

APPENDIX A

EXISTING HARD STANDING

Setting out dimensions, walls and levels to architects' drawings



- [illegible]

- Existing Surface Water Drain
New Surface Water Drain
Existing Brown Water Drain
New Brown Water Drain
Existing Foul Water Drain
New Foul Water Drain
Existing Combined Water Drain
New Combined Water Drain
- +10.30 Indicates Existing Ground Level
+10.35 Indicates Proposed Ground Level
- Drain direction / diameter marked on plan
- Exceedance rules

Exceedance routes

PRELIMINARY

[illegible]

**MARKS
HEELEY**

THE STABLES
CANNONS MILL LANE
BISHOPS STORTFORD
HERTFORDSHIRE MK23 2BN

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CONSULTING STRUCTURAL AND CIVIL ENGINEERS

MFG

Project

EXISTING HARDSTANDING

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	1:200	Date 27.06.22	Date 27.06.22	Date 27.06.22
Status	Drawing Number	Rev		
P	H16000-01	-		

APPENDIX B

PROPOSED HARDSTANDING

APPENDIX C

PROPOSED CATCHMENT AREA

[illegible]

EXISTING SITE AREA: 2870M²
 $0.07 \times 2070 = 144.9 \times 1000 = \frac{144900}{3600} = 40.25 \text{ l/s}$
 PROPOSED SITE AREA 2108M²
 CATCHMENT OF SITE BEING SERVED BY NEW SW
 DRAINAGE = 2108-520 = 1788M²
 $0.07 \times 1788 = 125.16 \times 1000 = \frac{125160}{3600} = 34.7 \text{ l/s}$
 $34.7 + 1 = 35.7 \text{ l/s}$
 22% REDUCTION IN OUTFLOW RATE ACROSS THE
 WHOLE SITE.

STOCKPORT ROAD

SURFACE AREA SERVED
BY NEW DRAINAGE
320M2

- Existing Surface Water Drain
New Surface Water Drain
Existing Brown Water Drain
New Brown Water Drain
Existing Foul Water Drain
New Foul Water Drain
Existing Combined Water Drain
New Combined Water Drain
- 10 to 30 Indicates Existing Ground Level
10 to 35 Indicates Proposed Ground Level
10 to 35 Drain direction / diameter marked on plan
Exceedance routes

Exceedance routes

PRELIMINARY

[illegible]MARKS
HILL FY

Cont.

MFG

Subject
MFG LEVENSHULME
STOCKPORT ROAD, CRINGLE ROAD
MANCHESTER, M19 2RE

NEW DRAINAGE CATCHMENT AREA

Sheet Size A1	Original Scale 1:100	Designed/Drawn	Checked	Authorised
		Date 27.06.22	Date 27.06.22	Date 27.06.22
Status P	Drawing Number H16000-03	Rev -		

APPENDIX D

ATTENUATION CALCULATIONS

Marks Heeley Limited		Page 1
The Stables Cannons Mill Lane Bishops Stortford CM23 2BN		
Date 29/06/2022 16:53	Designed by A.Flack	
File	Checked by	
XP Solutions		Source Control 2016.1

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

Half Drain Time : 113 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	99.246	0.246	0.0	1.0	1.0	7.1	O K
30 min Summer	99.317	0.317	0.0	1.0	1.0	9.1	O K
60 min Summer	99.375	0.375	0.0	1.0	1.0	10.8	O K
120 min Summer	99.397	0.397	0.0	1.0	1.0	11.4	O K
180 min Summer	99.394	0.394	0.0	1.0	1.0	11.3	O K
240 min Summer	99.383	0.383	0.0	1.0	1.0	11.0	O K
360 min Summer	99.351	0.351	0.0	1.0	1.0	10.1	O K
480 min Summer	99.316	0.316	0.0	1.0	1.0	9.1	O K
600 min Summer	99.281	0.281	0.0	1.0	1.0	8.1	O K
720 min Summer	99.250	0.250	0.0	1.0	1.0	7.2	O K
960 min Summer	99.195	0.195	0.0	1.0	1.0	5.6	O K
1440 min Summer	99.122	0.122	0.0	1.0	1.0	3.5	O K
2160 min Summer	99.074	0.074	0.0	0.9	0.9	2.1	O K
2880 min Summer	99.060	0.060	0.0	0.8	0.8	1.7	O K
4320 min Summer	99.045	0.045	0.0	0.6	0.6	1.3	O K
5760 min Summer	99.039	0.039	0.0	0.5	0.5	1.1	O K
7200 min Summer	99.034	0.034	0.0	0.4	0.4	1.0	O K
8640 min Summer	99.032	0.032	0.0	0.3	0.3	0.9	O K
10080 min Summer	99.029	0.029	0.0	0.3	0.3	0.8	O K
15 min Winter	99.278	0.278	0.0	1.0	1.0	8.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	118.843	0.0	7.8	18
30 min Summer	79.493	0.0	10.4	32
60 min Summer	50.812	0.0	13.3	62
120 min Summer	31.438	0.0	16.5	106
180 min Summer	23.432	0.0	18.4	138
240 min Summer	18.907	0.0	19.8	170
360 min Summer	13.852	0.0	21.8	240
480 min Summer	11.115	0.0	23.3	308
600 min Summer	9.363	0.0	24.6	370
720 min Summer	8.134	0.0	25.6	434
960 min Summer	6.509	0.0	27.3	552
1440 min Summer	4.746	0.0	29.9	780
2160 min Summer	3.454	0.0	32.6	1104
2880 min Summer	2.754	0.0	34.7	1468
4320 min Summer	1.997	0.0	37.7	2200
5760 min Summer	1.588	0.0	40.0	2936
7200 min Summer	1.329	0.0	41.8	3672
8640 min Summer	1.148	0.0	43.4	4352
10080 min Summer	1.014	0.0	44.7	5128
15 min Winter	118.843	0.0	8.7	18

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XP Solutions		Source Control 2016.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.361	0.361	0.0	1.0	1.0	10.4	O K
60 min Winter	99.427	0.427	0.0	1.0	1.0	12.3	O K
120 min Winter	99.458	0.458	0.0	1.0	1.0	13.2	O K
180 min Winter	99.450	0.450	0.0	1.0	1.0	13.0	O K
240 min Winter	99.435	0.435	0.0	1.0	1.0	12.5	O K
360 min Winter	99.390	0.390	0.0	1.0	1.0	11.2	O K
480 min Winter	99.340	0.340	0.0	1.0	1.0	9.8	O K
600 min Winter	99.282	0.282	0.0	1.0	1.0	8.1	O K
720 min Winter	99.233	0.233	0.0	1.0	1.0	6.7	O K
960 min Winter	99.155	0.155	0.0	1.0	1.0	4.5	O K
1440 min Winter	99.078	0.078	0.0	0.9	0.9	2.2	O K
2160 min Winter	99.055	0.055	0.0	0.7	0.7	1.6	O K
2880 min Winter	99.045	0.045	0.0	0.6	0.6	1.3	O K
4320 min Winter	99.036	0.036	0.0	0.4	0.4	1.0	O K
5760 min Winter	99.032	0.032	0.0	0.3	0.3	0.9	O K
7200 min Winter	99.028	0.028	0.0	0.3	0.3	0.8	O K
8640 min Winter	99.026	0.026	0.0	0.2	0.2	0.7	O K
10080 min Winter	99.024	0.024	0.0	0.2	0.2	0.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.493	0.0	11.7	32
60 min Winter	50.812	0.0	14.9	60
120 min Winter	31.438	0.0	18.5	114
180 min Winter	23.432	0.0	20.7	144
240 min Winter	18.907	0.0	22.2	182
360 min Winter	13.852	0.0	24.4	260
480 min Winter	11.115	0.0	26.1	338
600 min Winter	9.363	0.0	27.5	398
720 min Winter	8.134	0.0	28.7	462
960 min Winter	6.509	0.0	30.6	572
1440 min Winter	4.746	0.0	33.5	766
2160 min Winter	3.454	0.0	36.5	1108
2880 min Winter	2.754	0.0	38.8	1468
4320 min Winter	1.997	0.0	42.3	2196
5760 min Winter	1.588	0.0	44.8	2944
7200 min Winter	1.329	0.0	46.9	3672
8640 min Winter	1.148	0.0	48.6	4416
10080 min Winter	1.014	0.0	50.1	4952

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The Stables Cannons Mill Lane Bishops Stortford CM23 2BN		
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XP Solutions		Source Control 2016.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.362	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.035

Time (mins)	Area
From:	To: (ha)

0	4	0.035
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XP Solutions	Source Control 2016.1

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 1.5
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.96
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	30.0	30.0	0.600	0.0	41.0
0.500	30.0	41.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0054-1000-0500-1000
Design Head (m) 0.500
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 54
Invert Level (m) 99.000
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	1.0
Flush-Flo™	0.151	1.0
Kick-Flo®	0.332	0.8
Mean Flow over Head Range	-	0.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	1.200	1.5	3.000	2.2	7.000	3.4
0.200	1.0	1.400	1.6	3.500	2.4	7.500	3.5
0.300	0.9	1.600	1.7	4.000	2.6	8.000	3.6
0.400	0.9	1.800	1.8	4.500	2.7	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.8	9.000	3.8
0.600	1.1	2.200	1.9	5.500	3.0	9.500	3.9
0.800	1.2	2.400	2.0	6.000	3.1		
1.000	1.4	2.600	2.1	6.500	3.2		

APPENDIX E

PROPOSED DRAINAGE PLAN

[illegible]

- Existing Surface Water Drain
New Surface Water Drain
Existing Brown Water Drain
New Brown Water Drain
Existing Foul Water Drain
New Foul Water Drain
Existing Combined Water Drain
New Combined Water Drain
- +10.30 Indicates Existing Ground Level
+10.35 Indicates Proposed Ground Level
- Drain direction / diameter marked on plan
- Exceedance routes

PRELIMINARY

[illegible]

**MARKS
HEELEY**

THE STABLES
CANNONS MILL LANE
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CONSULTING STRUCTURAL AND CIVIL ENGINEERS

Client

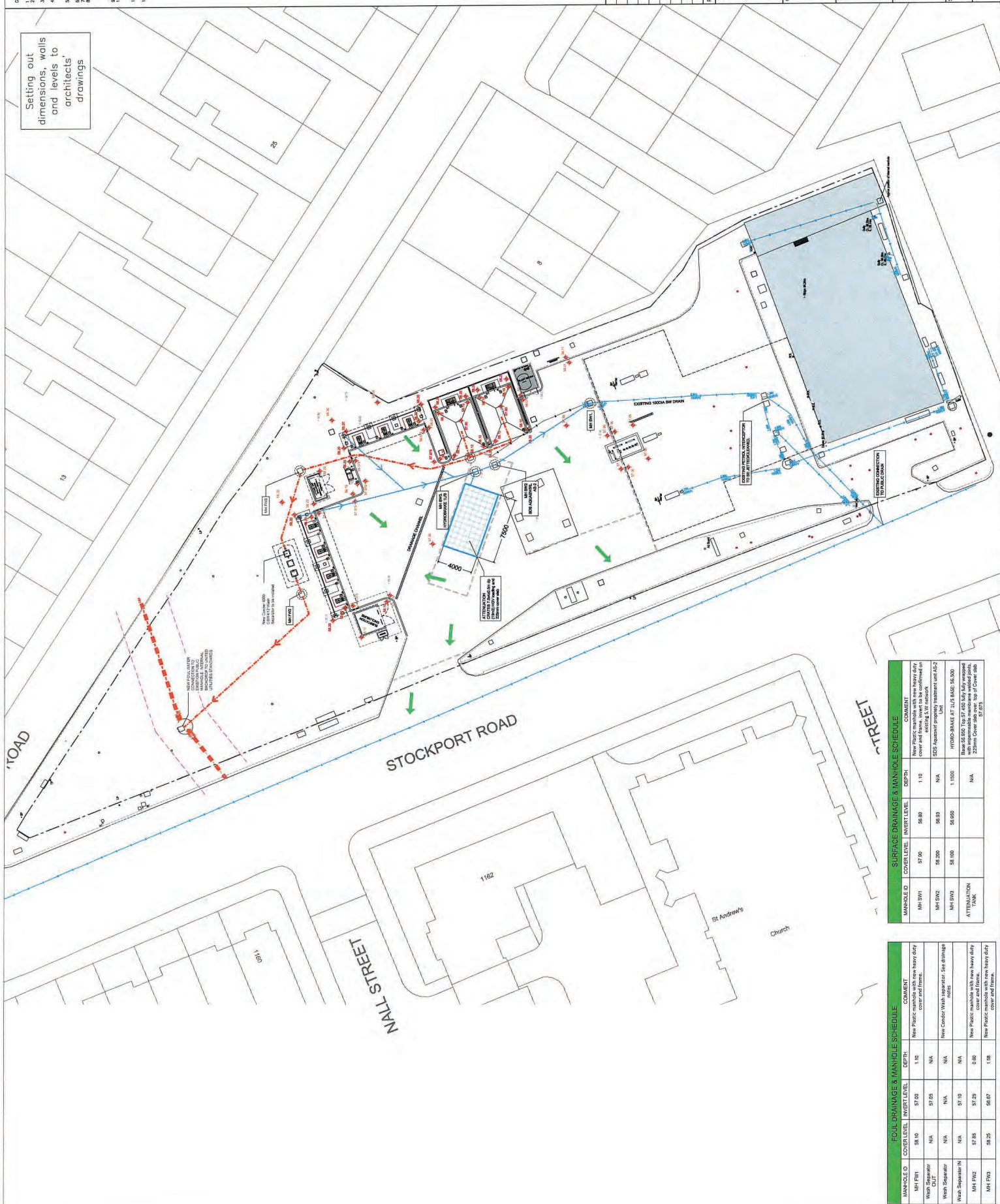
MFG

MFG LEVENSHULME
STOCKPORT ROAD, CRINGLE ROAD
MANCHESTER, M19 2RE

DRAINAGE SCHEMATIC

Sheet Size A1	Original Scale 1:200	Designed/Drawn		Checked	Authorized
		Date 27.06.22	Date 27.06.22	Date 27.06.22	Date 27.06.22
Status P	Drawing Number		Rev H16000-04		

Setting out dimensions, walls and levels to architects' drawings



SURFACE DRAINAGE & MANHOLE SCHEDULE				
MANHOLE ID	COVER/LEVEL	INVERT LEVEL	DEPTH	COMMENT
MH 301	57.90	56.80	1.10	New manhole with new 18" deep daily cover and 18" x 18" manhole frame and existing & LV network
MH 302	55.200	56.93	N/A	SDS Aquaplay properly installed unit A-2
MH 303	58.000	56.050	1.9500	HYDRO-BRACE 17 1/2" x 54" x 50.000
ATTENUATION TANK			N/A	30' dia. x 10' deep concrete tank with impermeable membrane and 22500' Cover data over top of Cover data

FOUR DRAINAGE & WHOLE SCHEDULE				
MANHOLE	OVERLEVEL	INVERT LEVEL	DEPTH	COMMENT
MH FVI	58.10	57.00	1.10	New Plastic manhole with new heavy duty cover and frame.
Wash Receiver OUT	N/A	57.05	N/A	
Wash Separator	N/A	N/A	N/A	New Center Wall separator. All drainage nodes
Wash Separator IN	N/A	57.10	N/A	
MH P102	57.58	57.29	0.06	New Plastic manhole with new heavy duty cover and frame.
MH P103	58.25	56.87	1.08	New Plastic manhole with new heavy duty cover and frame.

APPENDIX F

SuDs FEATURES MAINTENANCE DETAILS

SDS Aqua-Swirl™

Hydrodynamic Vortex Separator

SDS Aqua-Swirl™ is a custom engineered, flow through water quality device that utilises hydrodynamic separation technology to maximise the removal of sediment, debris and free floating oil within surface water runoff.

SYMBiotic™

When connected to a SDS SYMBiotic™ system, SDS Aqua-Swirl™ provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

- BBA HAPAS approved
- HDPE plastic construction
- No moving parts
- Sealed baffle
- Large debris storage chamber
- Lifting supports
- Compact dimensions
- Available in 9 different sizes
- Bespoke sizing available



SDS Aqua-Swirl™ is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl™ system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution train.

Features	Benefits
Available with performance monitoring via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by the Highways Agency.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Specialised sealed baffle.	Delivers the most effective performance of any vortex separator.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
NJDEP verified performance.	Verification accepted by UK Government environmental regulators (as cited in the CIRIA C753 SuDS Manual).
Single swirl chamber.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

SPECIFICATIONS

SDS Aqua-Swirl™ Model No.	Maximum ID pipe connection (mm) BYP ¹	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate NJDEP (L/s) Fine	Water Quality Treatment Flow Rate (L/s) OK110 Coarse	Oil/debris storage capacity litres	Sediment storage capacity m ³	Aqua-Swirl™ Weight kg
AS-2	375	750	16	30	136	0.3	300
AS-3	500	1050	31	53	416	0.6	700
AS-4	600	1200	40	77	644	0.8	1000
AS-5	750	1500	63	120	1382	1.3	1100
AS-6	900	1800	91	173	1439	1.8	1400
AS-7	1050	2100	123	235	1987	2.5	1700
AS-8	1200	2400	161	307	2612	3.3	2200
AS-9	1350	2800	220	418	3596	4.4	2600
AS-10	1500	3000	252	480	4164	5.1	3100

¹BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.

Notes:

Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.

The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.

For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0819



Installation & Maintenance

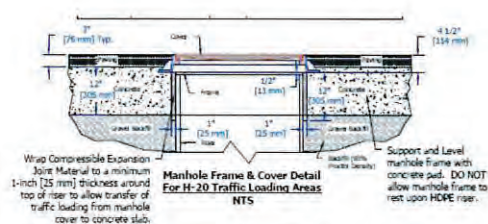
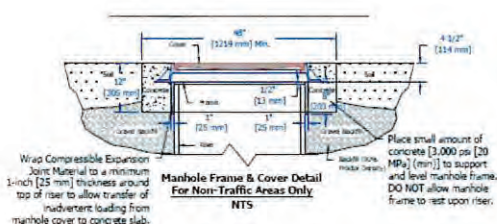
SDS Aqua Swirl™ Hydrodynamic Separator

Aqua-Swirl™ systems are fabricated from high performance HDPE materials; they are durable lightweight and can be installed without use of heavy lifting equipment.

Lifting support cables are provided to allow easy off loading and installation, resulting in significantly reduced installation costs.

Installation:

- 1) Excavation to required size and depth allowing for 600mm around each side of the unit
- 2) Prepare the bed with 20-40mm clean stone to a depth of 300mm
- 3) Compacted in 150mm layers to ASTM D 2321 to a proctor density of 95%
- 4) Install the unit and backfill with 20-40mm clean stone in 150mm layers to ASTM D 2321 sufficient backfill should be placed over components prior to using heavy compaction or construction equipment to prevent damage.
- 5) Connect to drainage network pipework with rubber couplings like Fernco, Flex Seal or Band Seal.
- 6) The Aqua Swirl has an octagonal base plate extending 150mm from the outside diameter to provide mitigation against buoyancy, concrete can be poured directly onto the base plate if required to provide additional resistive force.
- 7) The riser pipe is supplied to the required length and can be cut to size on site to the required depth.
- 8) Recommended man hole cover Clark drain CD751H KMD frame and cover or equal
- 9) Where traffic loading is required a reinforced concrete pad must be placed over the entire Aqua swirl as per design calculated by engineer.
- 10) If traffic loading is not required, it's recommended that bollards are placed around access risers in non-traffic areas to prevent inadvertent loadings by maintenance vehicles.



System Operation:

The Aqua-Swirl[®] is most commonly installed in an "off-line" configuration. Or, depending on local regulations, an "in-line" (on-line) conveyance flow diversion (CFD) system can be used. The CFD model allows simple installation by connecting directly to the existing storm conveyance pipe thereby providing full treatment of the "first flush," while the peak design storm is diverted and channelled through the main conveyance pipe

The patented Aqua-Swirl[®] Stormwater Treatment System provides a highly effective means for the removal of sediment, floating debris, and free oil. Swirl technology, or vortex separation, is a proven form of treatment utilized in the Stormwater industry to accelerate gravitational separation.

The treatment operation begins when Stormwater enters the Aqua-Swirl[®] through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminants to settle to the base of the unit. Since Stormwater flow is intermittent by nature, the Aqua-Swirl[®] retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms.

A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl[®] behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Maintenance:

Long term performance of the Aqua Swirl or any other device depends on inspection and maintenance program.

Recommended schedule in line with Ciria C753 guidance

On hand over – 3 months -6 months -12 months and then annually or as deemed necessary from details obtain from previous inspections.

Each sites sediment loadings will be different and at its highest just after the build phase, hence why a more frequent visit are required at the start of the programme.

The Aqua-Swirl[®] has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free- floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Inspection:

To inspect the Aqua-Swirl[®], remove the manhole cover. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl[®] model size, and serial number.

The only tools needed to inspect the Aqua-Swirl[®] system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water. When the sediment pile is within 42 to 48 inches of the water surface (or sediment pile thickness is 18 to 24 inches as measured from the base), the system should be maintained. The maximum Sediment storage capacity of the Aqua-Swirl[®] is reached when the sediment pile is within 30 inches of the water surface (or sediment accumulation is 36 inches thick as measured from the base).

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl[®] design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

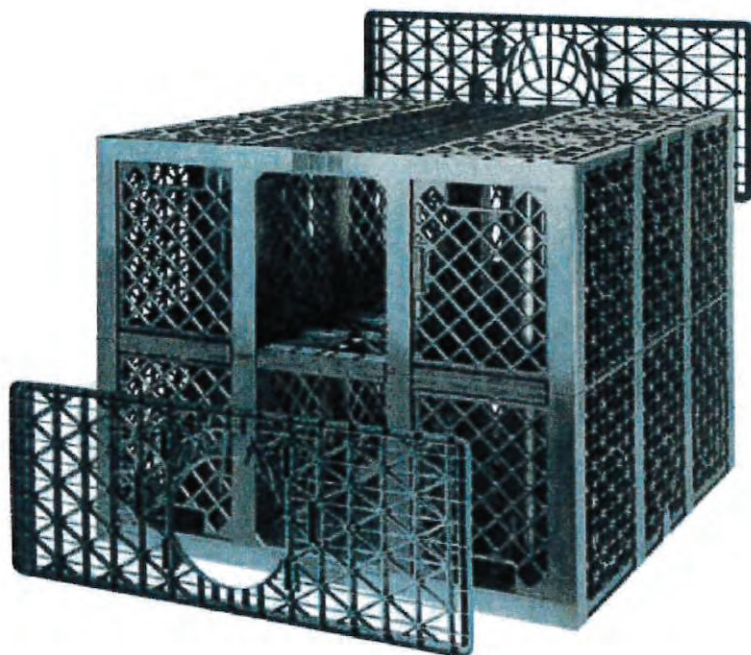
Removal:

Cleaning the Aqua-Swirl[®] is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the

Aqua-Swirl[®] design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or "blind") chambers in the Aqua-Swirl[®], there are no restrictions to impede on-site maintenance tasks.

Disposal:

All removed products should be disposed of in line with local council requirements



Stormbloc[®] User Manual



The Accessible 'Engineered' Solution to SuDS

SuDS / Source Control

Regulatory and guidance documents such as PPS 25 and Building Regulations are putting increasing demands on developers and engineers to consider sustainable drainage systems (SuDS) wherever possible and to incorporate source control approaches into surface water drainage systems.

*"Sustainable drainage systems (SuDS) are increasingly being used to mitigate the flows and pollution from runoff. The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site before development and to treat runoff to remove pollutants, so reducing the impact on receiving watercourses. This requires a reduction in the rate and volume of runoff from developments, combined with treatment to remove pollutants as close to the source as possible."*¹

¹ CIRIA C609 (2004) - Sustainable Drainage Systems - Hydraulic, structural and water quality advice.



Maintenance Instructions

The patented inspection / maintenance tunnels within each Stormbloc® module allows almost the entire volume of the construct to be inspected via CCTV camera and flushed through.

A catchpit chamber immediately upstream of the system is recommended as this will reduce the amount of silt entering the installation. For larger installations it may also be advantageous to add further catchpits to the system design or an advanced vortex silt trap such as the Downstream Defender® by Hydro International. The collection sump(s) should not be allowed to overfill as this will lead to silt carry-over into the Stormbloc® modules.

As all schemes are different, the frequency at which the catchpit(s) should be emptied will need to be determined on site. For small soakaways and individual infiltration tanks it will generally only be necessary to ensure that the catchpits / silt traps are free from debris such as leaves or sediment. It is recommended that any system be inspected no less frequently than at monthly intervals for the first 3 months and thereafter at 6 monthly intervals. In addition, it is suggested that the installation is inspected immediately following the first storm event, whenever this should occur post installation.

Individual maintenance schedules should be drawn up using the information obtained from the initial inspections. It should also be noted that more regular inspections may be required should the catchpit(s) fill more frequently and/or if the initial inspections reveal that maintenance / cleaning will be required more regularly than at six month intervals.

Flushing of the system can be achieved using a jetting system with a 150 bar pump pressure (ie. approximately 80 bar at the nozzle) at a discharge flow of 300 l/min. The jet nozzle should be introduced to the system via the Stormbloc® Inspect / manhole and the integral inspection / maintenance tunnel. The silt should be flushed to the Stormbloc® Inspect or catchpit manhole and removed from there.

References

- 1 Water Research Centre (2001)
Sewers for Adoption 5th Edition.
- 2 Department for Transport, Local Government and the Regions (2001).
Planning Policy Statement (PPS), Note 25: Development and Flood Risk.
- 3 The Building Regulations 2000 (amended 2001).
Approved Document H3.
- 4 British Standards Institute (1973).
CP312: Part 1: 1973 British Standard Code of Practice for Plastics Pipework (Thermoplastics Material). General Principles and Choice of Material.
- 5 Building Research Establishment (1991).
BRE Digest 365, Soakaway Design.
- 6 Construction Industry Research and Information Association (1995).
CIRIA Report 156 Infiltration Drainage - Manual of Good Practice.
- 7 Construction Industry Research and Information Association (1997)
The SUDS Manual (C. 697).
- 8 Micro Drainage.
The Micro Drainage Suite of Programs.
Website: www.microdrainage.co.uk
- 9 Hydro International.
Stormcell® User Manual.
- 10 Hydro International.
Stormwater Package Brochure.
- 11 WTB Geotechnics
SC Membrane: Technical Data Sheet.
- 12 WTB Geotechnics
AZTEX SPR14 Geotextile Technical Data Sheet.

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Agrément Certificate

10/4795

Product Sheet 1

HYDRO INTERNATIONAL STORMWATER MANAGEMENT SYSTEMS

STORMBLOC STORMWATER MANAGEMENT SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This relates to the Stormbloc Stormwater Management System, for use as sub-surface water storage or as a soakaway to manage run-off from impermeable surfaces.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

System design — information is provided in the Certificate to assist in the design of a stormwater management system (see section 5).

Strength — the system has adequate strength and stiffness to resist long- and short-term loads when used in accordance with this Certificate (see section 6).

Resistance to chemicals — the system will have adequate resistance to the types and levels of chemicals likely to be found in rainwater and soils normally encountered in civil engineering practice (see section 9).

Durability — the system will have a service life in excess of 50 years when installed in accordance with this Certificate (see section 11).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 24 December 2010

B C Chamberlain

Brian Chamberlain

Head of Approvals — Engineering

G N Cooper

Greg Cooper

Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct

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STORMBLOC® STORAGE SYSTEM – INSTALLATION GUIDELINES

Notes: Detailed design advice and installation instructions can be found in the Stormbloc® User Manual. Stormbloc® modules are delivered in stacks of 4 No 0.66m deep modules (20kg per module) or 8 No 0.35m deep modules (12kg per module). The maximum mass of any Stormbloc® Inspect component is 48kg. Modules should not be dropped or thrown and impacts should be avoided. Care should be taken when walking on the modules as these may be slippery especially when wet or frosty.

1) Excavate the area for the installation in accordance with the design. For installations greater than 3m from finished cover level to the base of the Stormbloc® tank, advice should be sought from Hydro International.



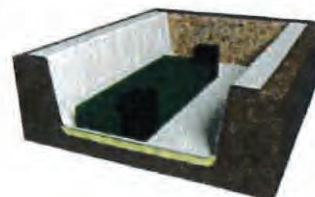
2) Form a level sand or gravel subgrade layer, min 100mm deep.



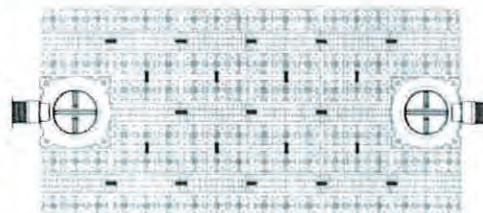
3) Line the excavation with a suitable impermeable geomembrane (min 460 g/m²). On sites where there are concerns relating to contamination, or groundwater level / protection, a fully encapsulated system, with a heat sealed membrane installed by a specialist lining contractor will often be required. Where multiple sheets are required, these should be lapped and sealed in accordance with the manufacturer's recommendations.



4) Inspect the modules for damage prior to installation. Lay the Stormbloc® modules and Stormbloc® Inspect Chambers on the geomembrane in accordance with the design. The integral inspection tunnels within the modules should generally create a continuous line along the length of the tank.



5) The modules should be connected using the supplied connecting pieces in the centre of each edge that neighbours another module. Where a single layer of 0.35m deep modules is used, the supplied connecting pieces should link the top of the structural support pillars of neighbouring modules.



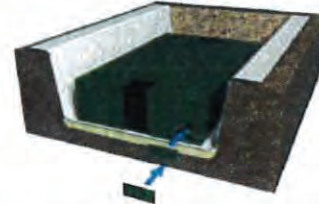
6) For multi-layer designs, the supplied multi-layer connectors should be used between layers. Modules on the second and subsequent layers can then be located using the multi-layer connectors.

Where 0.35m deep modules are used, these should form the top layer and oriented such that the text imprinted on the 0.35m deep module is at the bottom edge.



7) All tunnel ends should be fitted with the appropriate end plate as supplied. End plates can be provided blank, with holes pre-cut to ease pipe connections, or with an adapter spigot in accordance with the design.

Pipe connections into the Stormbloc® Inspect modules may require a band-seal to attach onto the spigot. Please contact Hydro International for site specific details.



8) The sides and top of the Stormbloc® system should be completely wrapped within the geomembrane. Holes should be cut into the geomembrane to accommodate pipe connections and the extension shaft on the Stormbloc® Inspect chambers. Where multiple sheets are required, these should overlap by min 300mm. All joints, laps and pipe connections must be appropriately sealed.



9) The sides of the excavation should be filled with a suitable granular material such as Type 1 or Type 2 sub-base or Class 6P selected granular material as defined in the Department for Transport Specification for Highway Works (SHW). This material should be compacted in 150mm layers using a laminar working device. Care should be taken to ensure that the geomembrane is not punctured or torn during installation or backfilling.



10) Backfill over the top of the modules should also be carried out using Type 1 or Type 2 sub-base in accordance with the Department for Transport Specification for Highway Works (SHW). The initial 300mm of cover should be compacted using a laminar working device. Thereafter other types of compaction plant may be used provided the mass per metre width $\leq 2300\text{kg}$.



11) Once 500mm of well compacted cover has been achieved, heavier plant may run across the system up to a maximum mass per metre width of 5000kg. The wheel load from tipper trucks and excavators should not exceed 50 kN fully loaded. Vehicles should only traverse above the Stormbloc® in straight passes. If a change in direction is required, vehicles should drive off the system, turn and drive back on in the direction required.



GEOLIGHT maintenance

Once received stormwater reaches the storage reservoir through one or more distribution pipes laid out on the side faces of the Geolight blocks.

These distribution pipes are covered in a trench filled with draining material requiring little compaction, like washed rolled pebbles, free from fines, and 15/25 grading.

A 10 mm mesh geogrid or GEOTextile, laid between the distribution pipe and Geolight, prevents the horizontal Geolight blocks being clogged by the draining materials.

The permeability of the supply and distribution pipe located on the periphery of the reservoir is designed to prevent any clogging of the system upstream of the stormwater drain.

This sizing is checked for each supply. It is obtained thanks to design programmes by SDS limited following testing of a size 1 reservoir in which all hydraulic configurations were studied.

These tests also made it possible to check the very good vertical and horizontal permeabilities of Geolight blocks and this general layout is usually accepted.

The choice of one of these layouts or a combination of them is according to:

- the place reserved for the reservoir
- available slopes
- hydraulic parameters (discharge)
- position of stormwater input and output systems.

The ends of feeder drains (distribution pipes) are connected to inspection chambers(manholes), acting as settling tanks and making inspection and maintenance of the whole distribution pipe possible.

For small discharges, stormwater does not penetrate Geolight blocks, but circulates either in an appropriate bypass, or in the distribution pipe drain. This is for draining the first water which will be handled downstream if required.

When the reservoir is drained, water is drained through a distribution pipe possibly the same as the one located at the input which operates in the opposite direction. Drainage discharge is controlled by the downstream system piping.

A ventilation system consisting of a drainage geocomposite is fresh air vented in the inspection pits. It is laid out in the upper part of the distribution pipes and the general space occupied by the reservoir.

We generally recommend that the stormwater tank inspection chambers are checked periodically in conjunction with general maintenance of the underground pipe network.



CONDER® TANKS
COVERED BY THIS
GUIDE:

- All CNS & Forecourt Separators
- Above and Below Ground

*Environment Agency**

"Use and Design of Oil Separators in Surface Water Drainage Systems: PPG3"

**CNS & Forecourt
Separators
Commissioning &
Maintenance
Guide Rev 4**

CNS & Forecourt Separators Commissioning and Maintenance Guide

INTRODUCTION

The primary function of oil/water separators is to separate oil, petrol, diesel etc., from waste water and retain the separated liquids. These separated liquids must be removed regularly, using a licensed effluent disposal contractor (your contracted service provider), to ensure that the separator operates as efficiently as possible.

The natural oil/water separating process from gravity fed waste water depends on the storage, or 'dwell', time within the separator chamber. Guidelines have been established by the *Environment Agency** for minimum 'dwell' times, and hence, minimum working volumes for separators. These have been applied in tests carried out by Premier Tech Aqua Ltd which are based on the maximum flowrate into the separator (l/sec). As the working volume reduces by the accumulation of the separated oil, petrol, diesel etc., so the separating efficiency reduces.

Another major influencing factor on the efficiency of separator systems is sediment. Oil/water separators are usually designed as liquid/liquid separators unless the specification has determined a requirement to store a volume of sediment. This can be accommodated within a combined liquid/sediment separator where the storage volume is increased accordingly. However, if the design of the drainage system can allow the sediment to be separated and stored upstream of the oil/water separator, in catch-pits or sediment separators, the system would function more efficiently. Settled sediment must be removed regularly to ensure optimum efficiency (ref. *Environment Agency*).

REGULAR MAINTENANCE OF SEPARATOR EQUIPMENT WILL ENSURE IT OPERATES AS INTENDED WITH MINIMUM RISK OF POLLUTION TO THE ENVIRONMENT.

MAINTENANCE INSPECTIONS

Separators are used in widely varying circumstances where some will require very frequent maintenance and others will have substantially longer intervals before any maintenance (emptying) is required. However, for every separator regular maintenance inspections should be carried out to determine whether or not there is a need to remove the accumulated oil, petrol, Diesel, etc., or sediment. The owner of the Conder® separator is responsible for its operation and ensuring that the effluent quality does not breach any Discharge Consent Standards. It is advisable to set up a 'Service Agreement' with an effluent disposal contractor who can provide 'automatic' and regular maintenance and advise you if any problems with the system occur. The owner is reminded that the existence of a 'Service Agreement' does not necessarily transfer responsibility for general maintenance which must be conducted in accordance with this guide.

The *Environment Agency** has determined that separators shall be inspected at least every six months to establish whether or not emptying is necessary, and a log shall be maintained. Additional equipment for separators provided by Premier Tech Aqua such as an Alarm System which will give warning of the accumulation of oil, petrol, diesel, etc., but should not be used to replace regular inspections.

To keep your Conder® Separator in top condition, we recommend regular servicing by Premier Tech Aqua's service partners

MAINTENANCE PROCEDURES

1.0 Health and Safety

Section 6(a) of the United Kingdom Health and Safety at Work Act 1974 requires manufacturers to advise their customers on the safety and handling precautions to be observed when installing, operating, maintaining and servicing their products.

The maintenance procedures described here should be read and fully understood by the operator (competant person) before commencing work. Appropriate personal protective equipment should be used (gloves, goggles, waterproof clothing etc.,) particularly when handling filters which have been in contact with oil and oily sediment.

Before any work commences always identify the separator and its associated manhole covers or access covers and cone off or erect suitable barriers around the entire work area. Ensure that access and circulation areas are clearly designated and ensure that there is an adequate safety buffer between vehicles and any above ground tank and its associated pipework.

A MEWP or suitable scaffolding will be required to gain access the manway of above ground tanks; maintain adequate seperation between MEWP and the tank shell. Scaffolding should not be permitted to come in contact with the tank shell and must not be supported off of the tank shell.

DO NOT ENTER THE TANK

2.0 Commissioning the separator following installation

- 2.1 Sediment and other construction debris can accumulate in the separator during its installation and whilst associated works are in progress. If this has occurred, isolate the separator from the drainage system remove the sediment as follows.
- 2.2 Slowly lift out the combined coalescing filter and automatic closure device assembly. This should be lifted at a rate of 20mm per second (1.2m per minute), until clear of the water, ensuring that most of the residual water is drained from the coalescing filter. This will reduce the combined overall weight of the assembly.

NOTE: This assembly could weigh up to 55kgs and should be handled by two persons unless a mechanical hoist (recommended) is being used.

- 2.3 Remove this assembly to a place of safe keeping.

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- 2.4 Fill the separator with clean water up to the outlet invert level.
- 2.5 Whilst ensuring that the closure is captive inside the housing tube, and the retaining cap is in place at the top of the tube, slowly lower the filter/closure assembly into the separator until it is firmly located inside the coned seating at the bottom of the tank.

NOTE: Do not lower the filter/closure assembly into the separator *before* it has been filled with water. If you do, the closure will be held in the **closed position** and the separator will not function.

3.0 Maintenance

- 3.1 If, following maintenance inspections, the separator is found to be storing the maximum volume of oil, petrol, diesel etc., or the maximum volume of sediment, inform your licensed effluent disposal contractor who will arrange emptying. Before making arrangements, check that you are registered with the Environment Agency, as required under Hazardous Waste Regulations, where hazardous waste producers must be registered before any waste can be removed.

The following are guidelines only for determining the maximum storage volumes of oil and sediment.

- a) For CNS separators multiply the maximum flowrate for which the separator has been designed (l/sec) by 10. This will be the maximum storage volume of hydrocarbons in litres e.g. a CNS15 separator is designed for a 15 l/sec flowrate, therefore, can store 150 litres.

For forecourt separators the maximum storage volume of hydrocarbons is 7,600 litres.

- b) Where no specific sediment volumes have been determined for the separator, or where no sediment has been expected to accumulate in the system, the maximum stored depth of sediment should not exceed 20% of the depth of the separator barrel e.g. a 1.8m diameter separator should not store more than 360mm depth of sediment.

- 3.2 Apply the Health and Safety requirements detailed in Section 1 before commencing any work.
- 3.3 Isolate the separator from the drainage system either by closing pre-installed valves in the upstream and downstream manholes or by securely fitting proprietary pipeline stoppers.
- 3.4 Slowly lift out the combined coalescing filter and automatic closure device assembly. This should be lifted at a rate of 20mm per second (1.2m per minute), until clear of the water, ensuring that most of the residual water is drained from the coalescing filter. This will also reduce the combined overall weight of the assembly.

NOTE: This assembly could weigh up to 55kgs and should be handled by two persons unless a mechanical hoist (recommended) is being used.

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- 3.5 Remove this assembly to a place of safe keeping.
- 3.6 Using a licensed effluent disposal contractor (your contracted service provider) carry out the following:

Remove the oil, petrol, diesel etc., from the surface of the liquid, leaving as much of the cleaner water as possible in the separator. Remove the sediment from the bottom of the separator taking great care in and around the filter outlet housing on the base to ensure that it does not become damaged, again leaving as much of the cleaner water as possible in the separator.

- 3.7 Move the filter/closure assembly to a convenient position *upstream* of the separator so that any polluted water washed from the filter will be directed back to the separator.

Remove the filter from the housing tube and wash the filter using a low pressure hose. If the filter has become 'blinded' with sediment or it is too dirty to clean or has become damaged, replace it by contacting Premier Tech Aqua Tel: 0870 264 0004. Re-fit the filter to the housing tube.

- 3.8 Fill the separator with clean water up to the outlet invert level.

- 3.9 Whilst ensuring that the closure is captive inside the housing tube, and the retaining cap is in place at the top of the tube, slowly lower the filter/closure assembly into the separator until it is firmly located inside the coned seating at the bottom of the tank.

NOTE: Do not lower the filter/closure assembly into the separator *before* it has been filled with clean water. If you do, the closure will be held in the **closed position** and the separator will not function.

- 3.10 Check that the Alarm probe has not been damaged and that the alarm system is working.
- 3.11 Replace the manhole covers or access covers ensuring the covers are locked down where necessary and remove the cones and/or barriers from the worksite.

REMEMBER - if the alarm system activates due to the accumulation of oil, petrol, diesel etc., do not delay in contacting your licensed effluent disposal contractor.

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APPENDIX G

MAINTENANCE LOGS

Inspection Log – Year..... sheet 1 of 2

Inspection Date	A - Surface Water Catchpit Manholes	B - Foul Water Manholes	E – Surface Water Treatment	G – Hydro Attenuation	Comments
January					
February					
March					
April					
May					
June					

How to complete this Log:

- 1.0 Write date in LH column.
- 2.0 Tick which items have been inspected for that date.
- 3.0 Add to notes and maintenance completed e.g. Catch pits or Channels emptied.

Inspection Log – Year..... sheet 2 of 2

Inspection Date	A - Surface Water Catchpit Manholes	B - Foul Water Manholes	E – Surface Water Treatment	G – Hydro Attenuation	Comments
July					
August					
September					
October					
November					
December					

How to complete this Log:
1.0 Write date in LH column.
2.0 Tick which items have been inspected for that date.
3.0 Add to notes and maintenance completed e.g. Catch pits or Channels emptied.