



20 July 2020

✉ 52 Common Lane
Titchfield, Hants,
PO14 4BU

Metis Homes
59 Tower Street
Winchester
Hants
SO23 8TA



FAO: Andrew Sinclair

Ref: 1833

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

Dear Sirs

We have reviewed the Drainage Engineer comments forwarded on 1st May 2020 from Arun DC.

We had produced a drainage strategy for the development dated 20th March 2019 using Winter GWL and site permeability testing data undertaken by Messrs GESL. The strategy was for infiltration. Laura Gibbons for ADC requested shallow depth permeability tests which were undertaken ASAP and the results of these were discussed with Laura and these additional results were issued to Laura on 30th May 2019. In my email of 10th June 2019 I identified that the applicant needed to build out the site in 2019 and that the site predated the new ADC drainage policies. Three options were set out:

- a) Use the pond as per the previous strategy which ADC had already commented upon
- b) Use infiltration as per the calculations (excepting Winter permeability value)
- c) Build (b) but with overflow through petrol interceptor to the pond.

Alistair Harris for Metis Homes and Simon Davis the case officer for ADC had a subsequent email exchange over the period 12-17th June 2019. On 17th June 2019 I produced calculations which proved the proposed site layout could be supported even in the event of zero permeability from later Winter testing and this was forwarded by yourselves to ADC. Simon consulted Laura Gibbons on this who confirmed on 5th July 2019 that she was confident that the proposed layout could be supported and that reliance could be made on the outline planning drainage condition, which Simon agreed and informed the applicant. The email for this from ADC was provided under AL/33/19/RES.

The applicant undertook shallow Winter permeability testing on 6th March 2020 the calculations for which indicate a test result of 1.88×10^{-6} m/sec. However we have been asked by the applicant to consider soakaway calculations on the basis of 1.4×10^{-6} m/sec. Soakaway calculations are attached for the soakaway system set out on Arch Associates drainage design drawing AAL156-501-P4. These conservatively assume 2D rather than 3D infiltration. The soakaways are interlinked and the total 3,400m² drained area into 929m² of soakaways has been represented by 10 x10% of the total. In the 1%AEP +40%CC event the sokaways provide storage of $10 \times 35.3 = 353.0\text{m}^3$ and infiltrate a further $10 \times 3.75 = 37.5\text{m}^3$ of the $10 \times 47.69 = 476.9\text{m}^3$ total runoff and would therefore convey the balance $476.9 - 353.0 - 37.5 = 86.9\text{m}^3$ to the pond which will outfall to the watercourse at the agreed rate of 2 l/sec. The net overall discharge rate is $3.75 + 172.8 \text{ m}^3 / 24 \text{ hours} = 176.5 \text{ m}^3/\text{day}$ plus infiltration that occurs out the base of the pond which has conservatively been ignored. With the 2 l/sec discharge rate it would take some 32 hours to half drain the 1%AEP +40% rainfall. The 10%AEP +40%CC (1 in 10 year +CC) runoff volume is 311.4m³ which can be fully held by the soakaways without mobilising pond storage. Half the 10%AEP+40%CC volume is 155.7m³ which is more than met by the pond discharge of 172.9m³ per 24 hours at 2 l/sec.

In summary the scheme provides for full infiltration to at least 10%AEP +40%CC before any pond storage would be mobilised. The pond then provides enough additional storage for the 1%AEP +40%CC excess and regulates this to 2 l/sec discharge. The half drain time for 1%AEP +40% CC is 32 hours and 10%AEP+40%CC half drain occurs within 24 hours.

The water quality measures were agreed in consultation with the ecologist. Water quality is assessed at Q₁ flows which would not generate any flows to the pond at all. Only the longer duration 1%AEP +40%CC events generate enough rainfall to mobilise pond storage with a 2 l/sec outfall. A Klargest NPSB003 separator has been provided which has capacity for 100% runoff from 1,650 m² and given it would have to deal with less than half the volume from 3,400m² and is capable of operating at 3 l/sec is considered to be more than adequate.

An Ordinary Watercourse Consent (OWC) application will need to be made to ADC for the outfall to the pond and to the watercourse. To be clear there is no existing outfall from the pond as can be seen from the site topographic survey and we also understand Laura Gibbons confirmed this during a site visit last year.

We have drawn the relevant information into the attached drainage manual for the site including ADC standard outfall details. The final Arch Associates Drainage layout may need to be updated to make reference to the agreed ADC outfall detail from the OWC application but this is a matter of procedure.

We suspect the enclosed substantially answers the Drainage Engineer's queries of 1st May 2020 but there may need to be some minor amendments to reflect OWC details in order to fully complete the manual.

Yours Sincerely

Aqua Callidus Consulting Ltd

Andy Traves

Enc Permeability Test results 6th March 2020
 Soakaway performance calculations
 Drainage Manual

aquacallidus

From: Nigel Freemantle [REDACTED]
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

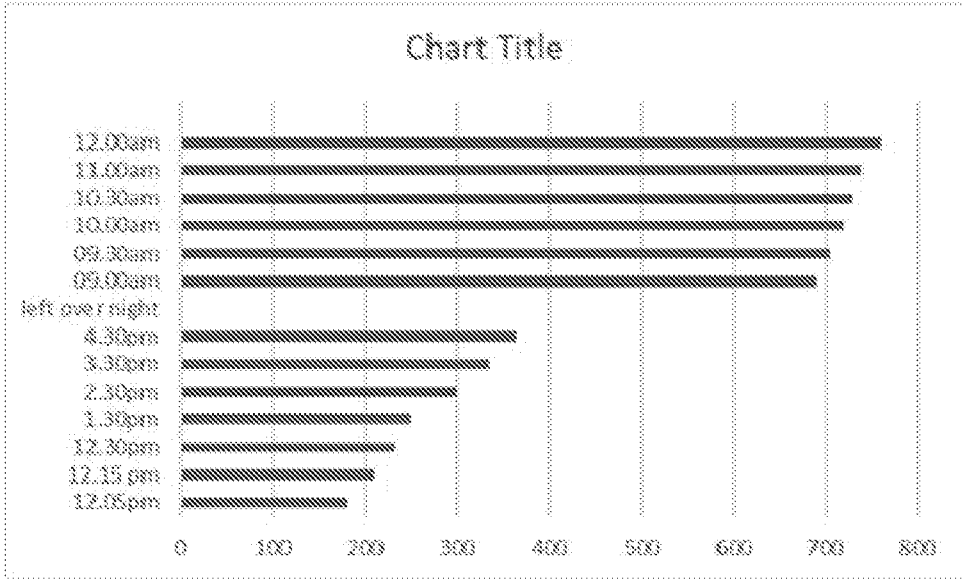
Water level reading @ 75% drop = 720mm

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



MAPLEDEAN PROJECTS LTD
Hollythorns House, The Hollythorns,
New Road, Swanmore, SO32 2NW

[Redacted]
[Redacted]s Place, Potters bar, Hertfordshire, EN6 2JD

Project No : 1833
Project Title : Hook Lane

Drainage blanket/CGA pavement or 2D planar infiltration (R156)

Site Location: Aldingbourne
r = 0.30 (range 0.12 to 0.45)
Drained Area = 340 m²
Design storm 1 in = 100 year
Runoff volume uplift = 40 % for climate change
Urban Creep allowance = 0 % uplift to Drained Area

Catchment ID: 10% represented

Infiltration Area = 92.9 m²

Site Considerations

Where determined, what is the depth to highest seasonal groundwater level (GWL) from surface 1.00 m
Is the infiltration far enough from drainage mounds/fields or other soakaways etc to avoid impact? Yes
What Source Protection Zone (SPZ) is the proposed soakaway located in? None
What is known and proposed about potential contaminated ground on the site? EA/LPA accept infiltration

Technical Assessment

Consequence of failure = 2-Minor inconvenience
Measured Soil Filtration Rate = 1.40E-06 m/s
Design Soil Filtration Rate = 4.67E-07 m/s
Storage media thickness = 0.40 m
Effective net porosity = 95 %
Depth of cover over media = 0.40 m

Storm Duration	5 min	10 min	15 min	30 min	1 hr	2 hr	4 hr	6 hr	10 hr	24 hr
(secs)	300	600	900	1800	3600	7200	14400	21600	36000	86400
r= 0.3 Value Z1	0.34	0.49	0.59	0.77	1.00	1.25	1.57	1.78	2.12	2.84
Rainfall M5 (mm)	6.8	9.8	11.8	15.4	20.0	25.0	31.4	35.6	42.4	56.8
M100/M5 gf Value Z2	1.83	1.91	1.94	1.99	2.03	2.01	1.96	1.93	1.87	1.76
Rainfall M100 (mm)	12.5	18.7	22.9	30.7	40.6	50.3	61.5	68.5	79.3	100.2
With CC & UC uplift (mm)	17.5	26.1	32.0	43.0	56.8	70.4	86.1	96.0	111.1	140.3
RUNOFF (m ³)	5.93	8.89	10.89	14.61	19.33	23.92	29.28	32.62	37.76	47.69
Infiltr capacity (m ³)	0.01	0.03	0.04	0.08	0.16	0.31	0.62	0.94	1.56	3.75
INFILTRATED (m ³)	0.01	0.03	0.04	0.08	0.16	0.31	0.62	0.94	1.56	3.75
Req'd STORAGE (m ³)	5.92	8.86	10.85	14.53	19.17	23.61	28.65	31.69	36.20	43.94
	pass	pass	pass	pass	pass	pass	pass	pass	fail	fail

TOTAL STORAGE AVAILABLE 35.30 m³
Time to drain full to half full = 140.8 hours

Overall Assessment

Media base elevation above seasonal high GWL 0.20 m fail GP3
Will the soakaway drain from full to half full in 24 hours or less? No fail
Does the soakaway provide sufficient storage? No fail

AL/33/19/RES

BARNSIDE, HOOK LANE

ALDINGBOURNE

DRAINAGE MANUAL

FOUL WATER DRAINAGE

The foul water drainage system comprises a system of reticulated pipes and inspection chambers and manholes which convey flow by gravity to the public Foul Water (FW) sewer in Hook Lane. Individual plot drainage is the responsibility of the individual plot owners. In the event of a blockage access is available at the inspection chambers for rodding or CCTV inspection etc. The foul drainage from each plot discharges to a collector along the estate road with a branch to chamber F8 at the rear of plot 4. This collector then passes along the frontage of plots 1 and 2 and connects to the public FW sewer manhole 4602 in Hook Lane from the final site manhole F1 to the front of plot 1. This collector sequentially serves all the properties, and will be maintained by the Estate Management Company (EMC)

In the event of a blockage access is available at the manholes for rodding or CCTV inspection etc arranged by the Estate Management Company. Residents shall communicate any concerns with this apparatus to the Estate Management Company for their action.

The layout of the foul drainage is shown on the attached plans and details.

SURFACE WATER DRAINAGE

The surface water drainage system comprises a system of reticulated pipes and inspection chambers which discharge to series of geocellular soakaways which discharge runoff to the ground. For some larger storm events these soakaways may fill and sequentially overflow to each other and excess rainfall for these events is passed through a petrol interceptor and discharged to the pond in the southwest corner of the site. The pond has an outfall into the watercourse along the western side of the site and the discharge rate out to the watercourse is regulated by a hydraulic flow control device (Details attached).

The storage is protected from excessive sediment ingress by the provision of catch pits (CP) on the inlets to the soakaways. These reduce the flow velocity within the pit forcing the precipitation of coarser sediment at the base of the pit. These pits need to be regularly checked by residents and accumulated sediment removed. Failure to remove the accrued sediment will promote the potential for sediment to pass to the soakaways leading to a reduction in storage capacity and infiltration rate into the ground. The EMC will maintain the catchpits and road gulleys serving the estate road drainage which need to be regularly desilted and cleaned to maintain the efficacy of the system and functionality of the gullies.

The petrol interceptor comprises a Klargestor NSPB003 bypass interceptor. The EMC will arrange for maintenance of this in accordance with the manufacturer's recommendations. Residents shall communicate any concerns with this apparatus to the Estate Management Company for their action. The outfall to the pond is of concrete bagwork construction in accordance with ADC drawing 80000102 (copy attached)

To limit the discharge flow rate out into the watercourse a 'ACO Q flow control' is fitted with a flow control device limiting flow to 2 l/sec. It is essential that this chamber is left covered and that debris is not permitted to fall into the chamber. The petrol interceptor and sediment catch pits and gulley sumps are present to reduce the likelihood of blockage from upstream within the system and the flap valve to the outfall will similarly reduce the risk of blockage from downstream. These should be inspected at least annually and after significant rainfall events. If detritus is present this should be removed. The EMC will arrange for maintenance of this in accordance with the manufacturer's recommendations. Residents shall communicate any concerns with this apparatus to the Estate Management Company for their action. The outfall to the watercourse pond is of concrete bagwork construction in accordance with ADC drawing 80000102 (copy attached)

The watercourse is an earth channel and may gradually silt up and accrue leaf litter and other windblown litter and vegetation growth. The channel needs periodic trimming to desilt the invert, litter picking and vegetation maintenance. Man access to the channel, a 3m bankside width on the site side and to the head wall shall be maintained from the pond perimeter.

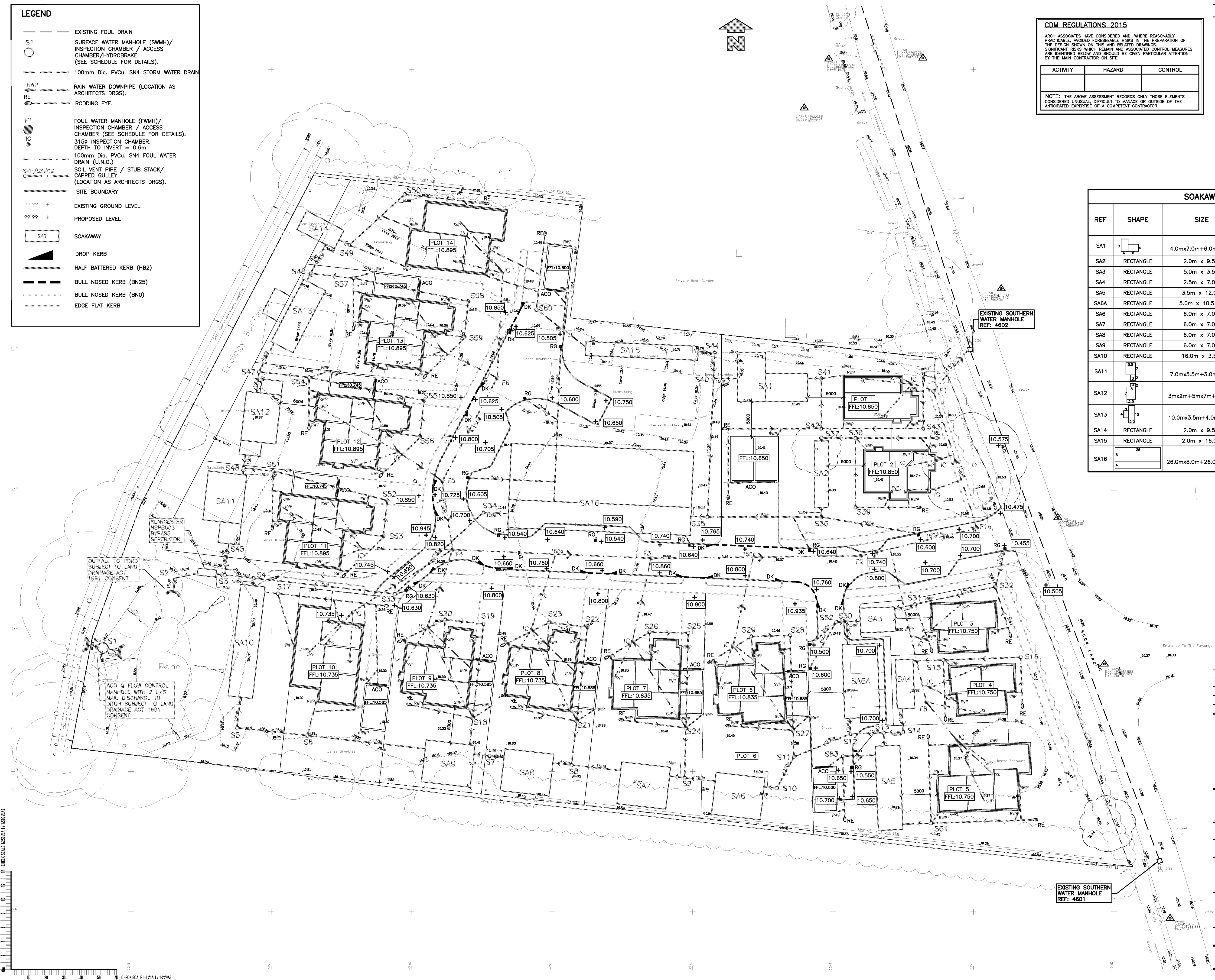
Individual plot drainage and catch pits are the responsibility of the respective plot owners, including soakaways. The road drainage, and drainage infrastructure under the road, shared landscaping and pond/watercourse are the responsibility of the Estate Management Company.

The layout of the drainage is shown on the attached drawings and details. The maintenance schedule for surface water drainage assets is given on the attached sheets. (Watercourse maintenance a per swale data sheet)

Watercourse

The watercourse is a small earth channel (ditch) running southwards along the western side of the site and separated from the rear gardens to plots 11-14 by the vegetated ecology buffer the first 3m back from the top of the bank of which is considered to comprise part of the watercourse for maintenance purposes.

	EXISTING FOUL DRAIN
	SURFACE WATER MANHOLE (SWMH)/ INSPECTION CHAMBER / ACCESS CHAMBER/HYDROBRAKE (SEE SCHEDULE FOR DETAILS).
	100mm Dia. PVCu. SN4 STORM WATER DRAIN
	RAIN WATER DOWNPIPE (LOCATION AS ARCHITECTS DRGS).
	RODDING EYE.
	FOUL WATER MANHOLE (FWMH)/ INSPECTION CHAMBER / ACCESS CHAMBER (SEE SCHEDULE FOR DETAILS).
	315ø INSPECTION CHAMBER. DEPTH TO INVERT = 0.6m
	100mm Dia. PVCu. SN4 FOUL WATER DRAIN (U.N.O.).
	SOIL VENT PIPE / STUB STACK/ CAPPED GULLY. (LOCATION AS ARCHITECTS DRGS).
	SITE BOUNDARY
	EXISTING GROUND LEVEL
	PROPOSED LEVEL
	SOAKAWAY
	DROP KERB
	HALF BATTERED KERB (HB2)
	BULL NOSED KERB (BN25)
	BULL NOSED KERB (BN0)
	EDGE FLAT KERB



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 IDENTIFIED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERTISE OF A COMPETENT CONTRACTOR.

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1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS, SPECIFICATIONS AND DETAILS.
2. ALL FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.
3. ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.
4. THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, LAYOUT AND ACCURACY OF ALL DIMENSIONS.
5. 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 THE TEMPORARY BRACING AND PROPPING.
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 MATERIALS AND SPILLAGE AND FOR THE PROTECTION OF ALL ABNORMAL TIP REQUIREMENTS WILL BE ENTERED.

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 10.5m	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	10.27	10.07
SA15	RECTANGLE	2.0m x 16.0m	400mm	9.90	9.70
SA16		26.0mx8.0m+26.0mx4.0m	400mm	9.89	9.79

REQUEST A COLOURED COPY IF
THIS STAMP IS NOT RED

P5	17.07.20	AMENDS TO LA COMMENTS	CI
P4	03.10.19	SURFACE WATER AMENDS	CI
P3	01.08.19	F1 TO F6 UPDATED, F7 REMOVED	JH
P2	19.07.19	PRELIMINARY ISSUE FOR COMMENT	P.
P1	15.07.19	PRELIMINARY ISSUE FOR COMMENT	P.
Revision	Date	Description	By



ARCH ASSOCIATES
CONSULTING CIVIL AND STRUCTURAL ENGINEERS



Client
MAPLEDEAN PROJECTS LIMITED
Architect

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

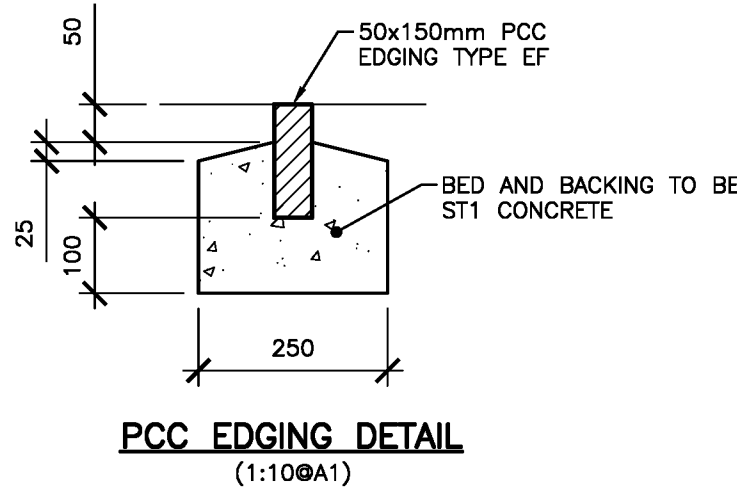
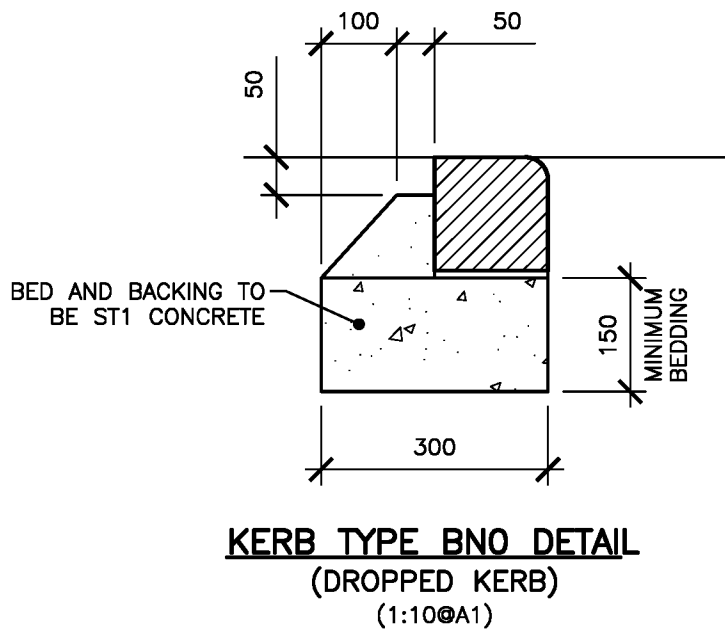
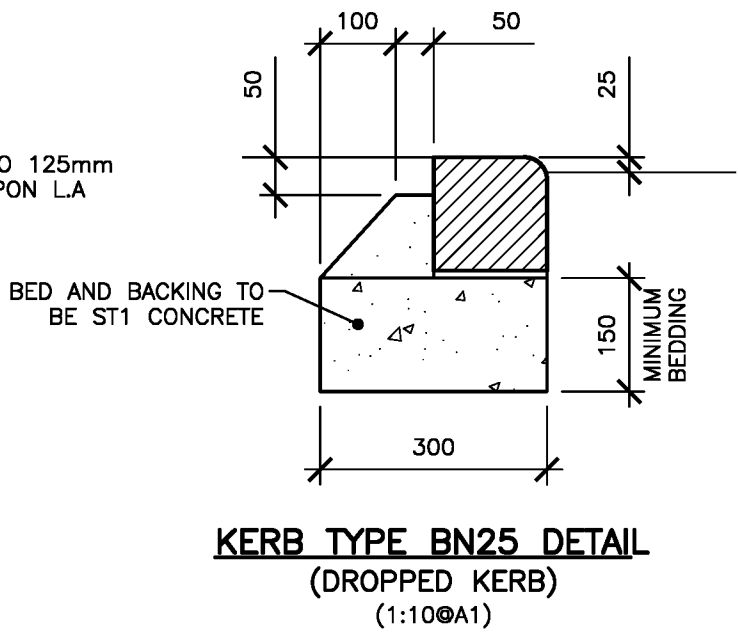
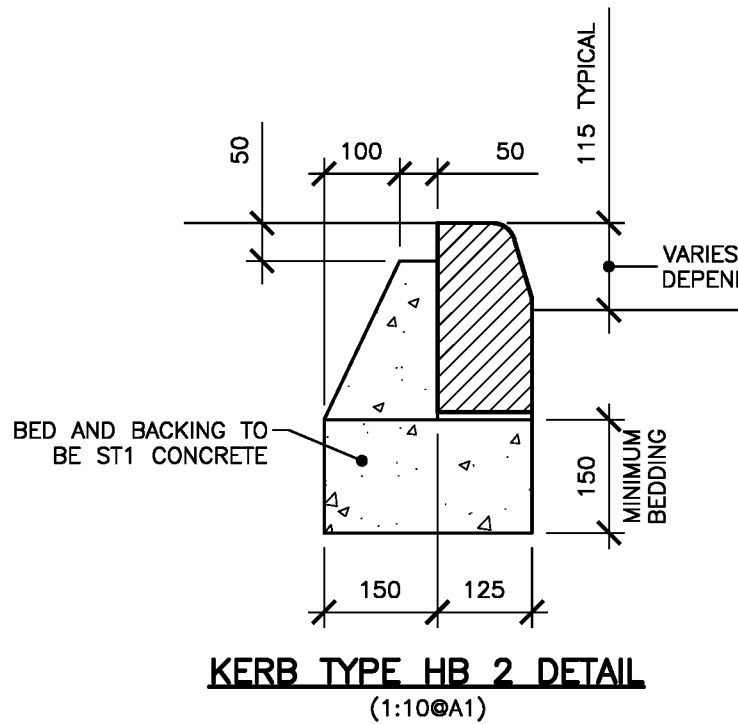
Scale 1:250	Paper Size A1	Date JUNE 2019	Drawn By PJM	Checked By CH
Project No. AAL156			Drawing No. 501	Revision P4

SURFACE WATER MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	SIZE	TYPE	COVER	COMMENTS
S1	10.400	9.80	0.600	TO ACO DETAIL	ACO Q CHAMBER	TO ACO DETAIL	ACO Q FLOW CONTROL @ 2 L/S
S2	10.585	9.84	0.745	450#	TYPE 3	A15 450x450	
S3	10.585	9.85	0.735	450#	TYPE 3	A15 450x450	
S4	10.585	9.85	0.735	450#	TYPE 3	A15 450x450	
S5	10.585	9.86	0.725	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S6	10.585	9.870	0.715	450#	TYPE 3	A15 450x450	
S7	10.585	9.880	0.705	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S8	10.585	9.890	0.695	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S9	10.685	9.900	0.785	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S10	10.685	9.910	0.775	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S11	10.685	9.910	0.775	450#	TYPE 3	A15 450x450	
S12	10.600	9.920	0.680	450#	TYPE 3	D400 450x450	
S13	10.600	9.930	0.670	450#	TYPE 3	A15 450x450	
S14	10.600	9.940	0.660	450#	TYPE 3	A15 450x450	
S15	10.600	9.990	0.610	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S16	10.600	10.100	0.500	450#	TYPE 3	A15 450x450	
S17	10.585	9.985	0.600	450#	TYPE 3	A15 450x450	
S18	10.585	9.855	0.730	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S19	10.692	9.975	0.717	450#	TYPE 3	C250 450x450	
S20	10.585	10.025	0.560	450#	TYPE 3	A15 450x450	
S21	10.585	9.855	0.730	450#	TYPE 3	A15 450x450	
S22	10.692	9.975	0.717	450#	TYPE 3	C250 450x450	
S23	10.585	10.025	0.560	450#	TYPE 3	A15 450x450	
S24	10.685	9.935	0.750	450#	TYPE 3	A15 450x450	
S25	10.792	10.075	0.717	450#	TYPE 3	C250 450x450	
S26	10.685	10.125	0.560	450#	TYPE 3	A15 450x450	
S27	10.685	9.935	0.750	450#	TYPE 3	A15 450x450	
S28	10.810	10.075	0.735	450#	TYPE 3	C250 450x450	
S29	10.685	10.125	0.560	450#	TYPE 3	A15 450x450	
S30	10.700	9.970	0.730	450#	TYPE 3	B125 450x450	CATCHPIT MANHOLE
S31	10.600	9.980	0.620	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S32	10.600	10.100	0.500	450#	TYPE 3	A15 450x450	
S33	10.500	9.860	0.640	450#	TYPE 3	D400 450x450	
S34	10.825	9.880	0.945	450#	TYPE 3	A15 450x450	
S35	10.765	9.890	0.875	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S36	10.700	10.000	0.700	450#	TYPE 3	B125 450x450	
S37	10.700	10.050	0.650	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S38	10.700	10.100	0.600	450#	TYPE 3	A15 450x450	
S39	10.700	10.200	0.500	450#	TYPE 3	A15 450x450	
S40	10.700	9.900	0.800	450#	TYPE 3	A15 450x450	
S41	10.700	10.180	0.520	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S42	10.700	10.180	0.520	450#	TYPE 3	A15 450x450	
S43	10.700	10.320	0.380	450#	TYPE 3	A15 450x450	
S44	10.700	9.950	0.750	450#	TYPE 3	A15 450x450	
S45	10.745	9.97	0.775	450#	TYPE 3	A15 450x450	
S46	10.745	9.980	0.765	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S47	10.745	9.990	0.755	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S48	10.745	10.000	0.745	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S49	10.745	10.275	0.470	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S50	10.745	10.345	0.400	450#	TYPE 3	A15 450x450	
S51	10.745	10.010	0.735	450#	TYPE 3	A15 450x450	
S52	10.798	10.136	0.662	450#	TYPE 3	A15 450x450	
S53	10.745	10.187	0.558	450#	TYPE 3	A15 450x450	
S54	10.745	10.036	0.709	450#	TYPE 3	A15 450x450	
S55	10.798	10.136	0.662	450#	TYPE 3	C250 450x450	
S56	10.745	10.187	0.558	450#	TYPE 3	A15 450x450	
S57	10.745	10.080	0.685	450#	TYPE 3	A15 450x450	
S58	10.798	10.136	0.662	450#	TYPE 3	C250 450x450	
S59	10.745	10.187	0.558	450#	TYPE 3	A15 450x450	
S60	10.600	10.000	0.600	450#	TYPE 3	D400 450x450	CATCHPIT MANHOLE
S61	10.600	10.000	0.600	450#	TYPE 3	A15 450x450	CATCHPIT MANHOLE
S62	10.550	9.800	0.750	450#	TYPE 3	D400 450x450	
S63	10.600	10.000	0.600	450#	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	450#	TYPE 3	A15 450x450	
F1a	10.600	8.657	1.943	450#	TYPE 3	D400 450x450	
F2	10.740	8.772	1.968	450#	TYPE 3	D400 450x450	
F3	10.800	8.994	1.806	450#	TYPE 3	D400 450x450	
F4	10.700	9.203	1.497	450#	TYPE 3	D400 450x450	
F5	10.750	9.277	1.473	450#	TYPE 3	D400 450x450	
F6	10.750	9.400	1.350	450#	TYPE 3	D400 450x450	
F7	NOT REQUIRED						
F8	10.600	9.913	0.687	450#	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 AND 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

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



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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.		
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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
Revision	Date	Description	By

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architectural engineering sustainable environment

UKAS
STRUCTURAL
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Client

MAPLEDEAN PROJECTS LIMITED

Architect

Project Title

HOOK LANE, ALDINGBOURNE, WEST SUSSEX.

Drawing Title

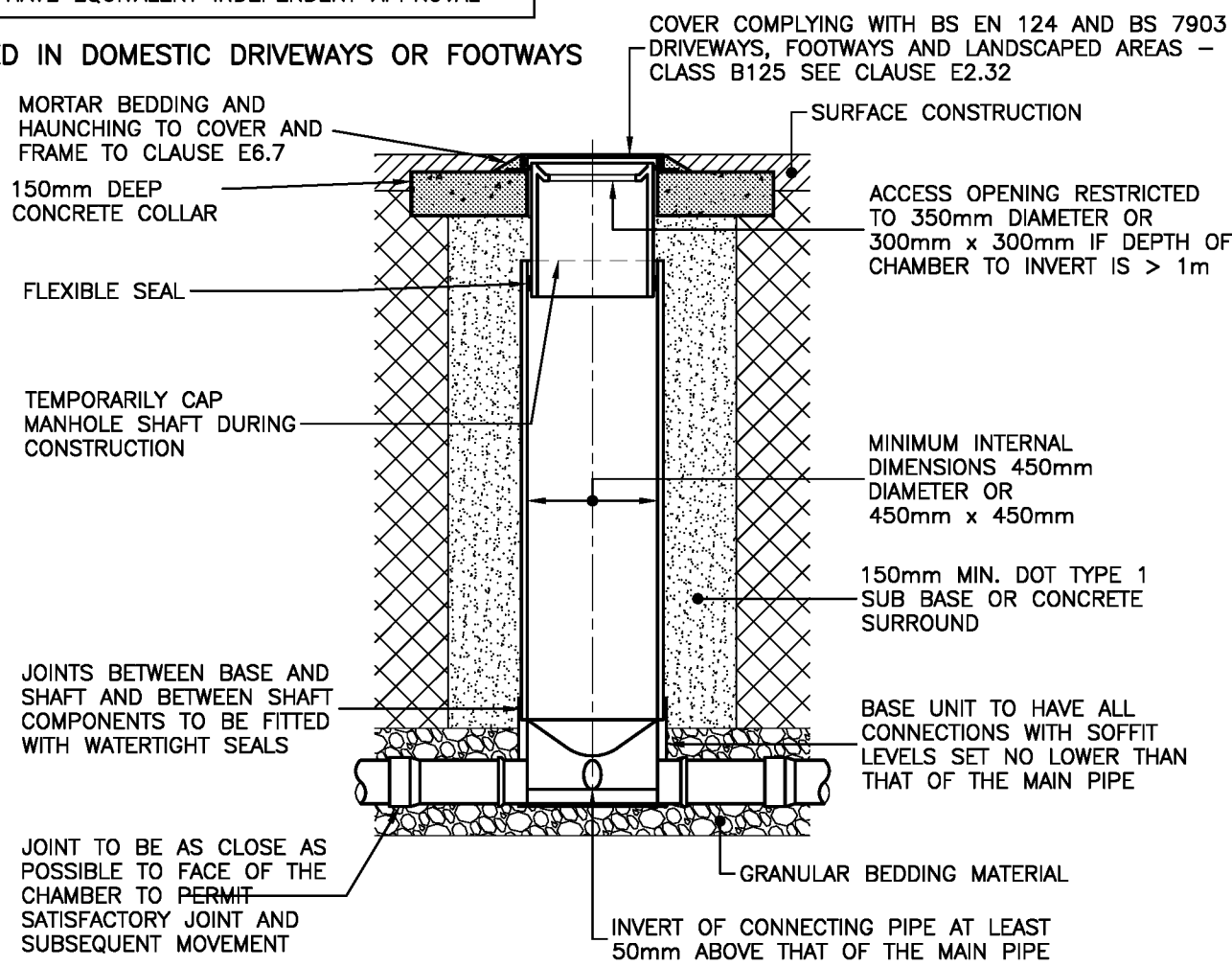
DRAINAGE AND ROAD DETAILS

SHEET 1

Scale	Paper Size	Date	Drawn By	Checked By
AS SHOWN	A1	JULY 2019	PJM	CH
Project No.	Drawing No.	Revision		
AAL156	551	P6		

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

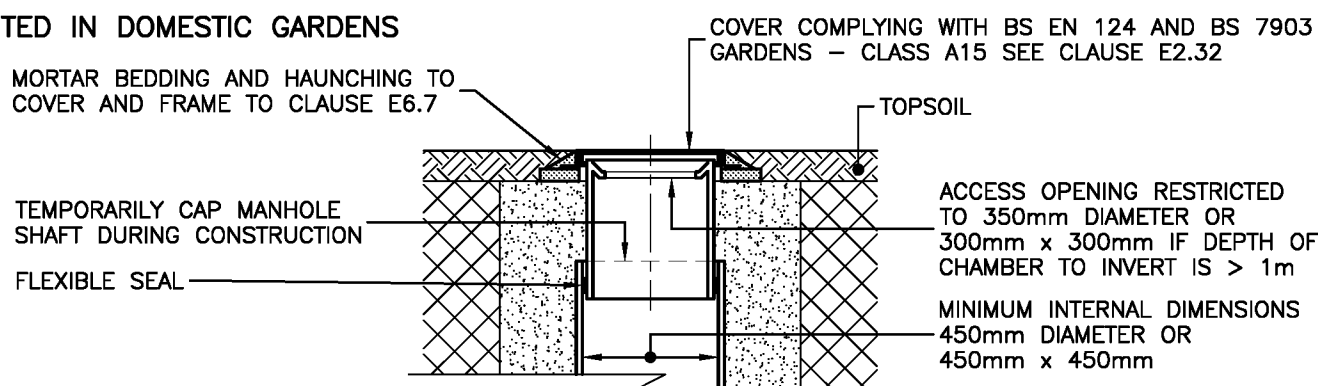
SITED IN DOMESTIC DRIVEWAYS OR FOOTWAYS



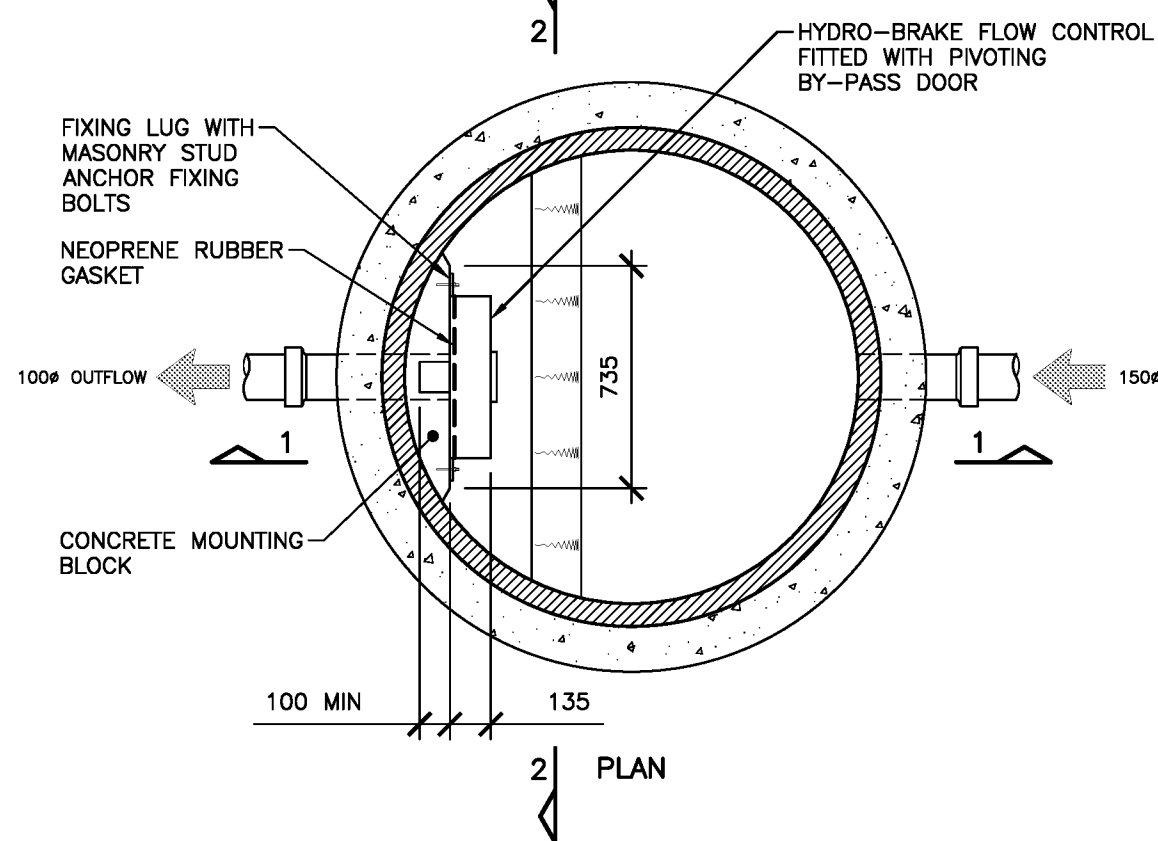
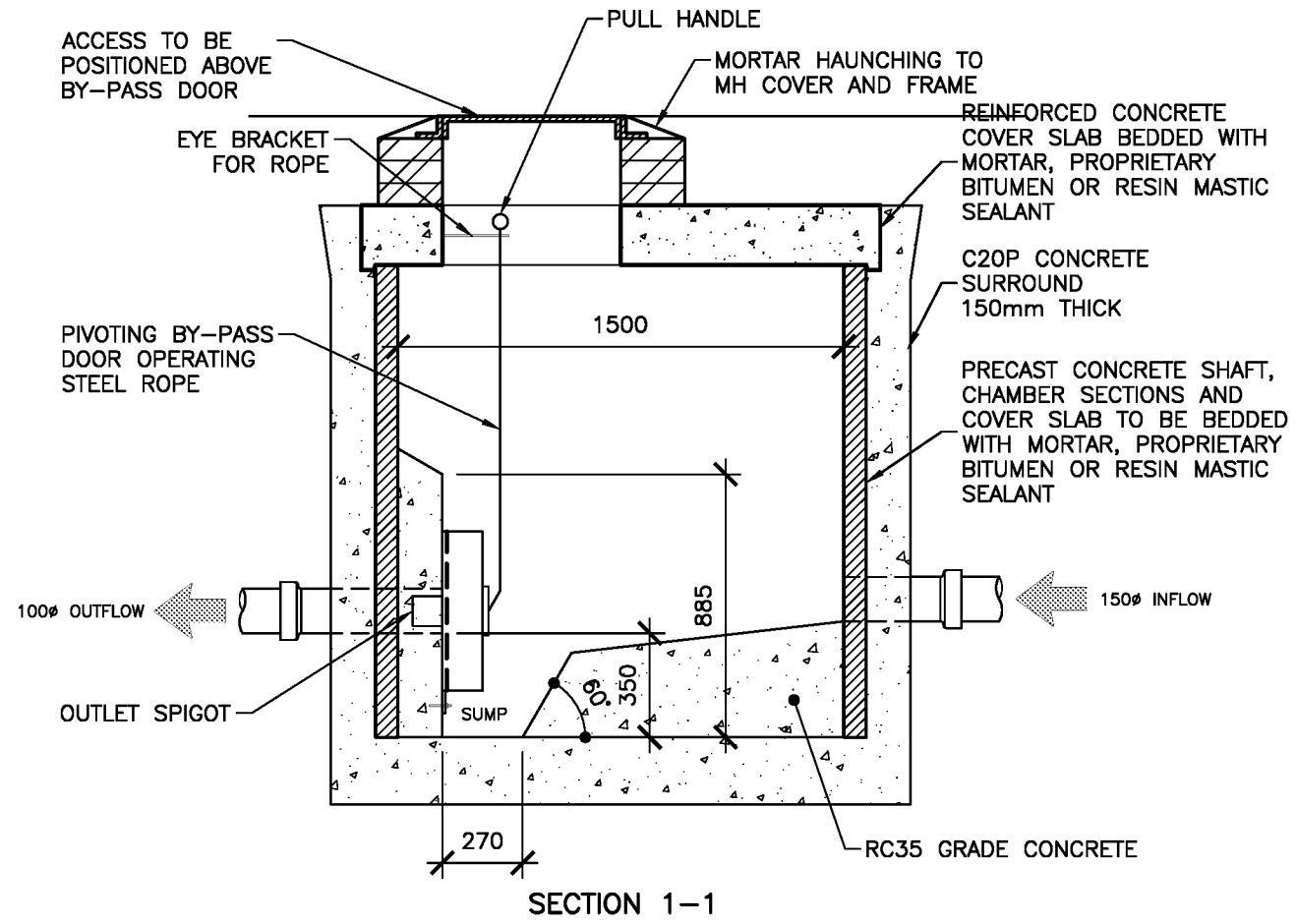
TYPICAL ACCESS CHAMBER DETAIL – TYPE 3 (FLEXIBLE MATERIAL DETAIL)

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

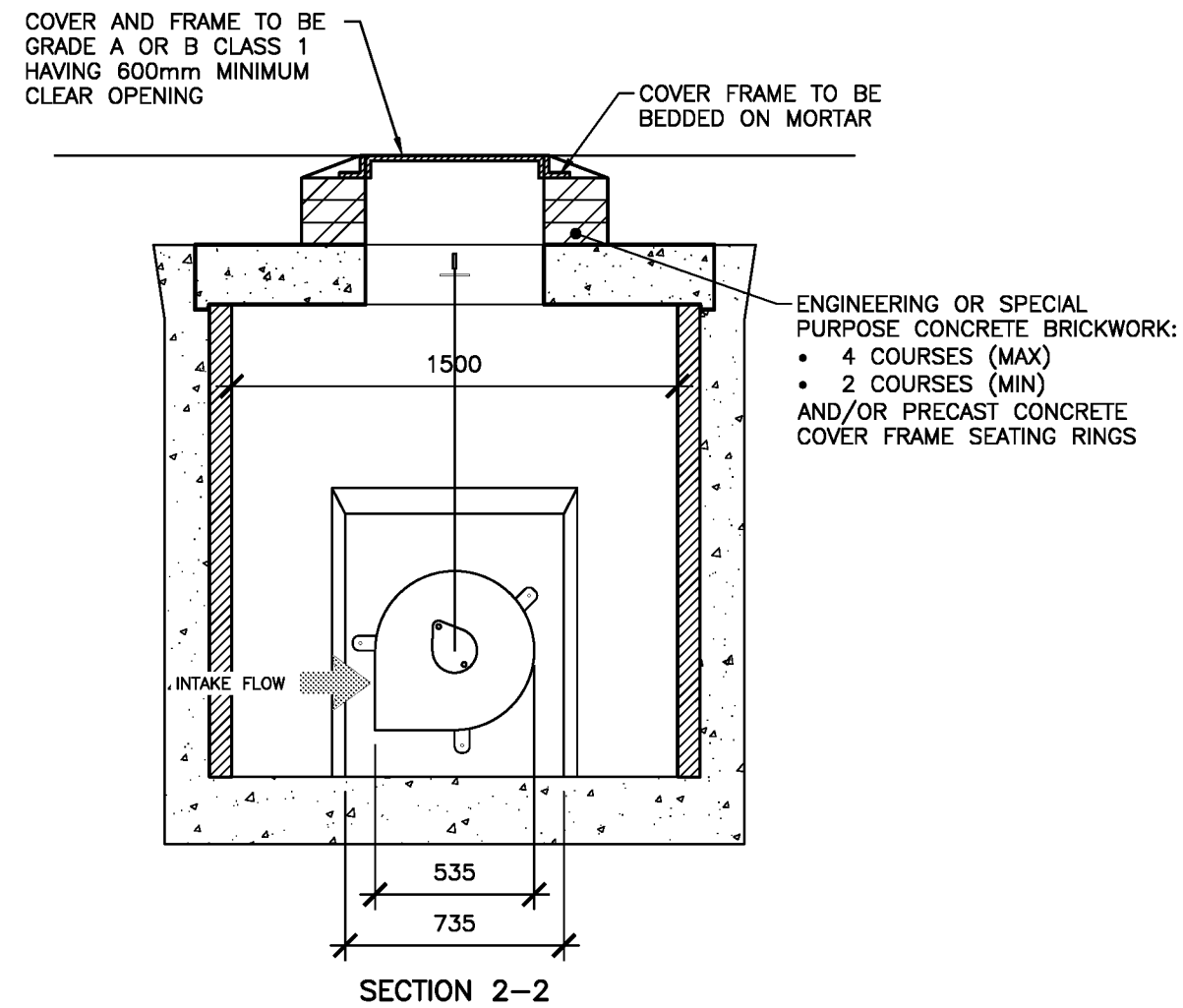
SITED IN DOMESTIC GARDENS



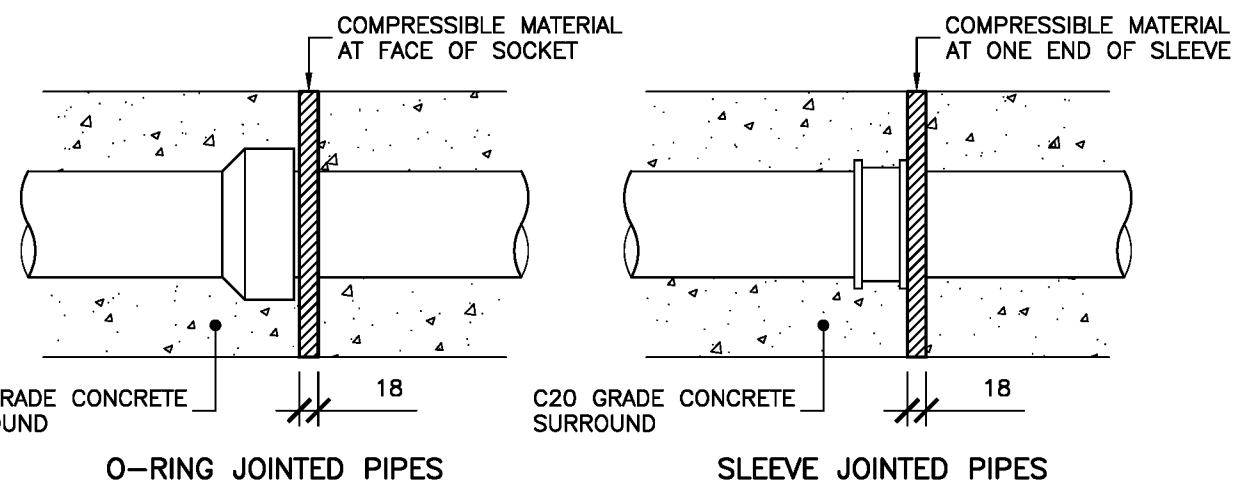
ALTERNATIVE COVER DETAIL FOR LANDSCAPED AREAS – TYPE 3 (1:25@A1)



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



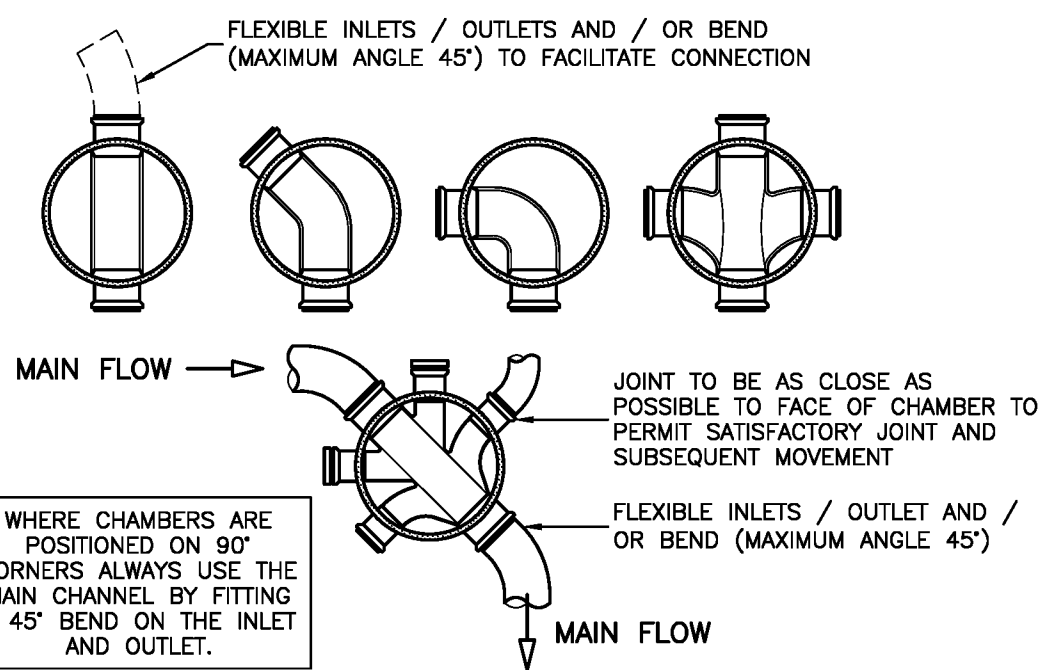
STANDARD TARMAC ROAD CONSTRUCTION DETAIL (1:10@A1)



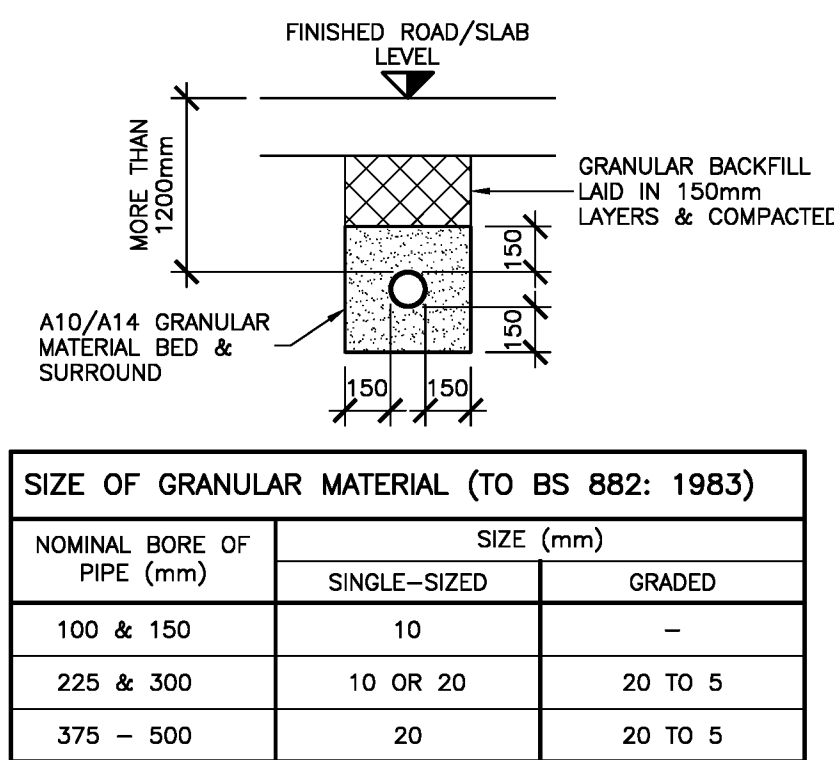
O-RING JOINTED PIPES

SLEEVE JOINTED PIPES

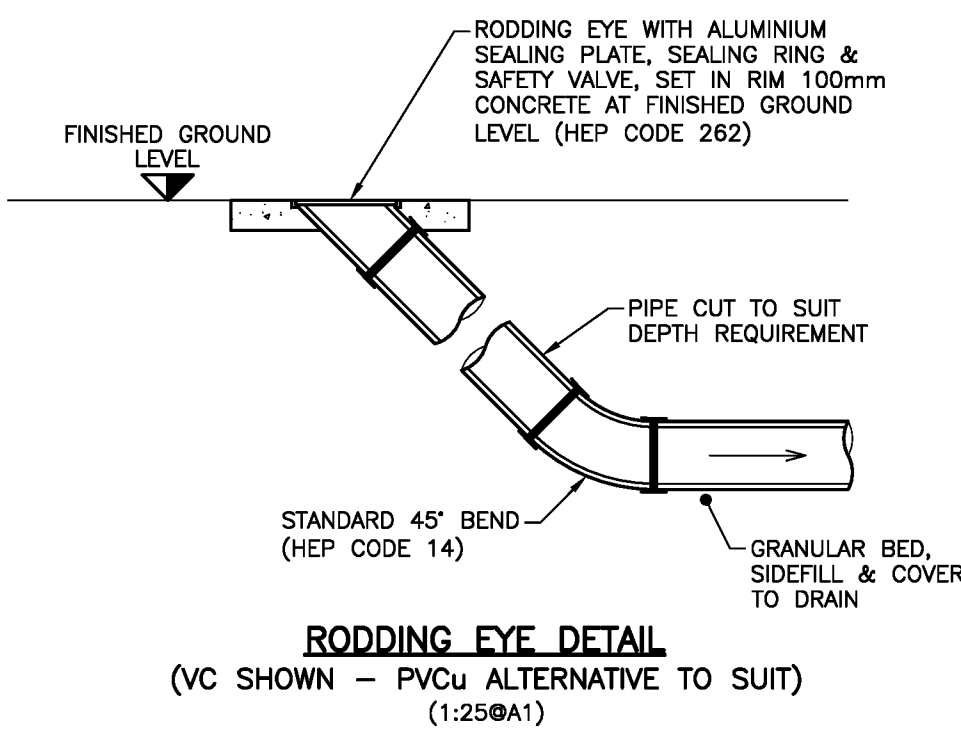
THE FLEXIBILITY OF A PIPELINE BEDDED ON, OR SURROUNDED WITH, CONCRETE SHOULD NORMALLY BE MAINTAINED BY THE PROVISION OF FLEXIBLE CONSTRUCTION JOINTS THROUGH THE CONCRETE AT PIPE JOINTS. THESE SHOULD BE MADE FROM BITUMEN IMPREGNATED INSULATING BOARD COMPLYING WITH B.S. 1142 PART 3, OR OTHER EQUALLY COMPRESSIBLE FILLER MATERIAL SUCH AS EXPANDED 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.



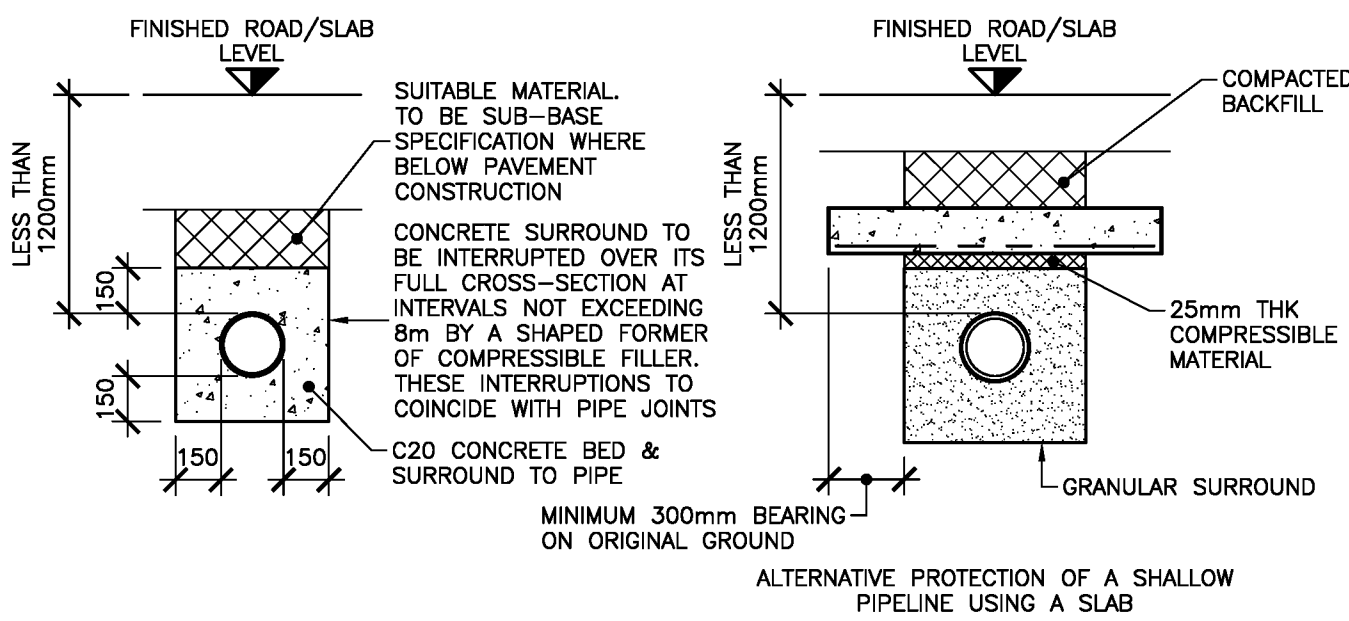
ALTERNATIVE BASE LAYOUTS FOR TYPE 3 CHAMBERS (1:25@A1)



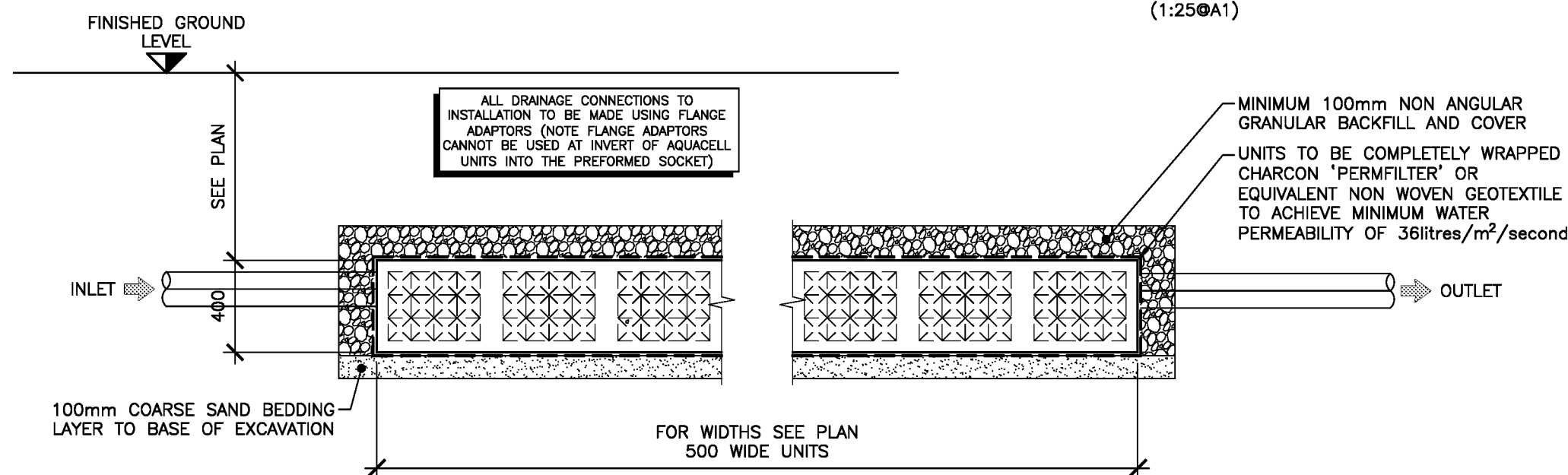
PIPE BED & SURROUND DETAIL (CLASS S) (1:25@A1)



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



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



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

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Revision	Date	Description	By
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

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Client
MAPLEDEAN PROJECTS LIMITED

Architect

Project Title
HOOK LANE,
ALDINGBOURNE, WEST SUSSEX.

Drawing Title
DRAINAGE AND ROAD DETAILS
SHEET 2

Scale
AS SHOWN

Paper Size
A1

Date
JULY 2019

Drawn By
PJM

Checked By
CH

Project No.
AAL156

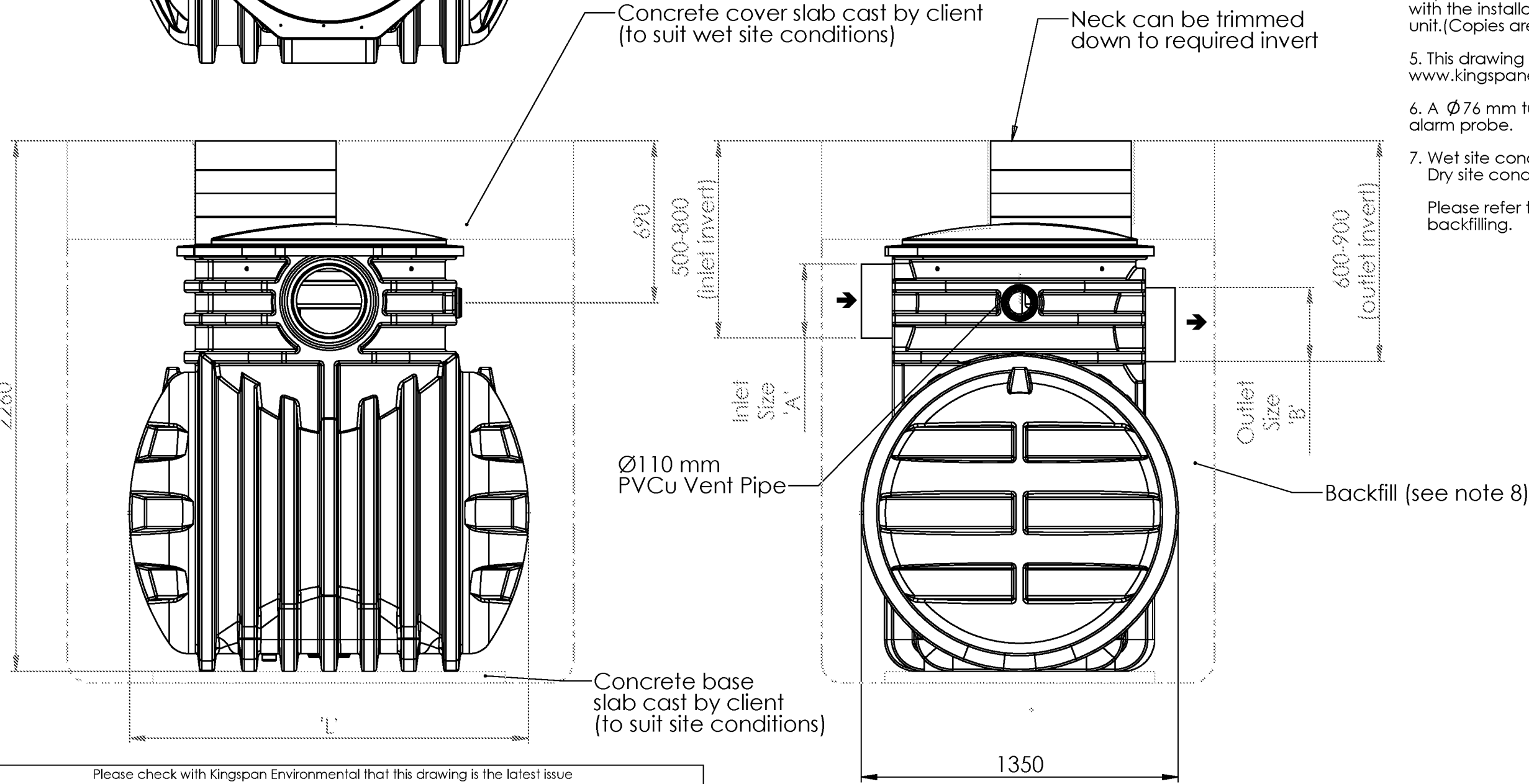
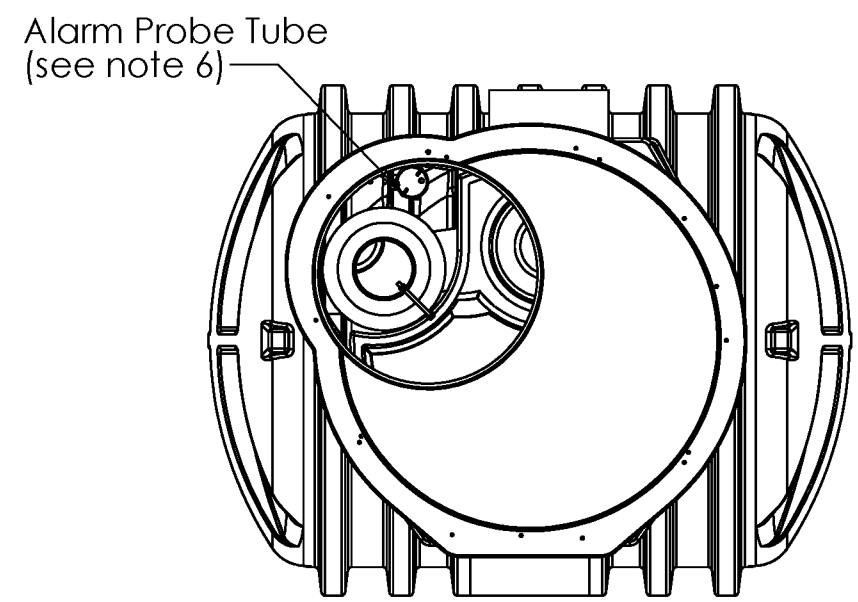
Drawing No.
552

Revision
P4

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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Appendices

Separator Maintenance Log

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 pokers to consolidate concrete. DO NOT discharge concrete directly on to the tank. Ensure that the concrete is not too wet and that 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

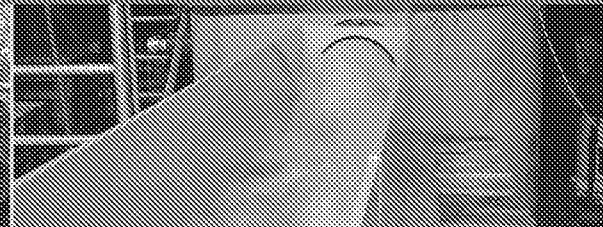
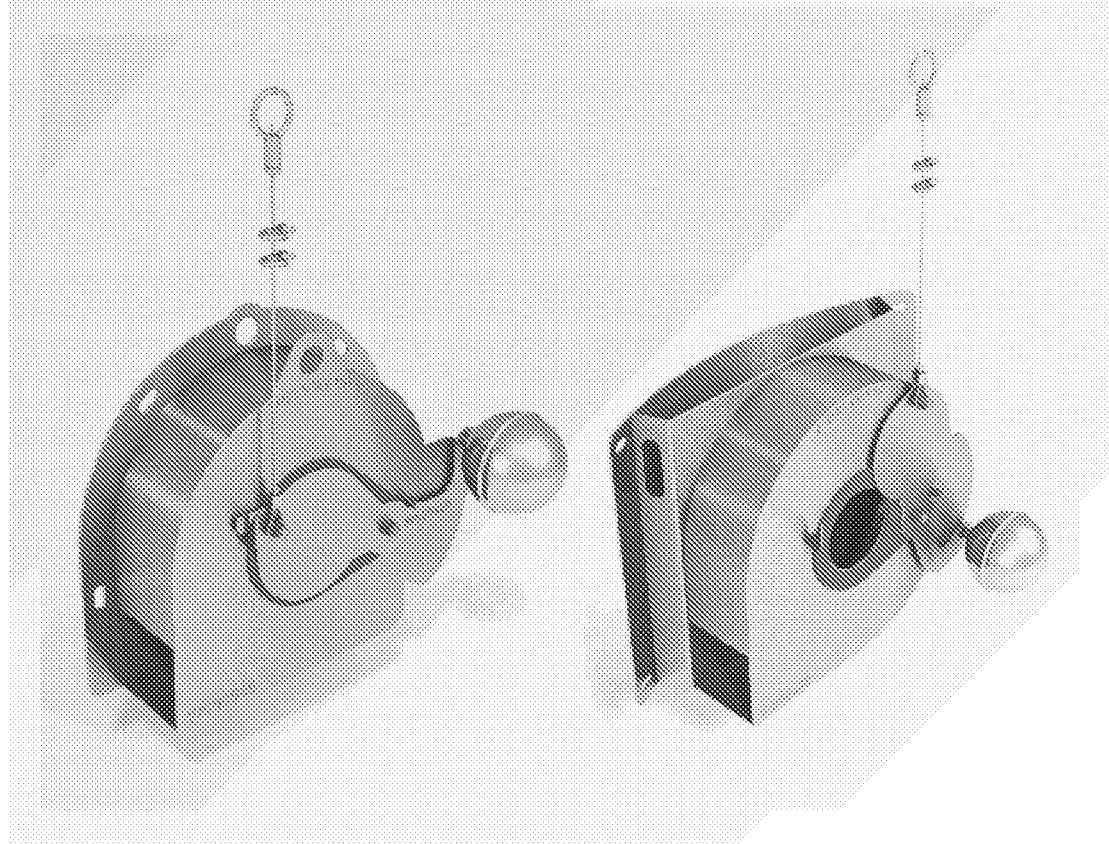
Inspection/ Maintenance Date	Comments	Waste Volumes Removed (if appropriate)

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

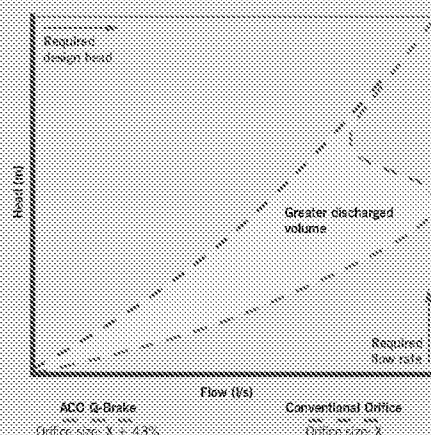
*Larger than traditional orifice plates



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

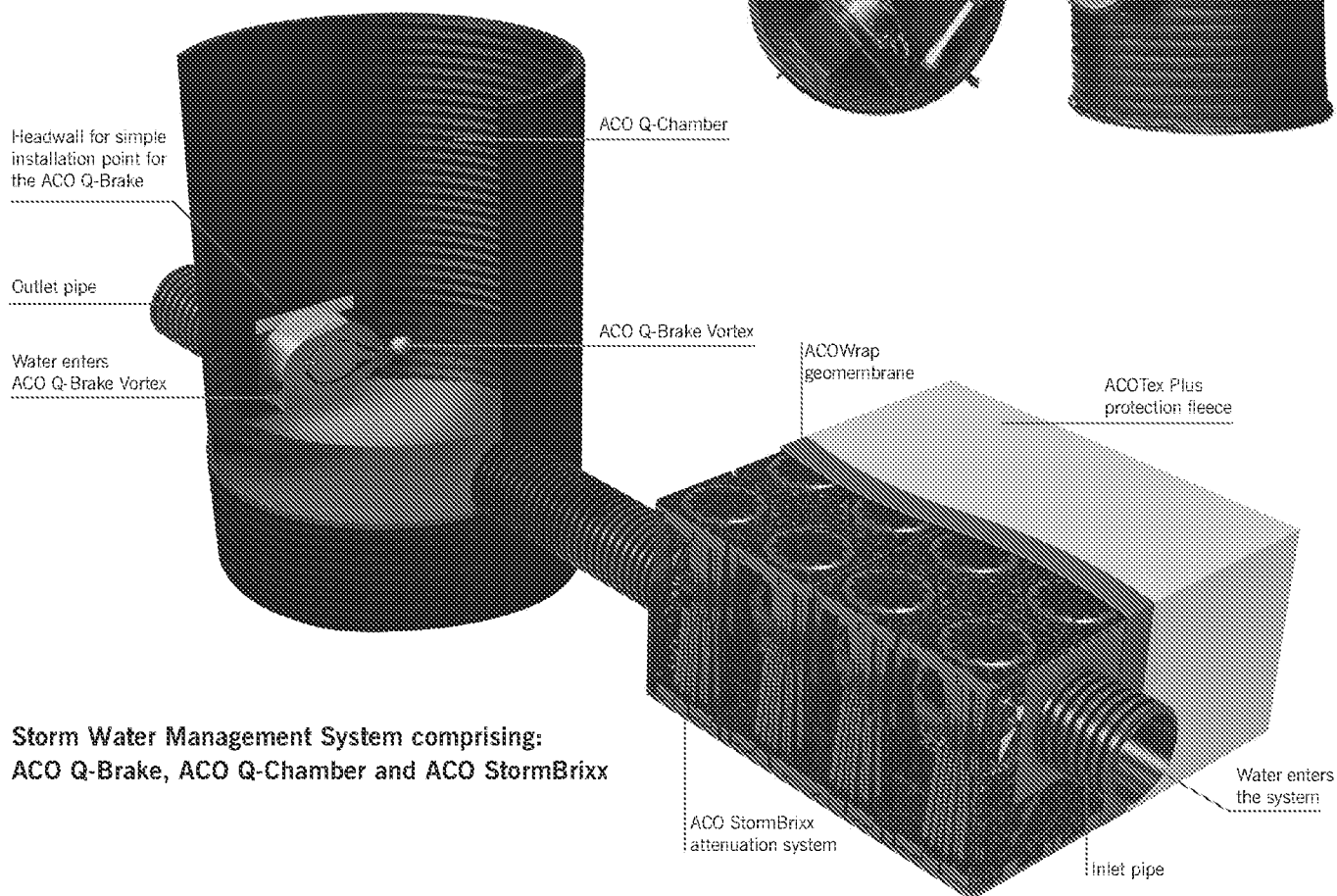
- Easy transportation and installation
- Minimise working time in a confined space
- All plastic interfaces fully welded, watertight and spark tested
- Available in a structured wall HDPE plastic chamber with a solid HDPE baseplate
- Bespoke fabrication of chambers with inlets and outlets in twin-wall 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

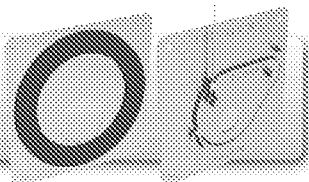
ACO Business Park, Hitchin Road, Shefford, Bedfordshire SG17 5TE

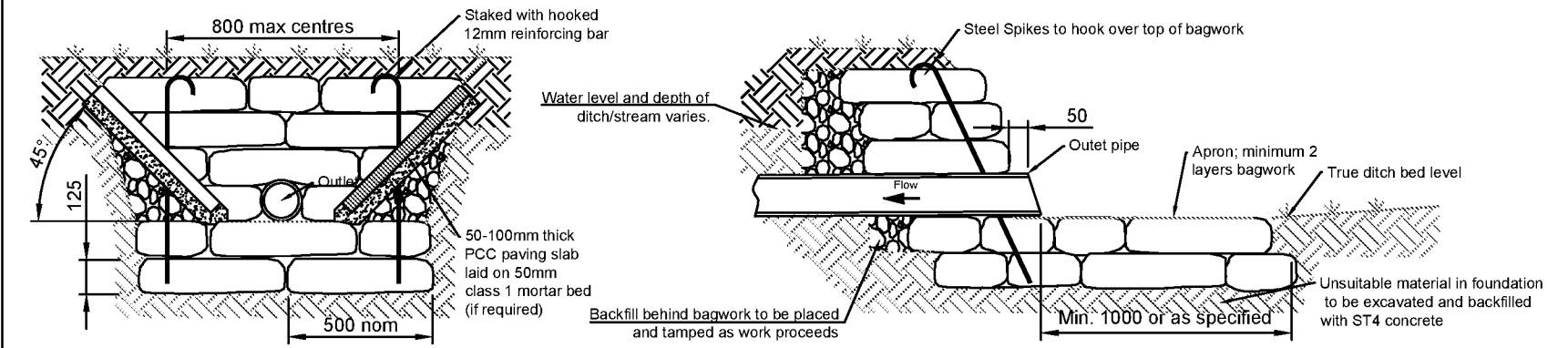
Tel: 01462 816666 Fax: 01462 815895

e-mail: technologies@aco.co.uk website: www.aco.co.uk



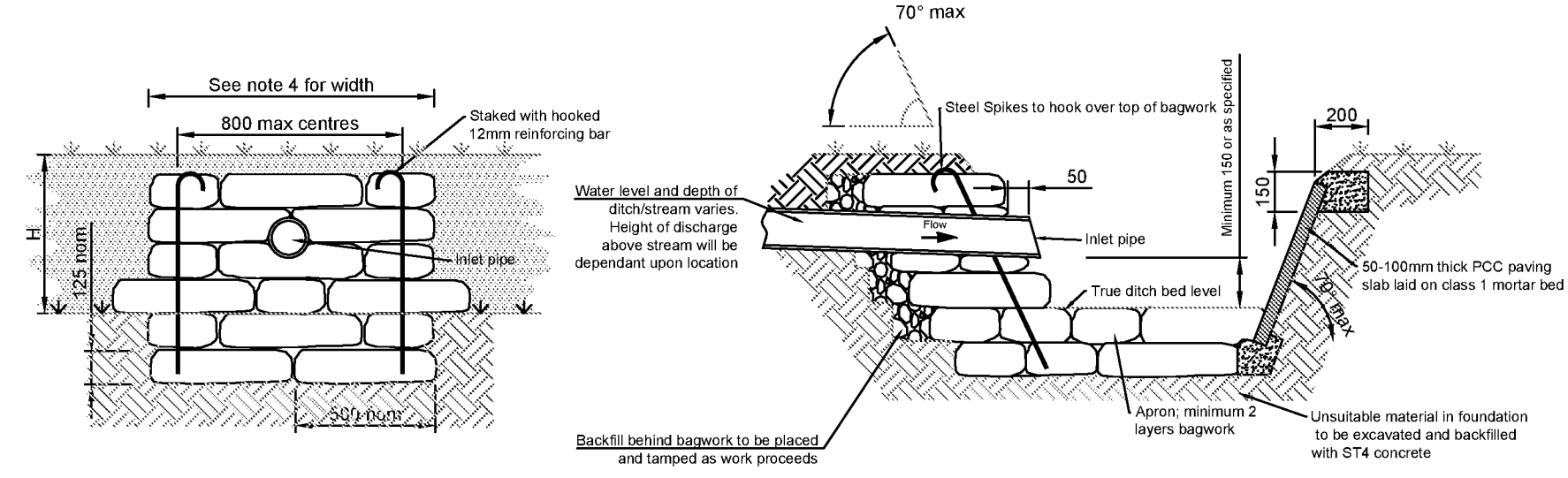
For more information on orifice plates and geocellular tanks visit www.aco.co.uk





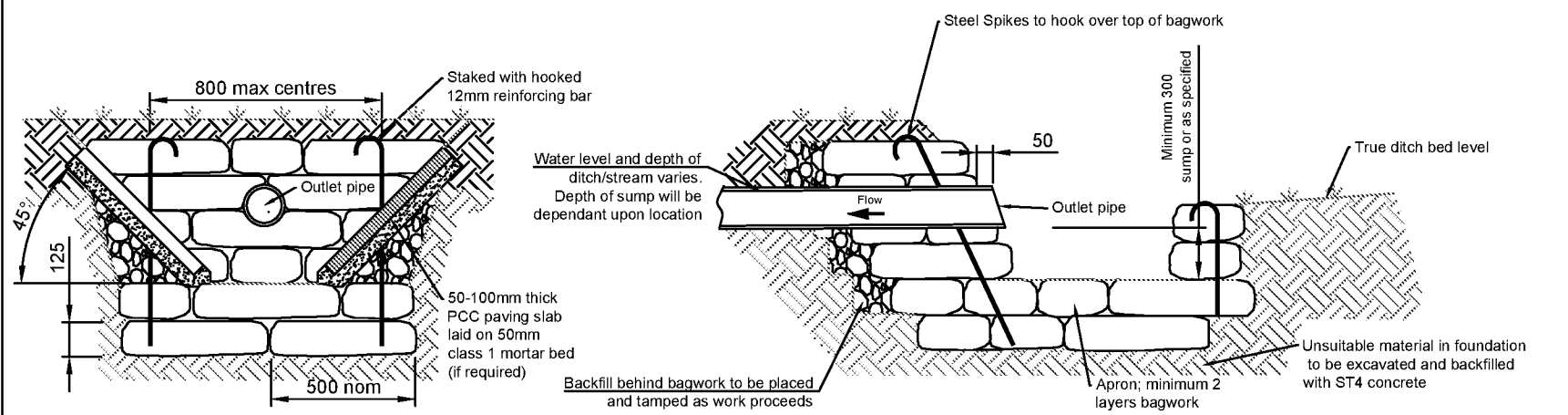
ELEVATION OF HEADWALL
OUTLET FROM END OF DITCH

HEADWALL SECTION
OUTLET FROM POND / END OF DITCH



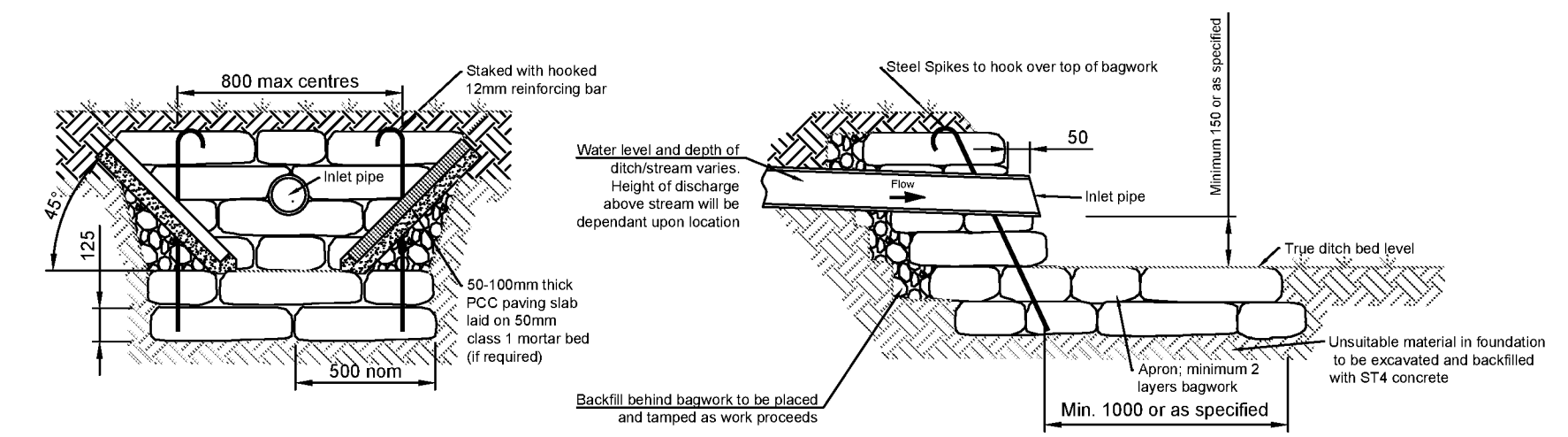
ELEVATION OF HEADWALL
OUTFALL TO SIDE OF DITCH

HEADWALL SECTION
OUTFALL TO SIDE OF DITCH



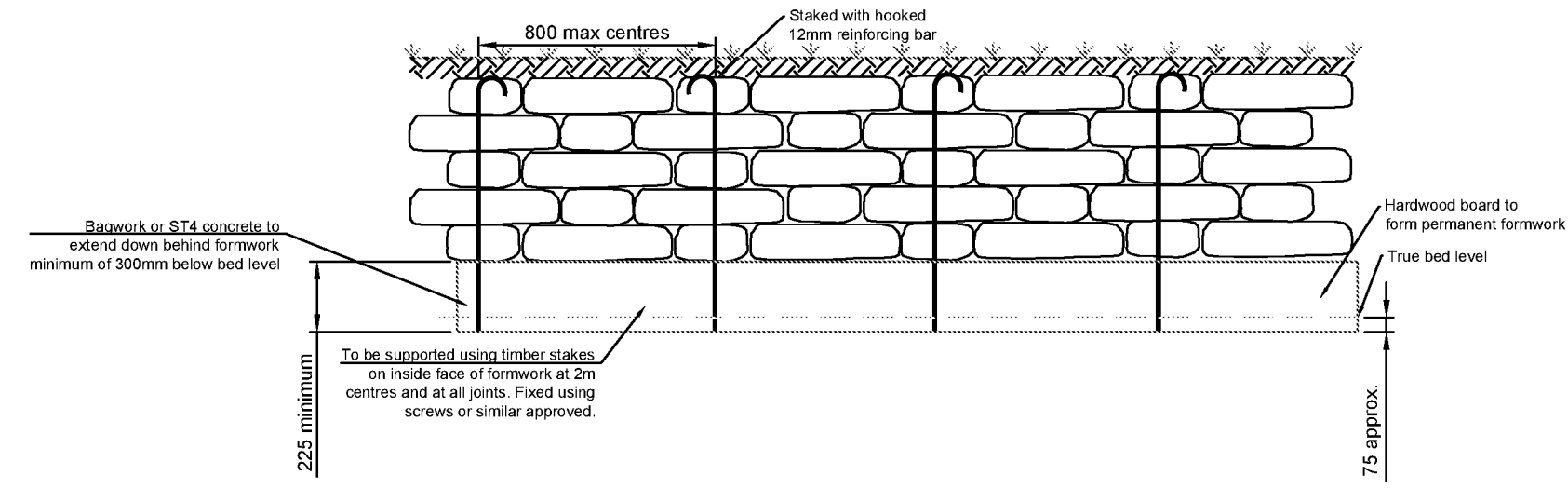
ELEVATION OF HEADWALL
OUTLET FROM END OF DITCH
(WITH SUMP)

HEADWALL SECTION
OUTLET FROM POND / END OF DITCH
(WITH SUMP)

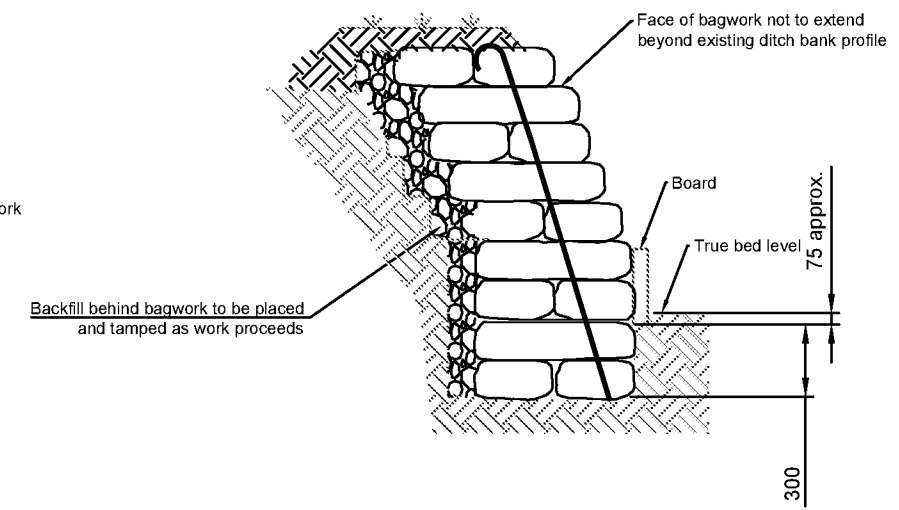


ELEVATION OF HEADWALL
OUTFALL TO END OF DITCH

HEADWALL SECTION
OUTFALL TO POND / END OF DITCH



ELEVATION OF RETAINING WALL
TO POND / SIDE OF DITCH



RETAINING WALL SECTION
TO POND / SIDE OF DITCH

- Notes
1. Bags shall be of Hessian and shall be of a size to provide a wall thickness of 500mm
 2. Concrete bagwork shall be to Clause 519 and be three quarter filled with 25mm slump ST4 concrete immediately prior to placing with the ends sewn.
 3. 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
 4. Extent of outlet protection to be the greater of 1500mm or pipe diameter + 1200mm spanning the outlet pipe.
 5. Headwall design may need to be adjusted to on site conditions following approval from ADC Engineer.
 6. Ditch to be regraded as requested.
 7. All exposed pipework to be certified UV stable.
 8. Pipe details to be as specified on supporting drawings.

E			
D			
C			
B			
A			
Rev	Description	By	Date

Project:
ADC Technical Standards

Drawing Title:
Concrete bagwork headwall and retaining wall standard details

Drawn by: LG
Checked by: PC
Date: 10/01/19
Scale: 1:25

Arun District Council
Arun Civic Centre
Maltravers Road
Littlehampton
West sussex
BN17 5LF
Tel: 01903 737500
Email: Engineering.Services@arun.gov.uk



Original Sheet Size - A2
Drawing Number: 80000102
Rev:

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	Pervios pavements	Swale/bioretenction/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.
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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.