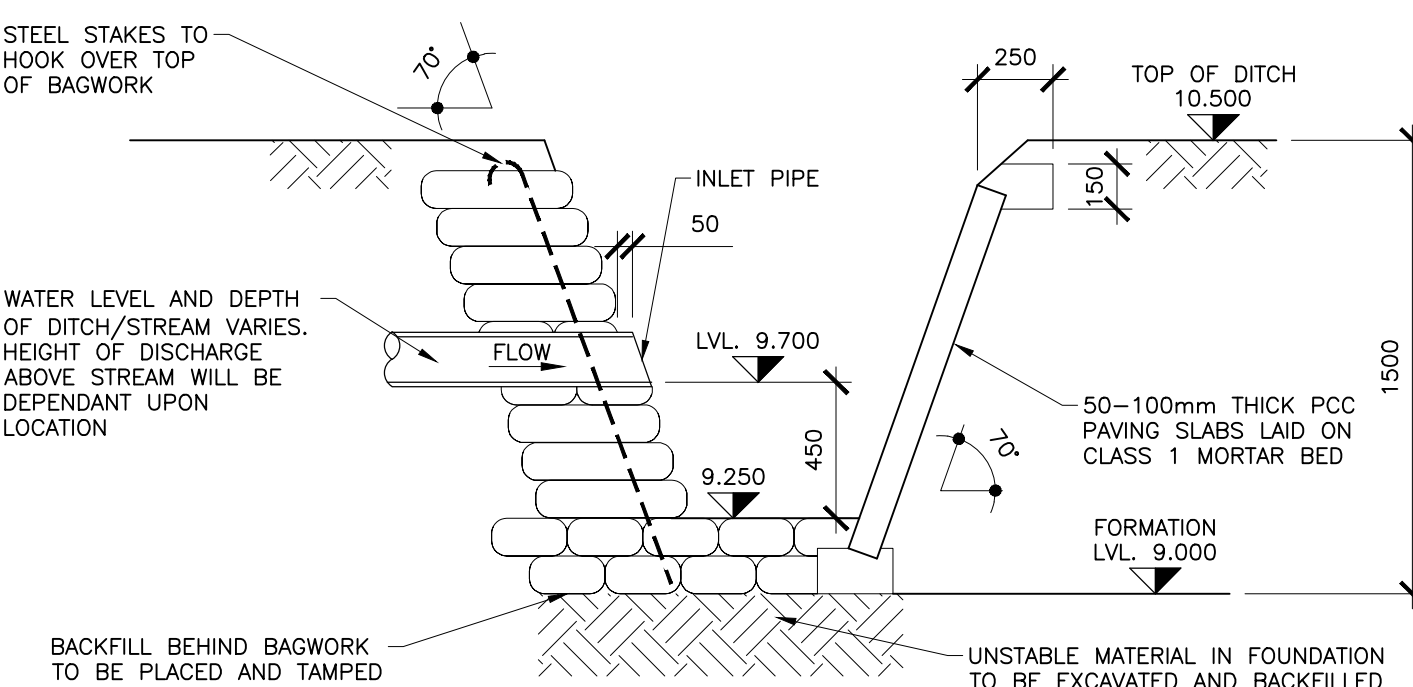
ELEVATION OF HEADWALL OUTFALL FROM POND TO SIDE OF DITCH
(1:25)

HEADWALL DETAIL 'A'
(1:25)

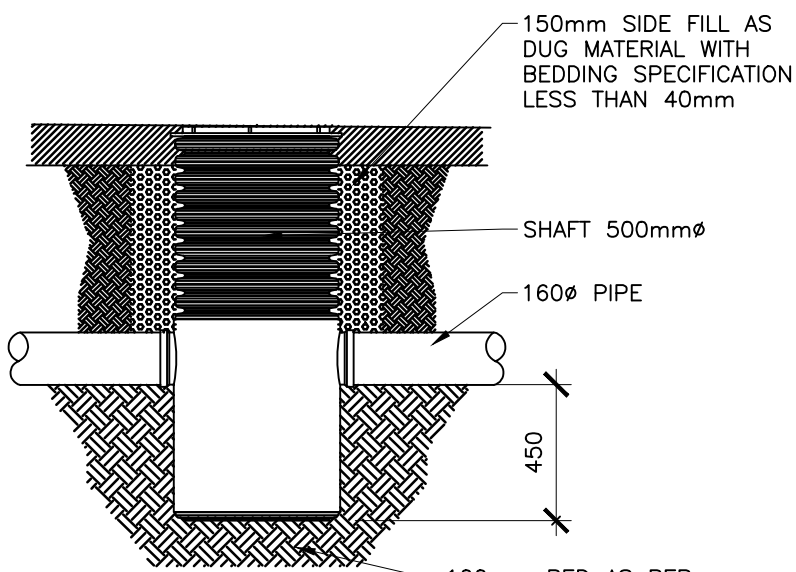
HEADWALL DETAIL 'B'
(1:25)



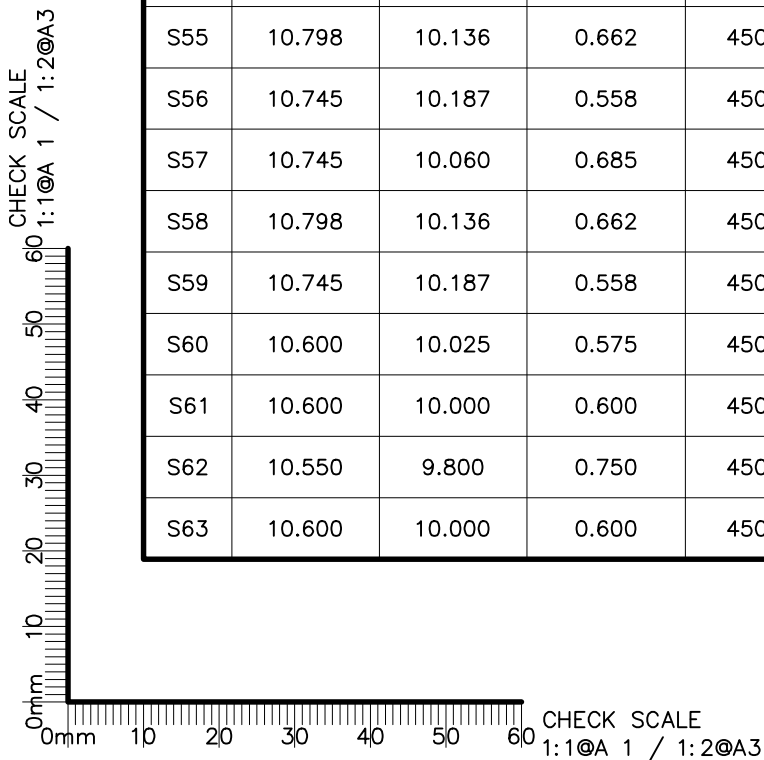
HEADWALL SECTION INTO & OUT OF POND (WITH SUMP)
(1:25)



HEADWALL SECTION OUTFALL FROM POND TO SIDE OF DITCH
(1:25)



SILT TRAP DETAIL
(1:25)



KERB TYPE HB 2 DETAIL
(1:10@A1)

KERB TYPE BN25 DETAIL
(DROPPED KERB)
(1:10@A1)

KERB TYPE BNO DETAIL
(DROPPED KERB)
(1:10@A1)

PCC EDGING DETAIL
(1:10@A1)

Revision	Date	Description	By
P7	13.08.20	UPDATED/DETAILS ADDED AS REQUESTED BY DRAINAGE ENGINEEG.	PJM
P6	17.07.20	S18 CATCHPIT ADDED & S1 AMENDED	CH
P5	03.10.19	SURFACE WATER AMENDS	CH
P4	11.09.19	DRAWING TITLE AMENDED.	PJM
P3	01.08.19	F7 REMOVED, F1 TO F6 UPDATED	JH
P2	19.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM
P1	15.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM

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ISO 9001:2015 engineering business environment	UKAS

Client	MAPLEDEAN PROJECTS LIMITED
Architect	

Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
---------------	---------------------------------------

Drawing Title			
DRAINAGE AND ROAD DETAILS SHEET 1			
Scale	Paper Size	Date	Checked By
AS SHOWN	A1	JULY 2019	CH
Project No.	Drawing No.	Revision	
AAL156	551	P7	

- GENERAL NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.
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 4. THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS.
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 6. MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.
 7. IT IS THE CONTRACTORS SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL, NO CLAIM RESULTING FROM ABNORMAL TIP REQUIREMENTS WILL BE ENTERTAINED.

CDM REGULATIONS 2015

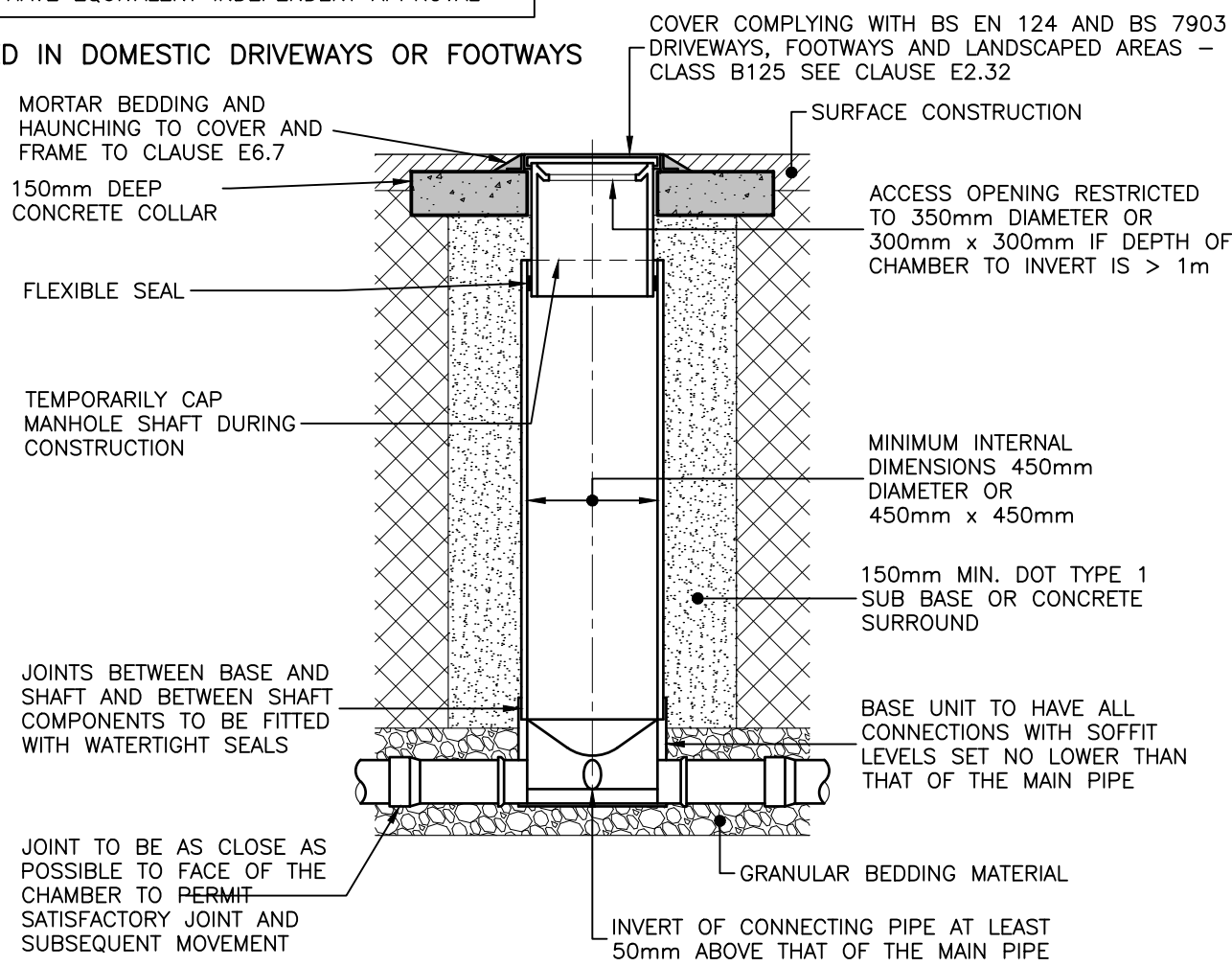
ARCH ASSOCIATES HAVE CONSIDERED AND, WHERE REASONABLY PRACTICABLE, AVOIDED FORESEEABLE RISKS IN THE PREPARATION OF THE DESIGN SHOWN ON THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.

ACTIVITY	HAZARD	CONTROL

NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERTISE OF A COMPETENT CONTRACTOR

PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 13598-1 AND BS EN 13598-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL

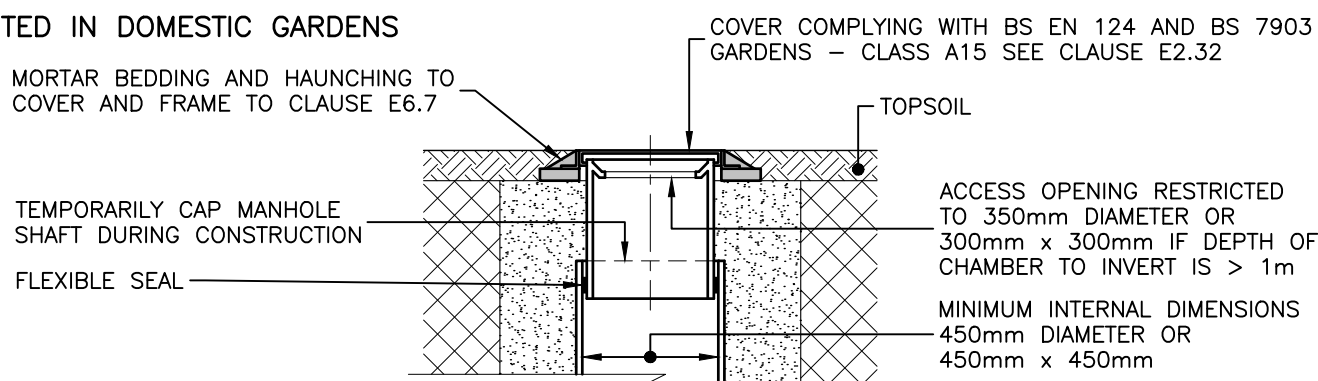
SITED IN DOMESTIC DRIVEWAYS OR FOOTWAYS



TYPICAL ACCESS CHAMBER DETAIL – TYPE 3
(FLEXIBLE MATERIAL DETAIL)

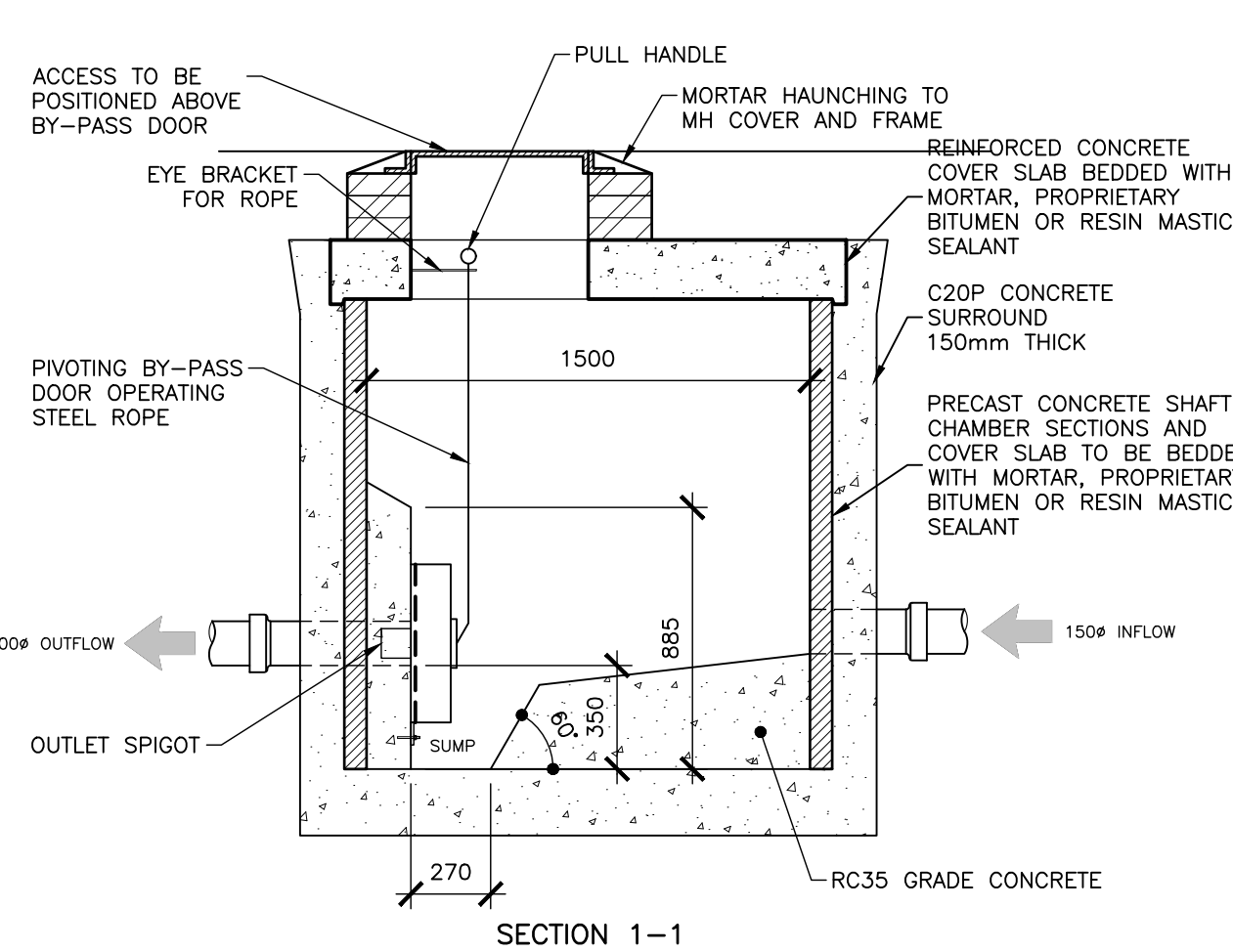
MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON-ENTRY
(1:25@A1)

SITED IN DOMESTIC GARDENS

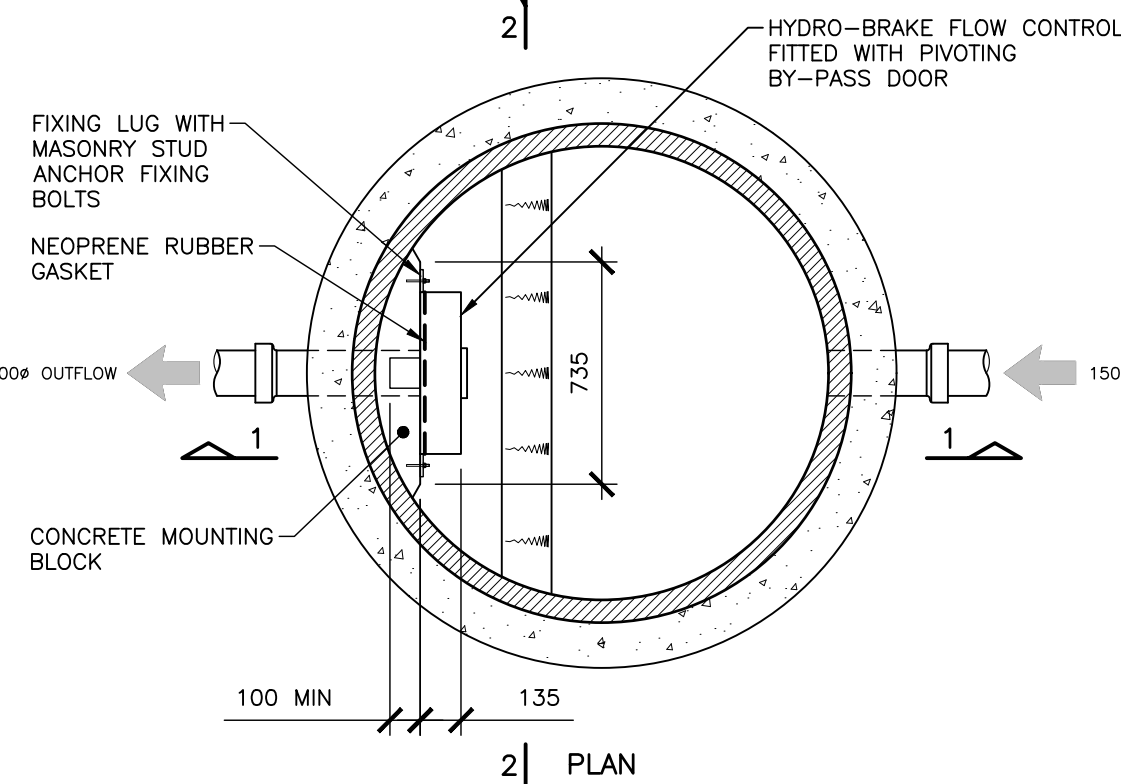


ALTERNATIVE COVER DETAIL FOR
LANDSCAPED AREAS – TYPE 3
(1:25@A1)

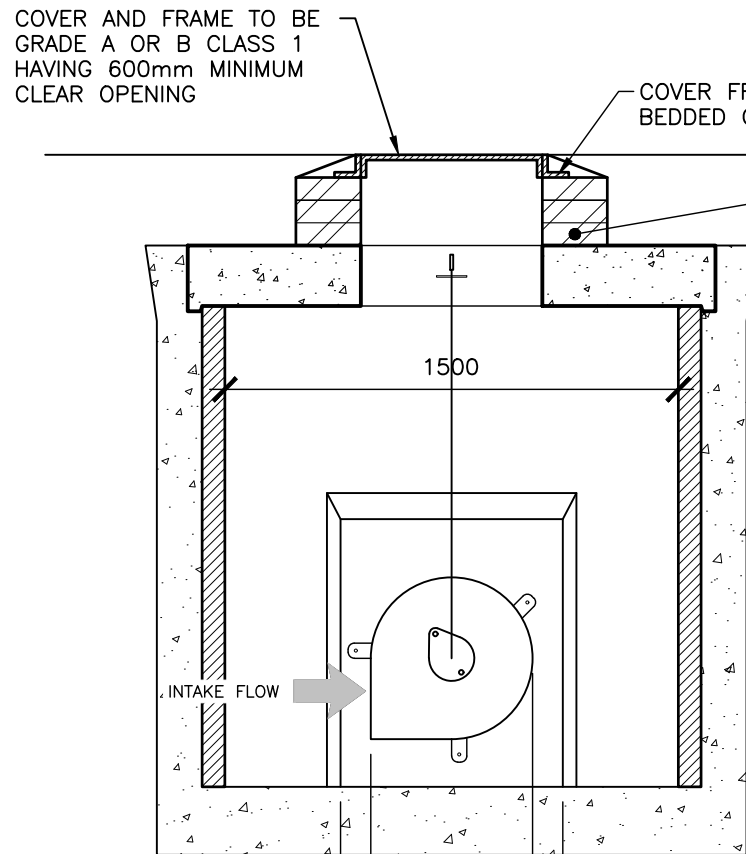
NOTE:
ACO 'Q' FLOW CONTROL MANHOLE WITH 2L/S MAX.
DISCHARGE 'Q' BRAKE FLOW CONTROL TO
MANUFACTURERS' STANDARD DETAILS TO BE USED IN
REFERENCE TO SITE CONSTRUCTED CHAMBER DETAILED.



SECTION 1-1



MANHOLE WITH HYDRO-BRAKE
(1:25@A1)



SECTION 2-2

NOTE:
DUE TO RESTRICTIVE SITE LEVELS, THE COURSES OF
BRICKWORK MAY NEED TO BE OMITTED & THE GULLY
BEDDED IMMEDIATELY ON CONCRETE SURROUND

- NOTES
1. ALL DIMENSIONS IN MILLIMETRES
 2. ALL DETAILS IN ACCORDANCE WITH SECTIONS 5.57 - 5.61
 3. UNTRAPPED GULLY CHAMBERS MAY BE EMPLOYED IN CONNECTED TO SURFACE WATER ONLY

KERB (OR SETT
& CHANNEL)

COVER TO OUTLET PIPE SHALL
BE 600mm MIN FOR MAIN ROAD
LOCATIONS (ie WHERE PIPE IS
UNDER CARRIAGEWAY)

GRATING & FRAME SHALL BE
SET 15mm BELOW FINISHED
ROAD LEVEL AT THE KERB/SETT
& 5mm BELOW FINISHED ROAD
LEVEL AT THE FRONT OF THE
GRATING

150mm CONNECTION TO
SW DRAINAGE SYSTEM
WITH 150mm CONCRETE
SURROUND

MIN 15 TO MAX 35mm THICK CLASS (i)
MORTAR BED TO CLAUSE 2623

15mm THICK CLASS (i) MORTAR
BACKING FOR GULLY FRAME TO
CLAUSE 2623

MAX 2 COURSES CLASS B
ENGINEERING BRICKWORK TO
BS3921 IN CLASS (i) MORTAR
(SEE BOXED NOTE)

450x900mm DEEP SEAL PRECAST
TRAPPED & RODDABLE GULLY POT:
CONCRETE TO BS 5911. VITRIFIED
CLAY TO BS 65. POLYPROPYLENE TO
ENGINEERS APPROVAL. ALKATHENE TO
ENGINEERS APPROVAL.

150mm THICK ST2 CONCRETE BED
& SURROUND TO GULLY POT

150mm DIA OUTLET WITH
SEALING PLUG ON CHAIN

150mm THICK ST2 CONCRETE BED
& SURROUND TO GULLY POT

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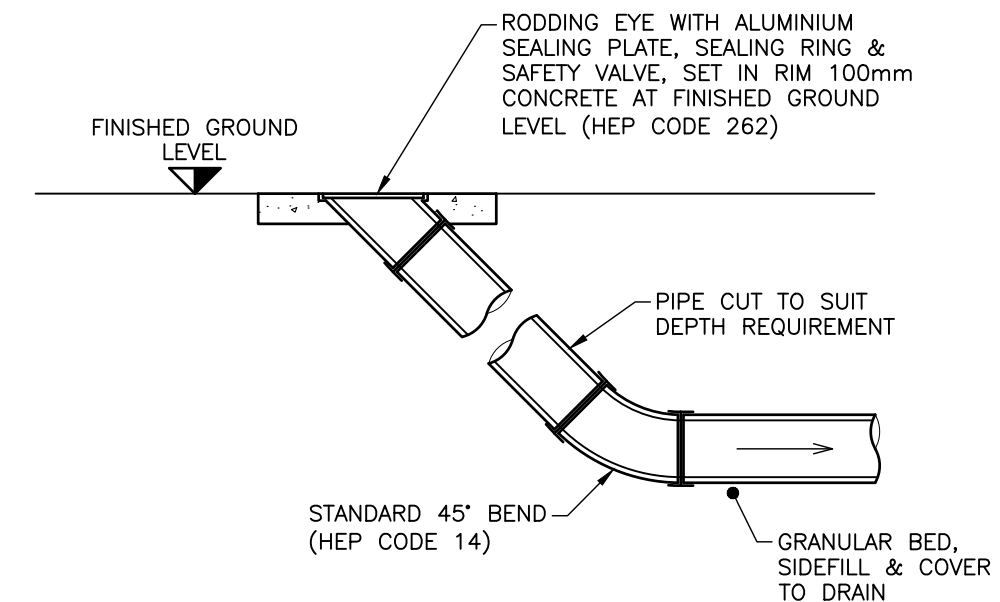
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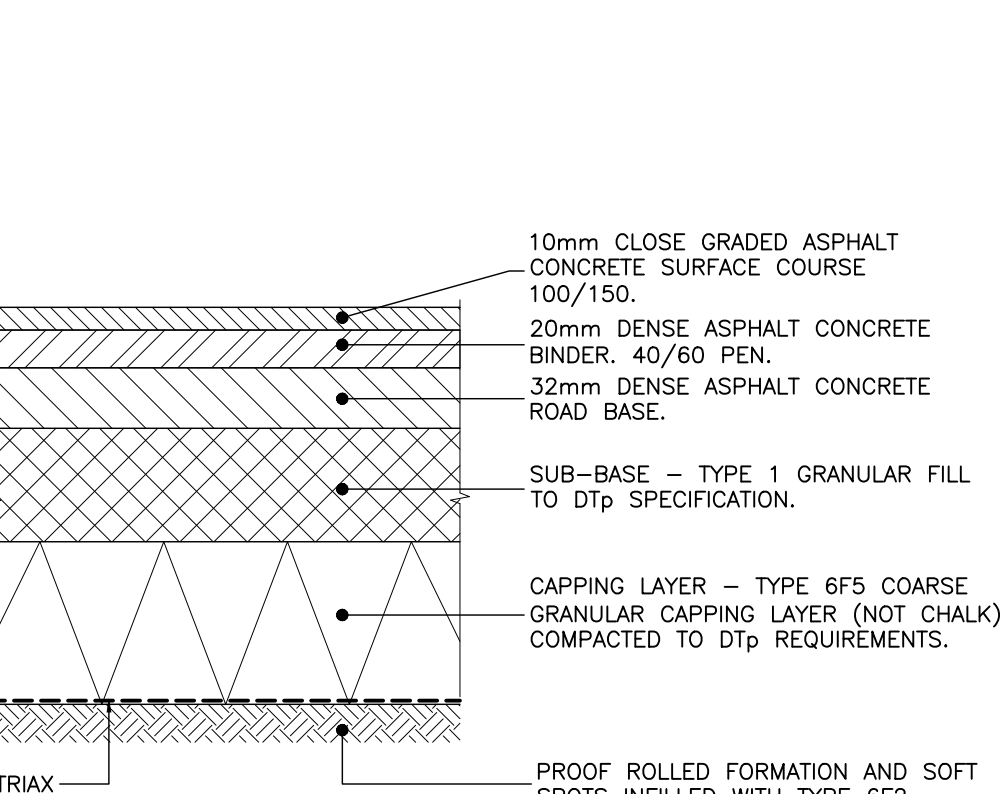
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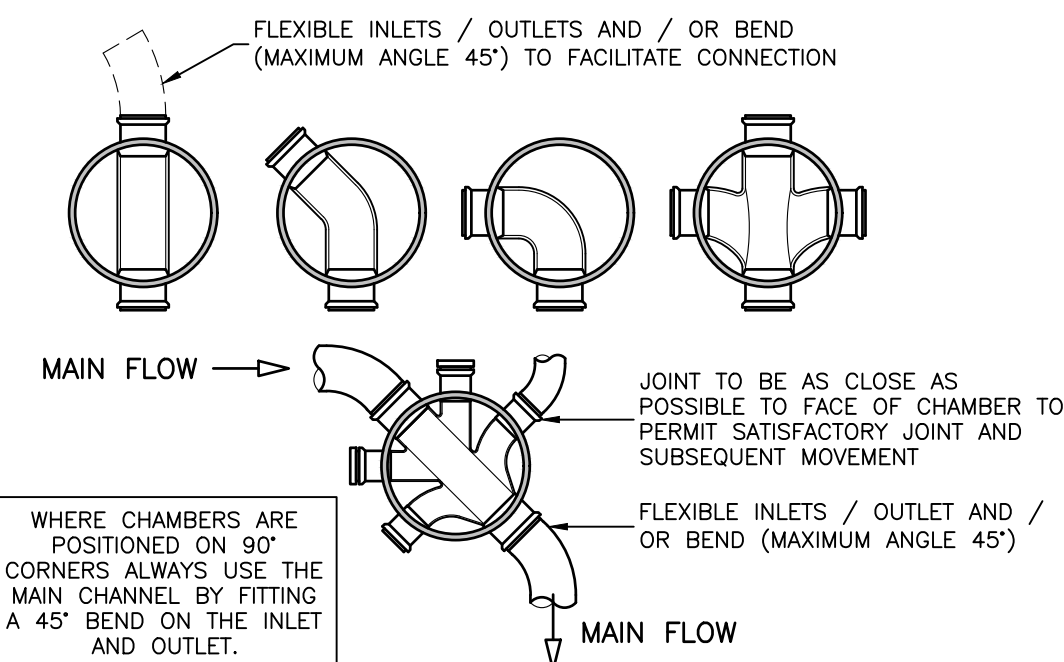
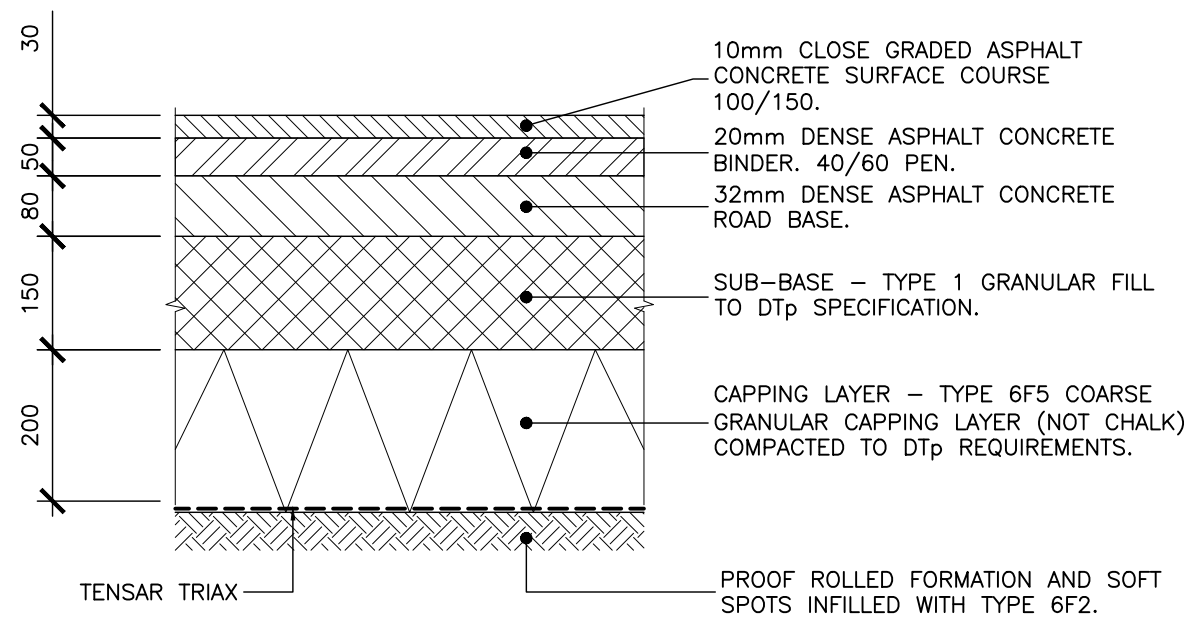
TYPICAL ROAD GULLY DETAIL
(1:25@A1)



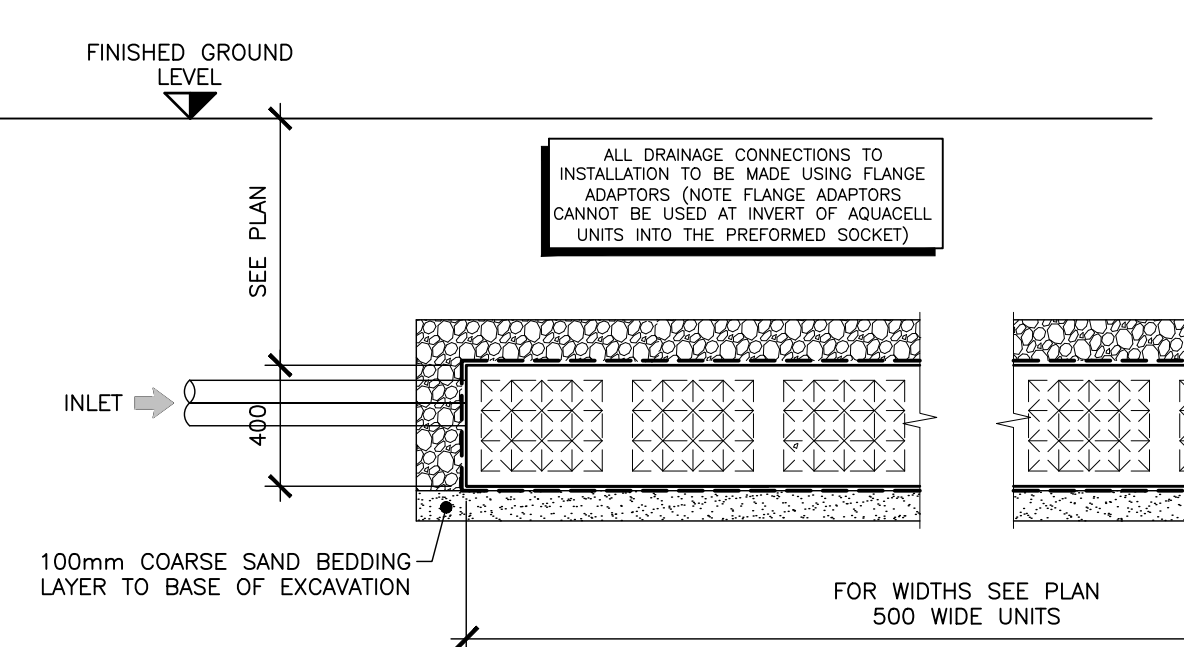
RODDING EYE DETAIL
(VC SHOWN – PVCu ALTERNATIVE TO SUIT)
(1:25@A1)



STANDARD TARMAC ROAD CONSTRUCTION
DETAIL
(1:10@A1)

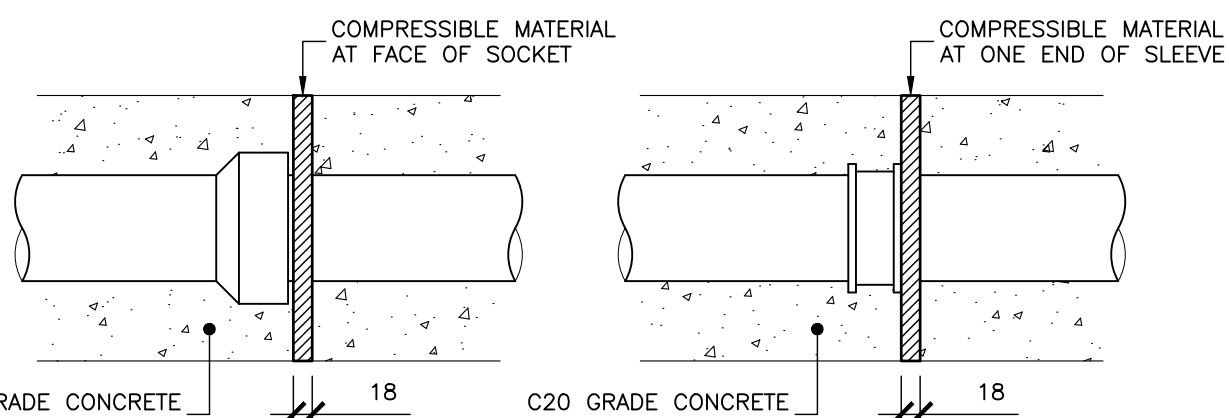


ALTERNATIVE BASE LAYOUTS FOR TYPE 3 CHAMBERS
(1:25@A1)



CRATE SOAKAWAY

WAVIN/OSMA 'AQUACELL' SOAKAWAY INSTALLATION
(OR SIMILAR)
(1:25@A1)

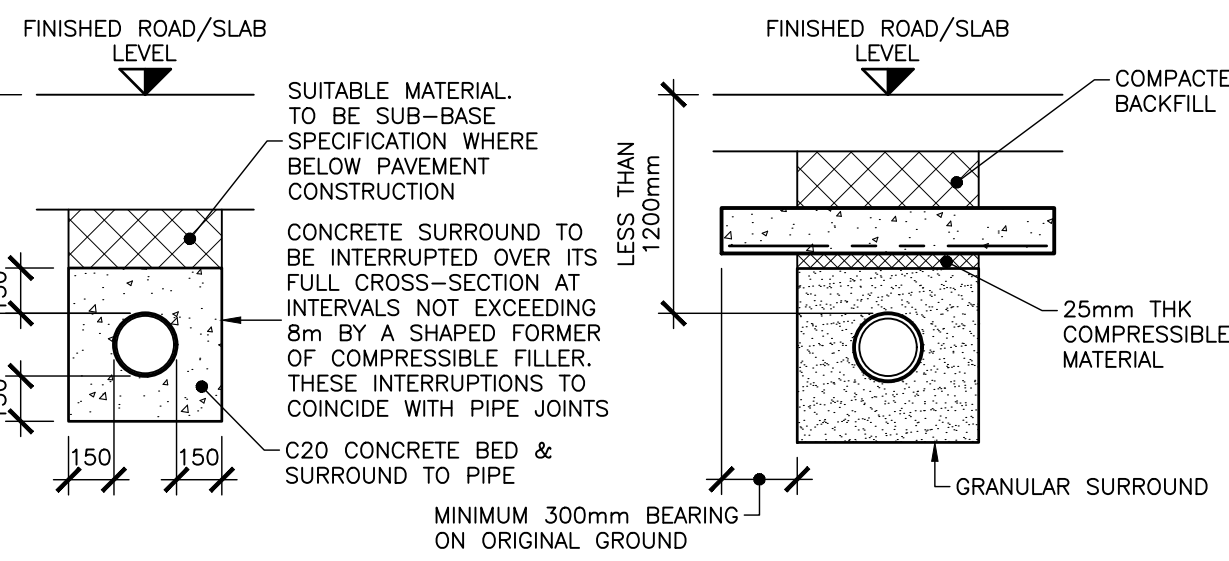


O-RING JOINTED PIPES

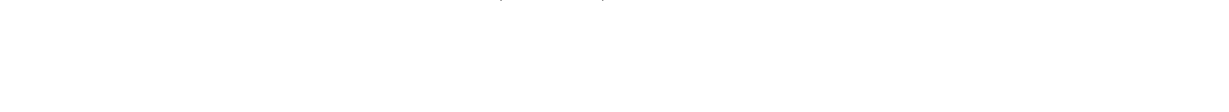
THE FLEXIBILITY OF A PIPELINE BEDDED ON, OR SURROUNDED WITH, CONCRETE SHOULD NORMALLY BE MAINTAINED BY THE PROVISION OF FLEXIBLE CONSTRUCTION JOINTS THROUGH THE CONCRETE AT PIPE JOINTS. THESE SHOULD BE MADE FROM BITUMEN IMPREGNATED INSULATING BOARD COMPLYING WITH B.S. 1142 PART 3, OR OTHER EQUALLY COMPRESSIBLE FILLER MATERIAL SUCH AS EXP&D POLYSTYRENE. THE BOARD SHOULD BE CUT TO FIT THE PIPES & PLACED AT THE FACE OF THE PIPE SOCKETS OR AT ONE END OF SLEEVE JOINTS. THE JOINT MATERIAL SHOULD BE AT LEAST 18mm THICK PLACED AT 5.0m CENTRES MAX.

SLEEVE JOINTED PIPES

THE FLEXIBILITY OF A PIPELINE BEDDED ON, OR SURROUNDED WITH, CONCRETE SHOULD NORMALLY BE MAINTAINED BY THE PROVISION OF FLEXIBLE CONSTRUCTION JOINTS THROUGH THE CONCRETE AT PIPE JOINTS. THESE SHOULD BE MADE FROM BITUMEN IMPREGNATED INSULATING BOARD COMPLYING WITH B.S. 1142 PART 3, OR OTHER EQUALLY COMPRESSIBLE FILLER MATERIAL SUCH AS EXP&D POLYSTYRENE. THE BOARD SHOULD BE CUT TO FIT THE PIPES & PLACED AT THE FACE OF THE PIPE SOCKETS OR AT ONE END OF SLEEVE JOINTS. THE JOINT MATERIAL SHOULD BE AT LEAST 18mm THICK PLACED AT 5.0m CENTRES MAX.



PROTECTION TO PIPELINES WITH LESS THAN 1200mm COVER
(1:25@A1)



CHECK SCALE 1:10@A1 1:20@A3

Revision	Date	Description	By
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P5	13.08.20	UPDATED/DETAILS ADDED AS REQUESTED BY DRAINAGE ENGINEER.	PJM
P4	11.09.19	DETAIL DESCRIPTION AMENDED.	PJM
P3	11.09.19	DETAIL & DRAWING TITLE AMENDED.	PJM
P2	19.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM
P1	15.07.19	PRELIMINARY ISSUE FOR COMMENT	PJM

Client	MAPLEDEAN PROJECTS LIMITED
Architect	
Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

Scale	AS SHOWN	Paper Size	A1	Date	JULY 2019	Drawn By	PJM	Checked By	CH
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
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Project No.	AAL156	Drawing No.	552	Revision	P5
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Project Title	HOOK LANE, ALDINGBOURNE, WEST SUSSEX.
Drawing Title	

SUDS operation and maintenance - general

There are three categories on maintenance activities:

Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example). The table below summarises the likely maintenance activities required for each SUDS component and specific maintenance activities is given in the following sections.

Remedial maintenance comprises intermittent tasks that may be required to rectify faults associated with the system. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict. Remedial maintenance items can comprise items such as:

- inlet/outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter fabrics
- construction stage sediment removal (although this activity should have been undertaken before the maintenance contract)
- system rehabilitation immediately following a pollution event.

O&M activity	SUDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter trench	Modular storage	Pervious pavements	Swale/bioretention/greenroofs	Filter strip	Sand filter	Pre-treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	■	■	□	□
Wee/invasive plant control	□	□	□	□		□	□		□	□	□	□	□
Shrub management	□	□	□	□					□	□	□		□
Shoreline vegetation management	■	■	□										□
Aquatic vegetation management	■	■	□										□
Occasional maintenance													
Sediment management *	■	■	■	■	■	■	■	■	■	■	■	■	■
Vegetation/plant replacement	□	□	□	□						□	□		□
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□		□	□	□	□	

■ will be required

□ may be required

* sediment to be collected upstream of the main device

GENERAL MAINTENANCE

Litter/debris removal

This is an integral part of SUDS maintenance and reduces the risks of inlet and outlet blockages, retains amenity value and minimises pollution risks. High litter removal frequencies may be required at high profile commercial/retail parks where aesthetics are a major driver.

Grass cutting

It is recommended that grass cutting be minimised around SUDS facilities, apart from swales and filter strips and structural embankments where a height of 100–150 mm is recommended to prevent the plants falling over, or “lodging”, when water flows across the surface. In general, allowing grass to grow tends to enhance water quality performance. Short grass around a wet system such as pond or wetland provides an ideal habitat for nuisance species such as geese; allowing the grass to grow is an effective means of discouraging them. Grass around wet pond or wetland systems should not be cut to the edge of the permanent water. Grass cutting is an activity undertaken primarily to enhance the perceived aesthetics of the facility. The frequency of cutting will tend to depend on surrounding land uses, and public requirements. Therefore, grass cutting should be done as infrequently as possible, recognising the aesthetic concerns of local residents. However, grass around inlet and outlet infrastructure should be trimmed closely to reduce risks to system performance. If a manicured, parkland effect is required, then cutting will need to be undertaken more regularly than for meadow type grass areas, which aim to maximise habitat and biodiversity potential.

Weed/invasive plant control

Weeds are generally defined as vegetation types that are unwanted in a particular area. For SUDS, weeds are often alien or invasive species, which do not enhance the technical performance or aesthetic value of the system, or non-native species and the spread of which is undesirable. In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally be required only during the first year, ie during plant establishment). However, over grassed surfaces, mowing can be an effective management measure. The use of herbicides and pesticides should be prohibited since they cause water quality deterioration. The use of fertilisers should also be limited or prohibited to minimise nutrient loadings which are damaging to water bodies.

Shrub management

Shrubs tend to be densely planted and are likely to require weeding at the base, especially during the first year to ensure that they get enough water. Shrubs should be selected so they can grow to their maximum natural height without pruning.

Aquatic/shoreline vegetation management

Aquatic plant aftercare in the first 1–3 years may be required to ensure establishment of planted vegetation and control nuisance weeds/invasive plants. Once established, the build-up of dead vegetation from previous seasons should be removed at convenient intervals to reduce organic silt accumulation (eg every three years and at the end of landscape contract periods).

Emergent vegetation may need to be harvested every 5–10 years to maintain flood attenuation volumes, optimise water quality treatment potential and ensure fresh growth, although this is often not required. Care should be taken to avoid nesting birds during the breeding season and to avoid great crested newt and water vole habitats. The typical window for this activity is towards the end of the growing season (September and October). As vegetation matures, plant height may also become a safety issue in residential areas.

Where emergent vegetation is managed, up to 25 per cent can be removed by cutting at 100 mm above soil level using shearing action machinery. Up to 25 per cent of submerged vegetation can be cut and raked out at any one time, using approved rakes, grabs or other techniques, depending on whether clay or waterproof membranes are present. Aquatic vegetation arisings should be stacked close to the water's edge for 48 hours to de-water and allow wildlife to return to the SUDS feature. They should then be removed to wildlife piles, compost heaps or off site before decomposition, rotting or damage to existing vegetation can occur.

Algae removal may be undertaken for aesthetic purposes during the first 3–5 years of a pond/wetland's life. The growth of algae, which is considered by some to be visually intrusive, is encouraged by nutrients introduced into the water body. This situation should settle down once upstream construction activities are complete.

Management of green waste

Appropriate methods should be implemented to dispose of green waste, including

- The development of wildlife piles
- On- or off-site composting
- Disposal to landfill

REMEDIAL MAINTENANCE

Structure rehabilitation/repair

There will come a time with most SUDS techniques when a major overhaul of the system is required to remove clogged filters, geotextiles, gravel etc. This will typically be between 10 and 25 years, depending on the technique and factors such as the type of catchment and sediment load. For example the use of geotextiles close to the surface in pervious surfaces traps the majority of sediment in a relatively easily accessible location. Reconstruction of the surface layer and bedding layer is all that is required, rather than reconstruction of the whole pavement depth.

Major overhaul is most likely to be required on techniques that rely on filtration through soils or aggregates, such as sand filters and infiltration devices. Other SUDS techniques are unlikely to need major overhaul if routine maintenance is undertaken as required (for example ponds and wetlands).

Rehabilitation activities for each SUDS component are described on the following tables.

Infiltration surface rehabilitation

In the event that grassed surface permeability has reduced, there are a number of landscape techniques that can be used to open the surface to encourage infiltration. Such activities are not commonplace and are likely to be required only in circumstances where silt has not been effectively managed upstream.

1. Scarifying to remove “thatch”. Thatch is a tightly intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface. Scarifying with tractor-drawn or self-propelled equipment to a depth of at least 50 mm breaks up silt deposits, removes dead grass and other organic matter and relieves compaction of the soil surface.
2. Spiking or tining the soil, using aerating equipment to encourage water percolation. This is particularly effective if followed by top dressing with a medium to fine sand, and is best undertaken when the soil is moist. Spiking or tining with tractor drawn or self-propelled equipment penetrates and perforates soil layers to a depth of at least 100 mm (at 100 mm centres) and allows the entry of air, water, nutrients and top dressing materials.
3. As a last resort, it may be necessary to remove and replace the grass and topsoil by:
 - removing accumulated silt and (subject to a toxicity test) applying to land or dispose of to landfill
 - removing damaged turf which should be composted
 - cultivating remaining topsoil to required levels
 - re turfing (using turf of a quality and appearance to match existing) or reseeded (to BS 7370: Part 3, Clause 12.6 (BSI, 1991) using seed to match existing turf) area to required levels. It may be necessary to supply and fix fully biodegradable coir blanket to protect seeded soil. Turf and seeded areas should be top dressed with fine sieved topsoil to BS 3882 (BSI, 1994) to achieve final design levels. Watering will be required to promote successful germination and/or establishment.

Water butts operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris..	Annually (or following poor performance).
Occasional maintenance	Replacement of any filters.	As required
Remedial actions	Repair of erosion damage, or damage to tank.	As required
Monitoring	Inspection of the tank for debris and sediment build up.	Annually (or following poor performance).
	Inspection of inlets, outlets and withdrawal devices.	Annually (or following poor performance).
	Inspection of areas receiving overflow, for evidence of erosion.	After extreme storms.
	Inspection of roof drain filters	Annually (or following poor performance).

Soakaway operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber.	Annually
	Cleaning of gutters and any filters on downpipes.	Annually
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	-	-
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs.	As required
	Replacement of clogged geotextile	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation.	Monthly in the first year and then annually.
	Check soakaway to ensure emptying is occurring.	Annually

Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/debris removal for large systems or in public environments.

Separators/interceptors operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Removal of litter and debris.	6 monthly
Occasional maintenance	Change of filter media.	As required
	Removal of sediment, oil, grease and floatables.	As required
Remedial actions	Replacement of malfunctioning parts.	As required
Monitoring	Inspect for evidence of poor operation.	6 monthly
	Inspect filter media and establish appropriate replacement frequencies.	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly in the first year of operation, then every 6 months.

For oil/water separators, the following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator if required
- check the coalescing material and clean or change if necessary (Class 1 only)
- check the function of the warning device (if fitted).

General inspection of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system
- structural condition
- internal coatings
- in-built parts
- electrical devices and installations
- checking of adjustment of automatic closure devices.
-

It is of key importance that the separator is filled with clean water before it is put into operation and each time after it is emptied for maintenance. Failure to do so will cause the separator to malfunction until stormwater builds up the required permanent water level in the facility. It is possible to fit an alarm to separators that will indicate when the collected oil volume is at a maximum, and this may be a regulatory requirement.

Swales operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal.	Monthly (or as required).
	Grass cutting – to retain grass height within specified design range.	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start then as required).
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible.	Annually.
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	Annually, or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	As required
	Re-level uneven surfaces and reinstate design levels.	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required
	Remove and dispose of oils or petrol residues using safe standard practices.	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for > 48 hours.	Monthly, or when required.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.

Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on-site if there is an appropriate safe and acceptable location to do so.

Modular systems operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Occasional maintenance	-	-
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Pond operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter removal.	As required
	Grass cutting – public areas.	Monthly (during growing season)
	Grass cutting – meadow grass.	Half yearly (spring, before nesting season, and autumn)
	Inspect vegetation to pond edge and remove nuisance plants (for first 3 years).	Monthly (at start, then as required)
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface).	Annually.
	Remove 25% of bank vegetation from waters edge to a minimum of 1 m above water level.	Annually.
	Tidy all dead growth before start of growing season.	Annually.
	Remove sediment from forebay.	1–5 years, or as required.
	Remove sediment from one quadrant of the main body of ponds without sediment forebays.	2-10 years.
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%.	>25 years (usually).
Remedial actions	Repair of erosion or other damage.	As required
	Aerate pond when signs of eutrophication are detected.	As required
	Realignment of rip-rap or other damage.	As required
	Repair/rehabilitation of inlets, outlets and overflows.	As required
Monitoring	Inspect structures for evidence of poor operation.	Monthly/after large storms.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly/after large storms.
	Inspect water body for signs of eutrophication.	Monthly (May–October).
	Inspect silt accumulation rates and establish appropriate removal; frequencies.	Half yearly.
	Check penstocks and other mechanical devices.	Half yearly.

Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on-site if there is an appropriate safe and acceptable location to do so.