KAVANAGH BURKE
CONSULTING ENGINEERS

Drainage Design Report

for

Site Development at Baldonnell Business Park, Baldonnell, Dublin 22

Job No:	D1660
Client:	Airtraks Limited T/A ATC Computer Transport
Date:	June 2021
Local Authority:	South Dublin County Council
Revision:	Planning Alterations PL2 (1.7.2021.)

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Introduction

This Drainage Report details the site development works design for a development at Baldonnell Business Park Baldonnell, Dublin 22.

As a part of planning alterations revisions, as indicated in the site notice, are as follows:

1) Provision of a new separate ancillary workshop building to the site's western corner measuring 278 sq.m, overall height 9.7m;
2) Provision of new extended glazed entrance of ancillary office at ground floor (28sq.m, 5.9m high) to the front north-western elevation and new emergency exit route at first floor (43sq.m) exiting to side north-eastern elevation by new external stairs. Additional floor area provided 71 sq.m;

   Note: the alterations above result in total floor area increase by 349 sq.m (from 2,222 sq.m to 2,571 sq.m);
3) Provision of 3 No. internally lit building mounted business logo signs, 12.25 sq.m each (12.7m above ground level) to the front (north-western), side (north-eastern) and rear (south-eastern) elevations;
4) Provision of 3 No. 10m high flagpoles to the north of the site, with a distance of approx. 31m from the warehouse and new extended office entrance;
5) Provision of 288 sq.m solar panels to the roof of the warehouse;
6) Provision of a new recessed access/egress, rearrangement of truck wash area and refuel area and partial revision of the north-western site's boundary fence type C;
7) Elevation and site plan revisions associated with entrance porch, signage and fire exit stairs; and
8) Associated drainage adjustments due to the inclusion of the above alterations.

The existing public services of watermain, foul sewer, surface water drain, power supply and communications are located within Barney's Lane & Clonlara Road and connection to these estate services is proposed at the sites' access/egress located to the south-western site boundary at Clonlara Rd. The provision of the new on-site foul sewer, surface water & watermain are described as follows. The drainage design approach is described below with calculations appended.

Surface Water:

Runoff from the proposed development will be collected by trapped road gullies and rainwater goods throughout the development and directed to an on-site surface water attenuation facility. This facility will attenuate the 1 in 30 year storm event plus allow sufficient additional volume to attenuate the 1 in 100 year 6 hour event. The rainfall figures used in calculations include 20% allowance for climate change. The restricted discharge from site will be limited by a proprietary flow control device. The flowrate through this device will be set to the specific limit calculated in the accompanying Drainage Design Report as per SuDS guidance.

It is proposed that only clean uncontaminated water will discharge to the existing manhole on site and from there to Business Park surface water network, as indicated at enclosed Drainage & Watermain Layout.

The attenuation facility will be formed by a proprietary system of thermoplastic arches backfilled in specific stone and wrapped in a pervious geotextile – i.e. "StormTech" chamber system ref. MC-3500 or similar approved. Prior to entering the system, the surface water runoff will pass through a proprietary silt trap and petrol interceptor to ensure the removal of debris, silts and hydrocarbons. Subsequently the surface runoff enters the attenuation facility through an "isolator row" whereby a row of void forming thermoplastic arches are wrapped in a pervious geotextile to apply a second level of suspended solid removal prior to the water entering the greater attenuation area. These water quality control measures require regular inspection and can be cleaned out be suction hose/tanker. In the case of the isolator row the chamber is backwashed with a proprietary power jet wash and its water removed by suction hose/tanker.

Interception storage capturing first 5mm of every rainfall event is proposed as part of the attenuation tank system to promote infiltration and to reduce the overall discharge to the receiving watercourses. Given the design size of the interception storage, the most of rainfall events will be stored in the attenuation and disposed by infiltration and will never leave the site.

Water quantity control is provided downstream of the attenuation facility by providing the above-mentioned flow control device. The discharge from site, i.e. the restricted flow from the flow control device enters the existing surface water manhole at Barney's Lane as detailed on the accompanying Drainage Layout.

The proposed surface water management solution for the subject site provides both runoff quality and quantity control. Quality control is provided by ensuring all surface water runoff is dealt with on site as described earlier in this document with reference to the specified attenuation system with inbuilt "isolator row", proprietary silt traps & petrol interceptors. Quantity control is also provided through the surface water attenuation system coupled with the downstream flow control device.

The following figures synopsise the surface water attenuation calculations:

STRUCTURE TYPE	AREA (ha)	RUNOFF COEFFICIENTS
Buildings	0.202	0.8
Green Roof (if any)	0	0.8
Concrete Yard/Road	0.5835	0.8
Pathways	0.026	0.8
Permeable paving	0	0.8
Grass	0.1645	0.3
TOTAL	0.976	

Details of the surface water attenuation system including interceptors, flow restrictions, volume and pipe designs are included in this Drainage Design Report and on the accompanying Drainage Layout (drawing reference D1660 - D3 - Drainage & Watermain Layout) for review by the Local Authority.

In considering the above surface water management solution we considered all SuDS devices and given the industrial nature of the proposed operations on this site, the above solution of underground surface water attenuation was decided on. In summary, a range of measures have been incorporated into the development as follows:

- Tree Pits
- Rain Water Harvesting
- Porous Asphalt
- Trapped Road Gullies
- Restricted discharge
- Silt trap and petrol interceptor
- Permeable paving

Foul Sewer:

The proposed development will be provided with a new foul sewer network on site which will directly connect to the existing foul sewer manhole on site prior connection to an existing business park foul sewer network at Clonlara Road.

The peak foul sewer discharge rate is based on the discharge unit method of drainage design for calculating maximum sewage and wastewater flows. The proposed ancillary office is the source of wastewater for this development.

As per the requirements of the Irish Water Code of Practice, minimum velocities of 0.75 m/s are met for the proposed gradients and contributing discharge unit numbers (refer to discharge unit calculation sheet for details). The proposed foul sewer including manholes and service connections will be constructed in compliance with design standards set out by Irish Water in the IW Code of Practice for Wastewater Infrastructure and Wastewater Infrastructure Standard Details.

The method of calculating the total discharge units from the development is carried out in accordance with BS EN 752-4:1998 "Drain and sewer systems outside buildings", refer to insert below for the relative tabulated extract;

Table C.1 — Typical frequency factors (k_{DU})

Type of building	k_{DU}
Dwelling. guesthouse. office (intermittent use)	0.5
Hospital. school. restaurant. hotel (frequent use)	0.7
Toilets and/or shower open to the public (congested use)	1.0
Laboratory buildings (special use)	1.2

Table C.2 — Typical values of discharge units (DU)

Type of appliance	DU
Washbasin. shower	0.3 to 0.6
Urinal	0.3 to 0.8
Bath. kitchen sink	0.8 to 1.3
Dishwasher	0.2 to 0.8
Household washing machine	0.5 to 0.8
Commercial washing machine	1.0 to 1.5
WCs (4.0 l to 9.0 l cistern)	1.2 to 2.5
Floor drains (DN 50 to DN 100)	0.6 to 2.0
The discharge unit will depend on the type of drainage system inside the building and the size of the appliance. Where no specific information is available. the higher value should be used.	

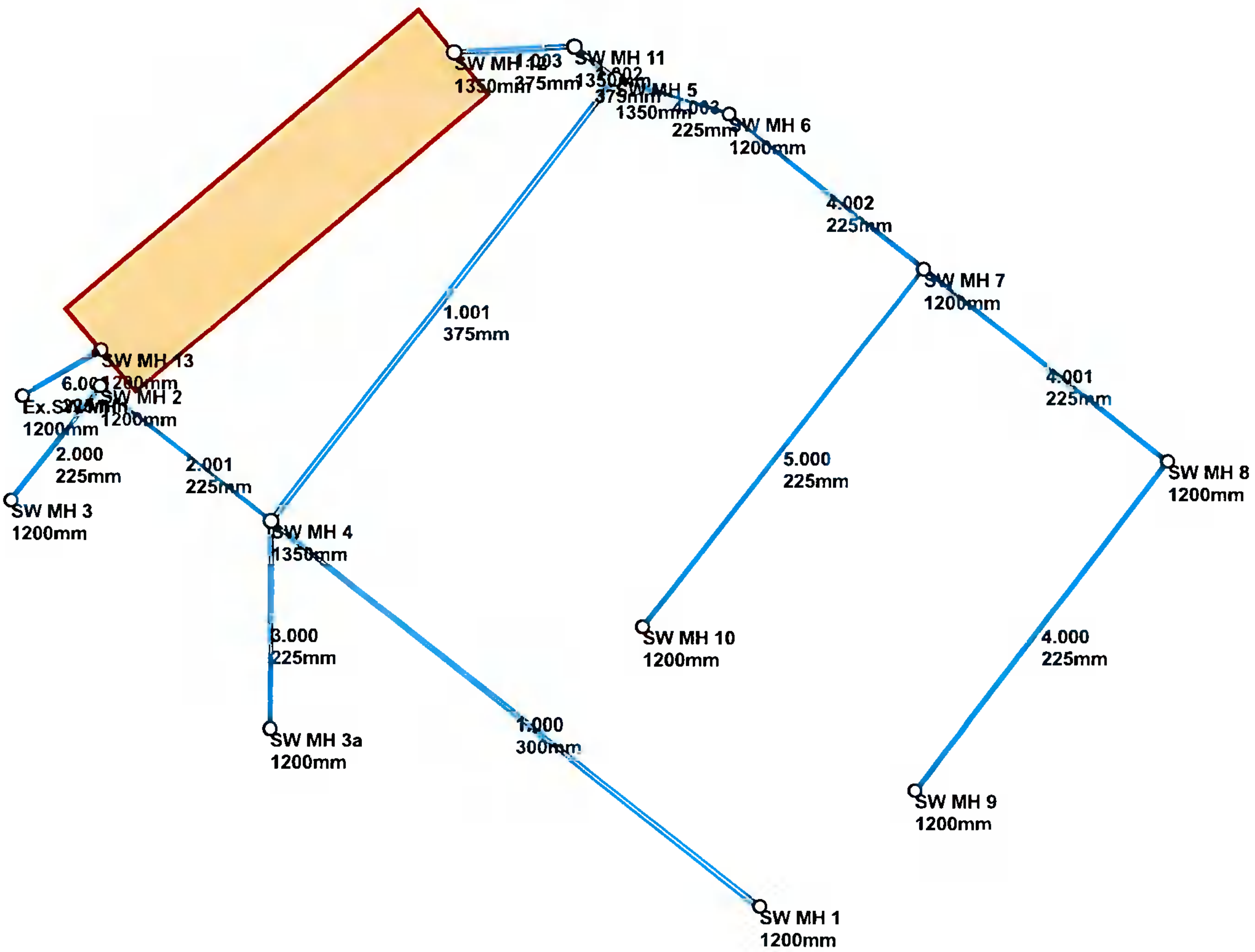
All proposed discharge units calculations, flows and pipe designs are included further in this Drainage Design Report for the review of the Local Authority.

Watermain:

The water supply to the new development is proposed by a metered connection from the existing Local Authority 200mm dia. main on Clonlara Road.
A new looped 150mm dia. HDPE watermain within the site will be provided with adequate sluice valves, water meter & fire hydrants to provide water supply to office/staff facilities and for firefighting purposes. Hydrants will not be placed within 6m of a building or structure and at a maximum 46m from proposed buildings. All associated details including watermain pipe material will be in accordance with the current Irish Water guidelines. Guidelines set out in the Irish Water Publications IW-CDS_5020-1 & IW-CDS-5030-1 have been consulted and adopted within the design of the proposed drainage & watermain networks. Refer to enclosed Drainage & Watermain drawing Ref. D1660-D3 for layout details.

Surface Water Network Design

KAVANAGH BURKE CONSULTING ENGINEERS	Kavanagh Burke Ltd Unit F3 Calmount Park, Ballymount, Dublin 12	File: D1660 - SW Network_PL Network: SURFACE WATER I Elena Dragoje 01/07/2021	Page 1 Surface Water Network



Design Settings

Rainfall Methodology	FSR
Return Period (years)	2
Additional Flow (%)	0
FSR Region	Scotland and Ireland
M5-60 (mm)	17.800
Ratio-R	0.271
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.750
Preferred Cover Depth (m)	0.750
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW MH 1	0.170	5.00	96.985	1200	703995.576	728394.828	1.285
SW MH 2	0.040	5.00	96.600	1200	703931.907	728444.901	1.000
SW MH 3	0.030	5.00	96.700	1200	703923.253	728433.897	1.000
SW MH 3a	0.055	5.00	97.000	1200	703948.301	728411.920	1.350
SW MH 4	0.045	5.00	96.600	1350	703948.414	728431.919	1.300
SW MH 9	0.080	5.00	97.250	1200	704010.654	728406.028	1.450
SW MH 8	0.020	5.00	96.950	1200	704035.080	728437.703	1.350
SW MH 10	0.100	5.00	97.100	1200	703984.289	728421.694	1.400
SW MH 7	0.020	5.00	96.950	1200	704011.510	728456.263	1.550
SW MH 6	0.025	5.00	96.950	1200	703992.654	728471.111	1.750
SW MH 5	0.165	5.00	96.900	1350	703981.657	728474.474	1.950
SW MH 11			96.800	1350	703977.717	728477.552	1.875
SW MH 12			96.700	1350	703966.098	728477.013	2.020
SW MH 13		5.00	96.600	1200	703932.002	728448.416	1.950
Ex.SW MH			96.780	1200	703924.378	728443.953	2.173

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SW MH 1	SW MH 4	60.000	0.600	95.700	95.375	0.325	184.6	300	5.87	50.0
2.000	SW MH 3	SW MH 2	13.999	0.600	95.700	95.600	0.100	140.0	225	5.21	50.0
2.001	SW MH 2	SW MH 4	21.000	0.600	95.600	95.450	0.150	140.0	225	5.53	50.0
3.000	SW MH 3a	SW MH 4	19.999	0.600	95.650	95.450	0.200	100.0	225	5.25	50.0
1.001	SW MH 4	SW MH 5	54.000	0.600	95.300	94.950	0.350	154.3	375	6.48	48.0
4.000	SW MH 9	SW MH 8	39.999	0.600	95.800	95.600	0.200	200.0	225	5.72	50.0
4.001	SW MH 8	SW MH 7	30.000	0.600	95.600	95.400	0.200	150.0	225	6.19	48.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Velocity (m/s)
1.000	1.154	81.5	23.0	0.985	0.925	0.985	0.170	0.0	0.996
2.000	1.103	43.9	4.1	0.775	0.775	0.775	0.030	0.0	0.694
2.001	1.103	43.8	9.5	0.775	0.925	0.925	0.070	0.0	0.883
3.000	1.307	52.0	7.5	1.125	0.925	1.125	0.055	0.0	0.936
1.001	1.456	160.8	44.3	0.925	1.575	1.575	0.340	0.0	1.248
4.000	0.921	36.6	10.8	1.225	1.125	1.225	0.080	0.0	0.805
4.001	1.065	42.3	13.3	1.125	1.325	1.325	0.100	0.0	0.946

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.000	SW MH 10	SW MH 7	44.000	0.600	95.700	95.400	0.300	146.7	225	5.68	50.0
4.002	SW MH 7	SW MH 6	24.000	0.600	95.400	95.200	0.200	120.0	225	6.53	47.9
4.003	SW MH 6	SW MH 5	11.500	0.600	95.200	95.100	0.100	115.0	225	6.69	47.4
1.002	SW MH 5	SW MH 11	5.000	0.600	94.950	94.925	0.025	200.0	375	6.75	47.2
1.003	SW MH 11	SW MH 12	11.631	0.600	94.925	94.825	0.100	116.3	375	6.87	46.9
6.000	SW MH 13	Ex.SW MH	8.834	0.600	94.650	94.607	0.043	205.4	225	5.16	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Velocity (m/s)
5.000	1.077	42.8	13.6	1.175	1.325	1.325	0.100	0.0	0.956
4.002	1.192	47.4	28.6	1.325	1.525	1.525	0.220	0.0	1.246
4.003	1.218	48.4	31.5	1.525	1.575	1.575	0.245	0.0	1.294
1.002	1.277	141.1	96.0	1.575	1.500	1.575	0.750	0.0	1.370
1.003	1.679	185.4	95.4	1.500	1.500	1.500	0.750	0.0	1.691
6.000	0.908	36.1	0.0	1.725	1.948	1.948	0.000	0.0	0.000

Pipeline Schedule

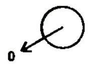
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	60.000	184.6	300	Circular	96.985	95.700	0.985	96.600	95.375	0.925
2.000	13.999	140.0	225	Circular	96.700	95.700	0.775	96.600	95.600	0.775
2.001	21.000	140.0	225	Circular	96.600	95.600	0.775	96.600	95.450	0.925
3.000	19.999	100.0	225	Circular	97.000	95.650	1.125	96.600	95.450	0.925
1.001	54.000	154.3	375	Circular	96.600	95.300	0.925	96.900	94.950	1.575
4.000	39.999	200.0	225	Circular	97.250	95.800	1.225	96.950	95.600	1.125
4.001	30.000	150.0	225	Circular	96.950	95.600	1.125	96.950	95.400	1.325
5.000	44.000	146.7	225	Circular	97.100	95.700	1.175	96.950	95.400	1.325
4.002	24.000	120.0	225	Circular	96.950	95.400	1.325	96.950	95.200	1.525
4.003	11.500	115.0	225	Circular	96.950	95.200	1.525	96.900	95.100	1.575
1.002	5.000	200.0	375	Circular	96.900	94.950	1.575	96.800	94.925	1.500
1.003	11.631	116.3	375	Circular	96.800	94.925	1.500	96.700	94.825	1.500
6.000	8.834	205.4	225	Circular	96.600	94.650	1.725	96.780	94.607	1.948

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW MH 1	1200	Manhole	Adoptable	SW MH 4	1350	Manhole	Adoptable
2.000	SW MH 3	1200	Manhole	Adoptable	SW MH 2	1200	Manhole	Adoptable
2.001	SW MH 2	1200	Manhole	Adoptable	SW MH 4	1350	Manhole	Adoptable
3.000	SW MH 3a	1200	Manhole	Adoptable	SW MH 4	1350	Manhole	Adoptable
1.001	SW MH 4	1350	Manhole	Adoptable	SW MH 5	1350	Manhole	Adoptable
4.000	SW MH 9	1200	Manhole	Adoptable	SW MH 8	1200	Manhole	Adoptable
4.001	SW MH 8	1200	Manhole	Adoptable	SW MH 7	1200	Manhole	Adoptable
5.000	SW MH 10	1200	Manhole	Adoptable	SW MH 7	1200	Manhole	Adoptable
4.002	SW MH 7	1200	Manhole	Adoptable	SW MH 6	1200	Manhole	Adoptable
4.003	SW MH 6	1200	Manhole	Adoptable	SW MH 5	1350	Manhole	Adoptable
1.002	SW MH 5	1350	Manhole	Adoptable	SW MH 11	1350	Manhole	Adoptable
1.003	SW MH 11	1350	Manhole	Adoptable	SW MH 12	1350	Manhole	Adoptable
6.000	SW MH 13	1200	Manhole	Adoptable	Ex.SW MH	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW MH 1	703995.576	728394.828	96.985	1.285	1200	0	1.000	95.700	300
SW MH 2	703931.907	728444.901	96.600	1.000	1200	1	2.000	95.600	225
						0	2.001	95.600	225
SW MH 3	703923.253	728433.897	96.700	1.000	1200	0	2.000	95.700	225
SW MH 3a	703948.301	728411.920	97.000	1.350	1200	0	3.000	95.650	225
SW MH 4	703948.414	728431.919	96.600	1.300	1350	1	3.000	95.450	225
						2	2.001	95.450	225
						3	1.000	95.375	300
						0	1.001	95.300	375
SW MH 9	704010.654	728406.028	97.250	1.450	1200	0	4.000	95.800	225
SW MH 8	704035.080	728437.703	96.950	1.350	1200	1	4.000	95.600	225
						0	4.001	95.600	225
SW MH 10	703984.289	728421.694	97.100	1.400	1200	0	5.000	95.700	225
SW MH 7	704011.510	728456.263	96.950	1.550	1200	1	5.000	95.400	225
						2	4.001	95.400	225
						0	4.002	95.400	225
SW MH 6	703992.654	728471.111	96.950	1.750	1200	1	4.002	95.200	225
						0	4.003	95.200	225
SW MH 5	703981.657	728474.474	96.900	1.950	1350	1	4.003	95.100	225
						2	1.001	94.950	375
						0	1.002	94.950	375
SW MH 11	703977.717	728477.552	96.800	1.875	1350	1	1.002	94.925	375
						0	1.003	94.925	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
SW MH 12	703966.098	728477.013	96.700	2.020	1350		1	1.003	94.825	375
SW MH 13	703932.002	728448.416	96.600	1.950	1200		0	6.000	94.650	225
Ex.SW MH	703924.378	728443.953	96.780	2.173	1200		1	6.000	94.607	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	17.800	Drain Down Time (mins)	240
Ratio-R	0.271	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320
30	120	240	480	720	1440	2880	5760

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0
100	20	0	0

Node SW MH 13 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	94.760	Product Number	CTL-SHE-0062-2100-1576-2100
Design Depth (m)	1.576	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.1	Min Node Diameter (mm)	1200

Node SW MH 13 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	94.650	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.015

Inlets
SW MH 12

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	465.0	0.0	1.676	465.0	0.0	1.680	5.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +20% CC 15 minute summer	253.887	71.841
30 year +20% CC 15 minute winter	178.167	71.841
30 year +20% CC 30 minute summer	174.382	49.344
30 year +20% CC 30 minute winter	122.373	49.344
30 year +20% CC 60 minute summer	121.804	32.189
30 year +20% CC 60 minute winter	80.923	32.189
30 year +20% CC 120 minute summer	77.654	20.522
30 year +20% CC 120 minute winter	51.591	20.522
30 year +20% CC 180 minute summer	60.874	15.665
30 year +20% CC 180 minute winter	39.569	15.665
30 year +20% CC 240 minute summer	48.843	12.908
30 year +20% CC 240 minute winter	32.450	12.908
30 year +20% CC 360 minute summer	38.107	9.806
30 year +20% CC 360 minute winter	24.770	9.806
30 year +20% CC 480 minute summer	30.501	8.060
30 year +20% CC 480 minute winter	20.264	8.060
30 year +20% CC 600 minute summer	25.301	6.920
30 year +20% CC 600 minute winter	17.287	6.920
30 year +20% CC 720 minute summer	22.792	6.108
30 year +20% CC 720 minute winter	15.317	6.108
30 year +20% CC 960 minute summer	19.047	5.016
30 year +20% CC 960 minute winter	12.617	5.016
30 year +20% CC 1440 minute summer	14.170	3.798
30 year +20% CC 1440 minute winter	9.523	3.798
30 year +20% CC 2160 minute summer	10.393	2.872
30 year +20% CC 2160 minute winter	7.161	2.872
30 year +20% CC 2880 minute summer	8.785	2.355
30 year +20% CC 2880 minute winter	5.904	2.355
30 year +20% CC 4320 minute summer	6.800	1.778
30 year +20% CC 4320 minute winter	4.478	1.778
30 year +20% CC 5760 minute summer	5.687	1.456
30 year +20% CC 5760 minute winter	3.681	1.456
100 year +20% CC 15 minute summer	329.850	93.336
100 year +20% CC 15 minute winter	231.474	93.336
100 year +20% CC 30 minute summer	227.636	64.413
100 year +20% CC 30 minute winter	159.744	64.413
100 year +20% CC 60 minute summer	157.925	41.735
100 year +20% CC 60 minute winter	104.922	41.735
100 year +20% CC 120 minute summer	99.751	26.361
100 year +20% CC 120 minute winter	66.272	26.361
100 year +20% CC 180 minute summer	77.692	19.993
100 year +20% CC 180 minute winter	50.502	19.993
100 year +20% CC 240 minute summer	62.032	16.393
100 year +20% CC 240 minute winter	41.213	16.393
100 year +20% CC 360 minute summer	48.047	12.364

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +20% CC 360 minute winter	31.232	12.364
100 year +20% CC 480 minute summer	38.251	10.109
100 year +20% CC 480 minute winter	25.413	10.109
100 year +20% CC 600 minute summer	31.597	8.642
100 year +20% CC 600 minute winter	21.589	8.642
100 year +20% CC 720 minute summer	28.365	7.602
100 year +20% CC 720 minute winter	19.063	7.602
100 year +20% CC 960 minute summer	23.575	6.208
100 year +20% CC 960 minute winter	15.617	6.208
100 year +20% CC 1440 minute summer	17.405	4.665
100 year +20% CC 1440 minute winter	11.697	4.665
100 year +20% CC 2160 minute summer	12.662	3.499
100 year +20% CC 2160 minute winter	8.725	3.499
100 year +20% CC 2880 minute summer	10.637	2.851
100 year +20% CC 2880 minute winter	7.149	2.851
100 year +20% CC 4320 minute summer	8.159	2.133
100 year +20% CC 4320 minute winter	5.373	2.133
100 year +20% CC 5760 minute summer	6.779	1.735
100 year +20% CC 5760 minute winter	4.388	1.735

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW MH 1	10	95.880	0.180	55.6	0.6813	0.0000	OK
4320 minute winter	SW MH 2	3360	95.726	0.126	0.7	0.2432	0.0000	OK
15 minute winter	SW MH 3	10	95.771	0.071	9.8	0.1234	0.0000	OK
15 minute winter	SW MH 3a	10	95.745	0.095	18.0	0.1843	0.0000	OK
4320 minute winter	SW MH 4	3360	95.726	0.426	3.6	0.9047	0.0000	SURCHARGED
15 minute winter	SW MH 9	12	96.149	0.349	26.2	0.7800	0.0000	SURCHARGED
15 minute winter	SW MH 8	12	96.085	0.485	31.7	0.6927	0.0000	SURCHARGED
15 minute winter	SW MH 10	12	96.122	0.422	32.7	1.0807	0.0000	SURCHARGED
15 minute winter	SW MH 7	12	96.010	0.610	60.1	0.8474	0.0000	SURCHARGED
4320 minute winter	SW MH 6	3360	95.726	0.526	2.5	0.7453	0.0000	SURCHARGED
4320 minute winter	SW MH 5	3360	95.726	0.776	7.7	2.4240	0.0000	SURCHARGED
4320 minute winter	SW MH 11	3360	95.726	0.801	7.6	1.1461	0.0000	SURCHARGED
4320 minute winter	SW MH 12	3360	95.726	1.046	7.6	1.4967	0.0000	OK
4320 minute winter	SW MH 13	3360	95.726	1.076	4.5	1.2168	0.0000	SURCHARGED
15 minute summer	Ex.SW MH	1	94.607	0.000	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW MH 1	1.000	SW MH 4	54.8	1.210	0.673	2.9386	
4320 minute winter	SW MH 2	2.001	SW MH 4	0.7	0.411	0.016	0.6575	
15 minute winter	SW MH 3	2.000	SW MH 2	9.7	0.606	0.221	0.2248	
15 minute winter	SW MH 3a	3.000	SW MH 4	17.7	1.153	0.341	0.4268	
4320 minute winter	SW MH 4	1.001	SW MH 5	3.6	0.368	0.022	5.9560	
15 minute winter	SW MH 9	4.000	SW MH 8	25.2	0.950	0.690	1.5908	
15 minute winter	SW MH 8	4.001	SW MH 7	25.0	0.768	0.592	1.1931	
15 minute winter	SW MH 10	5.000	SW MH 7	28.9	0.854	0.676	1.7499	
15 minute winter	SW MH 7	4.002	SW MH 6	53.1	1.335	1.120	0.9545	
4320 minute winter	SW MH 6	4.003	SW MH 5	2.5	0.620	0.052	0.4574	
4320 minute winter	SW MH 5	1.002	SW MH 11	7.6	0.652	0.054	0.5515	
4320 minute winter	SW MH 11	1.003	SW MH 12	7.6	0.618	0.041	1.2829	
4320 minute winter	SW MH 12	Flow through pond	SW MH 13	4.5	0.009	0.000	493.3748	
4320 minute winter	SW MH 13	Hydro-Brake®	Ex.SW MH	1.7				330.5

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.60%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW MH 1	12	96.091	0.391	72.2	1.4767	0.0000	SURCHARGED
4320 minute winter	SW MH 2	3420	95.977	0.377	0.9	0.7283	0.0000	SURCHARGED
4320 minute winter	SW MH 3	3420	95.977	0.277	0.4	0.4798	0.0000	SURCHARGED
4320 minute winter	SW MH 3a	3420	95.977	0.327	0.7	0.6367	0.0000	SURCHARGED
4320 minute winter	SW MH 4	3420	95.977	0.677	4.3	1.4383	0.0000	SURCHARGED
15 minute winter	SW MH 9	12	96.701	0.901	34.0	2.0133	0.0000	SURCHARGED
15 minute winter	SW MH 8	12	96.602	1.002	34.4	1.4300	0.0000	SURCHARGED
15 minute winter	SW MH 10	12	96.669	0.969	42.5	2.4816	0.0000	SURCHARGED
15 minute winter	SW MH 7	12	96.488	1.088	67.0	1.5108	0.0000	SURCHARGED
15 minute winter	SW MH 6	12	96.014	0.814	74.0	1.1531	0.0000	SURCHARGED
4320 minute winter	SW MH 5	3420	95.977	1.027	9.3	3.2089	0.0000	SURCHARGED
4320 minute winter	SW MH 11	3420	95.977	1.052	9.2	1.5056	0.0000	SURCHARGED
4320 minute winter	SW MH 12	3420	95.977	1.297	9.2	1.8562	0.0000	OK
4320 minute winter	SW MH 13	3420	95.977	1.327	5.3	1.5010	0.0000	SURCHARGED
15 minute summer	Ex.SW MH	1	94.607	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW MH 1	1.000	SW MH 4	65.4	1.190	0.803	4.2252	
4320 minute winter	SW MH 2	2.001	SW MH 4	0.9	0.442	0.021	0.8352	
4320 minute winter	SW MH 3	2.000	SW MH 2	0.4	0.255	0.009	0.5568	
4320 minute winter	SW MH 3a	3.000	SW MH 4	0.7	0.461	0.013	0.7954	
4320 minute winter	SW MH 4	1.001	SW MH 5	4.1	0.368	0.026	5.9560	
15 minute winter	SW MH 9	4.000	SW MH 8	26.4	0.962	0.721	1.5908	
15 minute winter	SW MH 8	4.001	SW MH 7	30.4	0.764	0.717	1.1931	
15 minute winter	SW MH 10	5.000	SW MH 7	31.3	0.859	0.731	1.7499	
15 minute winter	SW MH 7	4.002	SW MH 6	67.1	1.688	1.416	0.9545	
15 minute winter	SW MH 6	4.003	SW MH 5	75.4	1.896	1.557	0.4574	
4320 minute winter	SW MH 5	1.002	SW MH 11	9.2	0.652	0.065	0.5515	
4320 minute winter	SW MH 11	1.003	SW MH 12	9.2	0.611	0.050	1.2829	
4320 minute winter	SW MH 12	Flow through pond	SW MH 13	5.3	0.010	0.000	610.2120	
4320 minute winter	SW MH 13	Hydro-Brake®	Ex.SW MH	1.9				368.9

Project: **D1660 - Site at Baldonnell**

StormTech
A division of ADS

Chamber Model -	MC-3500			
Units -	Metric	Click Here for Imperial		
Number of Chambers -	144			
Number of End Caps -	16			
Voids in the stone (porosity) -	43	%		
Base of Stone Elevation -	94.20	m		
Amount of Stone Above Chambers -	305	mm	☑ Include Perimeter Stone in Calculations	
Amount of Stone Below Chambers -	305	mm		
Area of system -	760	sq.meters	Min. Area -	712.485 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1753	0.00	0.00	0.00	0.00	8.297	8.30	832.05	95.95
1727	0.00	0.00	0.00	0.00	8.297	8.30	823.75	95.93
1702	0.00	0.00	0.00	0.00	8.297	8.30	815.45	95.90
1676	0.00	0.00	0.00	0.00	8.297	8.30	807.16	95.88
1651	0.00	0.00	0.00	0.00	8.297	8.30	798.86	95.85
1626	0.00	0.00	0.00	0.00	8.297	8.30	790.56	95.83
1600	0.00	0.00	0.00	0.00	8.297	8.30	782.27	95.80
1575	0.00	0.00	0.00	0.00	8.297	8.30	773.97	95.77
1549	0.00	0.00	0.00	0.00	8.297	8.30	765.68	95.75
1524	0.00	0.00	0.00	0.00	8.297	8.30	757.38	95.72
1499	0.00	0.00	0.00	0.00	8.297	8.30	749.08	95.70
1473	0.00	0.00	0.00	0.00	8.297	8.30	740.79	95.67
1448	0.00	0.00	0.24	0.00	8.195	8.43	732.49	95.65
1422	0.01	0.00	0.79	0.00	7.954	8.75	724.06	95.62
1397	0.01	0.00	1.20	0.00	7.779	8.98	715.31	95.60
1372	0.01	0.00	1.65	0.01	7.585	9.24	706.32	95.57
1346	0.02	0.00	2.80	0.02	7.084	9.90	697.08	95.55
1321	0.03	0.00	4.19	0.02	6.484	10.70	687.18	95.52
1295	0.04	0.00	5.10	0.03	6.092	11.22	676.48	95.50
1270	0.04	0.00	5.80	0.04	5.785	11.63	665.26	95.47
1245	0.04	0.00	6.41	0.05	5.519	11.98	653.64	95.44
1219	0.05	0.00	6.96	0.05	5.280	12.30	641.66	95.42
1194	0.05	0.00	7.46	0.06	5.063	12.58	629.36	95.39
1168	0.05	0.00	7.90	0.07	4.868	12.84	616.78	95.37
1143	0.06	0.01	8.32	0.08	4.683	13.09	603.94	95.34
1118	0.06	0.01	8.70	0.09	4.515	13.31	590.85	95.32
1092	0.06	0.01	9.07	0.10	4.356	13.52	577.54	95.29
1067	0.07	0.01	9.41	0.11	4.205	13.72	564.02	95.27
1041	0.07	0.01	9.72	0.12	4.064	13.91	550.30	95.24
1016	0.07	0.01	10.03	0.12	3.932	14.08	536.39	95.22
991	0.07	0.01	10.31	0.13	3.807	14.25	522.31	95.19
965	0.07	0.01	10.58	0.14	3.686	14.41	508.07	95.17
940	0.08	0.01	10.83	0.15	3.575	14.56	493.66	95.14
914	0.08	0.01	11.07	0.16	3.468	14.70	479.10	95.11
889	0.08	0.01	11.30	0.17	3.365	14.83	464.41	95.09
864	0.08	0.01	11.52	0.18	3.268	14.96	449.57	95.06
838	0.08	0.01	11.73	0.19	3.175	15.09	434.61	95.04
813	0.08	0.01	11.92	0.19	3.086	15.20	419.52	95.01
787	0.08	0.01	12.11	0.20	3.001	15.32	404.32	94.99
762	0.09	0.01	12.28	0.21	2.925	15.42	389.00	94.96
737	0.09	0.01	12.45	0.22	2.849	15.52	373.59	94.94
711	0.09	0.01	12.62	0.22	2.776	15.62	358.07	94.91
686	0.09	0.01	12.77	0.23	2.708	15.70	342.45	94.89
660	0.09	0.01	12.91	0.24	2.645	15.79	326.75	94.86
635	0.09	0.02	13.05	0.24	2.581	15.87	310.96	94.84
610	0.09	0.02	13.18	0.24	2.526	15.95	295.09	94.81
584	0.09	0.02	13.30	0.25	2.469	16.02	279.14	94.78

559	0.09	0.02	13.42	0.26	2.416	16.09	263.12	94.76
533	0.09	0.02	13.53	0.26	2.366	16.16	247.03	94.73
508	0.09	0.02	13.64	0.26	2.320	16.22	230.87	94.71
483	0.10	0.02	13.74	0.27	2.273	16.28	214.65	94.68
457	0.10	0.02	13.83	0.27	2.231	16.34	198.37	94.66
432	0.10	0.02	13.92	0.28	2.191	16.39	182.04	94.63
406	0.10	0.02	14.02	0.28	2.151	16.44	165.65	94.61
381	0.10	0.02	14.10	0.28	2.113	16.49	149.20	94.58
356	0.10	0.02	14.18	0.29	2.074	16.54	132.71	94.56
330	0.10	0.02	14.29	0.29	2.028	16.61	116.16	94.53
305	0.00	0.00	0.00	0.00	8.297	8.30	99.56	94.50
279	0.00	0.00	0.00	0.00	8.297	8.30	91.26	94.48
254	0.00	0.00	0.00	0.00	8.297	8.30	82.97	94.45
229	0.00	0.00	0.00	0.00	8.297	8.30	74.67	94.43
203	0.00	0.00	0.00	0.00	8.297	8.30	66.37	94.40
178	0.00	0.00	0.00	0.00	8.297	8.30	58.08	94.38
152	0.00	0.00	0.00	0.00	8.297	8.30	49.78	94.35
127	0.00	0.00	0.00	0.00	8.297	8.30	41.48	94.33
102	0.00	0.00	0.00	0.00	8.297	8.30	33.19	94.30
76	0.00	0.00	0.00	0.00	8.297	8.30	24.89	94.28
51	0.00	0.00	0.00	0.00	8.297	8.30	16.59	94.25
25	0.00	0.00	0.00	0.00	8.297	8.30	8.30	94.23

Surface Water Attenuation Design

- StormTech Cumulative Spreadsheet

Surface Water Attenuation Calculation

1) Interception Storage

Calculate runoff from 5mm of rainfall on developed area. For this calculation only hardstanding areas are assumed to provide 80% runoff, and non-hardstanding areas are assumed to provide 0% runoff.
The equivalent volume of Interception Storage should be provided on site as no discharge from site should occur for this initial 5mm depth of rainfall. The Interception Storage on this subject site will be provided through the base of attenuation tank.

Site Area of development:	9,763 m^2 (0.9763 ha)
Landscaping:	1,615 m^2
Impermeable Areas (roof, concrete yard):	8,148 m^2
Design Impermeable Areas:	8,148 m^2 x 0.80 =
	= 7,003 m^2

Total volume for 5mm rainfall: 5mm x 7,003 m^2 =
= 32.6 m^3

Therefore, a minimum Interception Storage volume of 32.6 m^3 should be provided. This will prevent discharge from site during rainfall events of up to 5mm rainfall.

2) Greenfield Runoff Rate – QBAR, (mean annual flood flow):

$QBAR_{rural}$ (m^3/sec) = 0.00108 x $AREA^{0.89}$ x $SAAR^{1.17}$ x $SOIL^{2.17}$

SAAR (E 310000, N 241000): 783 mm

Soil Index: S1 (very low runoff)
S2
S3 (moderate runoff)
S4
S5 (very high runoff)

Soil = 0.1($Soil_1$) + 0.3($Soil_2$) + 0.37($Soil_3$) + 0.47($Soil_4$) + 0.53($Soil_5$)
As the site is relatively small in catchment terms the soil class will be 100% Soil2 *(As per hydrological properties of the site (53°17'45.9"N 6°26'25.2"W) obtained from www.uksuds.com).*

Soil Class: $Soil_2$
Runoff Potential: Low
Soil Value: 0.3

QBAR:
As the site area is less than 50 hectares, QBAR for 50 hectares is firstly calculated:

QBAR (m^3/sec) = 0.00108 x $AREA^{0.89}$ x $SAAR^{1.17}$ x $SOIL^{2.17}$ =
0.00108 x $(0.5)^{0.89}$ x $(783)^{1.17}$ x $(0.3)^{2.17}$ =
103.9 l/sec =
2.08 l/sec/ha

QBAR for the smaller area (i.e. the subject site area):

2.08 l/sec/ha x 0.9763 ha =
QBAR = 2.03 l/sec

According to GDSDS chapter 6.3.1.4 if the separate long term storage cannot be provided and temporary flood storage forms part of the single attenuation system, all the runoff from the site should be discharged at either a rate of 2.0 l/s/ha or the average annual peak flow rate QBAR, whichever is greater:
2 l/sec/ha x 0.9763 ha = 1.95 l/sec.

Therefore allowable discharge (QBAR) will be set at **2.03 l/sec.**

3) Attenuation Volume

80% of hardstand areas are assumed to contribute.
Soil SPR Value – 0.3, therefore 30% of non-hardstand areas assumed to contribute.

Equivalent Runoff Area: 80% x 8,148 m^2 + 30% x 1,615 m^2 =
= 6,518.40 m^2 + 484.50 m^2 =
= **7,003 m^2**

Met Eireann's Rainfall depths for the 30 year storm event have been used. The table below identified the 24 hour event as the critical event. The rainfall depth used includes a 20% allowance for climate change giving a volume of 626m^3 - (Column G).

A	B	C	D	E	F	G
Duration	**Runoff Area**	**Total Rainfall Depth**	**Revised Depth for 20% Climate Change**	**Total Surface Water**	**Total Permitted Discharge**	**Storage Volume Required**
	(m^2)	**(mm)**	**(mm) C x 1.2**	**(m^3) B x D**	**(m^3) Q2 x A *(Q2=2.03 l/sec)***	**(m^3) E - F**
15 min	7003	20.00	24.00	168.07	1.80	166.27
30 min	7003	25.40	30.48	213.45	3.60	209.85
1 hour	7003	32.10	38.52	269.75	7.20	262.55
2 hour	7003	40.70	48.84	342.02	14.40	327.62
4 hour	7003	51.60	61.92	433.62	28.80	404.82
6 hour	7003	59.20	71.04	497.49	43.20	454.29
12 hour	7003	75.00	90.00	630.26	86.40	543.86
1 day	7003	95.10	114.12	799.17	172.80	626.37
2 day	7003	106.40	127.68	894.13	345.60	548.53

An allowance to account for the simplifying assumption of head - discharge relationship of 1.25 is applied (due to simple calculations assuming the maximum flow rate can be mobilised immediately for each design return period).

Revised Critical Volume: 626.37 x 1.25 = 783 m^3

Subtract Interception Storage: 783 – 32.6 = **750.4 m^3 (Req'd Attenuation Vol)**

When this storage volume is being used for the 30 year storm event, no surface flooding should occur.

4) Temporary Flood Storage

In addition to the previous calculations for interception & attenuation storage, the temporary flood storage must be calculated.

The 6 hour duration, 100 year return period must be checked to assess the **temporary flood storage** required for the site.

100 year 6 hour event, rainfall depth: 83.5 mm
Factor up by 10% for climate change: 100.2 mm

Total Volume of Runoff:	100.2mm x 7,003 m^2	=	701.7 m^3
Deduct discharge at Q_{BAR} for 6hrs:	2.03 l/sec x 6 hrs	=	44 m^3
Storage volume required;	701.7 – 44	=	657.7 m^3
Factor up for head relationship factor;	657.7 x 1.25	=	822 m^3
Deduct Interception Storage;	32.6 m^3		
Deduct Attenuation Storage;	750.4 m^3		
Temporary Flood Storage required:	822 – 32.6 – 750.4	=	39 m^3

In summary:

Interception Storage: 32.6m^3 to be provided by a lowered base to the attenuation system. Attenuation System Area: 760m^2. Therefore the Interception Storage Depth will equal 150mm. A lowered base level to the attenuation facility allowing base infiltration will facilitate on site discharge of this interception volume. This storage volume being lower than the system outlet cannot discharge from site.

Required Attenuation Volume: 750.4m^3 to be provided within the attenuation system on site.

Temporary Flood Storage: 39m^3 can also be accommodated within the attenuation system provided - see system volumes below.

TOTAL VOLUME REQUIRED: 32.6 + 750.4 + 39 = 822 m^3

TOTAL VOLUME PROVIDED: 832 m^3

(Refer to StormTech Cumulative Storages spreadsheet below)

Appendix to Surface Water Design

- Rainfall table for subject site
- StormTech MC3500 Chamber Information Sheet
- Specification/Product Information for:
    - Separators
    - Silt Trap
    - Flow Control Devices

Met Eireann

Return Period Rainfall Depths for sliding Durations

Irish Grid: Easting: 304030, Northing: 228420,

DURATION	Interval 6months,	1year,	Years 2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.6,	4.3,	5.3,	6.0,	6.6,	8.5,	10.7,	12.2,	14.4,	16.3,	17.9,	20.3,	22.2,	23.8,	N/A ,
10 mins	3.4,	5.0,	6.0,	7.4,	8.4,	9.2,	11.8,	14.9,	17.0,	20.0,	22.8,	24.9,	28.3,	31.0,	33.2,	N/A ,
15 mins	4.0,	5.9,	7.0,	8.7,	9.9,	10.8,	13.9,	17.6,	20.0,	23.6,	26.8,	29.3,	33.3,	36.5,	39.1,	N/A ,
30 mins	5.2,	7.7,	9.1,	11.2,	12.7,	13.9,	17.8,	22.3,	25.4,	29.8,	33.7,	36.9,	41.7,	45.6,	48.8,	N/A ,
1 hours	6.8,	10.0,	11.8,	14.5,	16.4,	17.8,	22.7,	28.3,	32.1,	37.6,	42.5,	46.3,	52.3,	57.0,	60.9,	N/A ,
2 hours	9.0,	13.1,	15.3,	18.7,	21.1,	22.9,	29.0,	36.0,	40.7,	47.4,	53.4,	58.2,	65.5,	71.2,	76.0,	N/A ,
3 hours	10.5,	15.2,	17.8,	21.7,	24.4,	26.5,	33.4,	41.4,	46.8,	54.3,	61.1,	66.5,	74.7,	81.2,	86.5,	N/A ,
4 hours	11.8,	17.0,	19.9,	24.2,	27.1,	29.4,	37.0,	45.7,	51.6,	59.8,	67.3,	73.1,	82.0,	89.0,	94.9,	N/A ,
6 hours	13.9,	19.9,	23.1,	28.1,	31.4,	34.1,	42.7,	52.6,	59.2,	68.6,	77.0,	83.5,	93.6,	101.5,	108.0,	N/A ,
9 hours	16.2,	23.2,	26.9,	32.6,	36.4,	39.4,	49.3,	60.5,	68.0,	78.6,	88.0,	95.4,	106.8,	115.6,	123.0,	N/A ,
12 hours	18.2,	25.8,	30.0,	36.2,	40.4,	43.7,	54.6,	66.9,	75.0,	86.6,	96.9,	104.9,	117.2,	126.8,	134.8,	N/A ,
18 hours	21.3,	30.2,	34.9,	42.0,	46.9,	50.6,	62.9,	76.9,	86.2,	99.2,	110.8,	119.8,	133.7,	144.5,	153.5,	N/A ,
24 hours	23.9,	33.6,	38.9,	46.7,	52.0,	56.2,	69.7,	85.0,	95.1,	109.3,	121.9,	131.7,	146.8,	158.6,	168.3,	202.4,
2 days	30.1,	41.2,	47.0,	55.6,	61.4,	65.8,	80.1,	96.1,	106.4,	120.9,	133.6,	143.4,	158.4,	169.9,	179.4,	212.4,
3 days	35.2,	47.2,	53.5,	62.8,	68.9,	73.6,	88.6,	105.2,	115.9,	130.7,	143.7,	153.6,	168.7,	180.3,	189.8,	222.7,
4 days	39.6,	52.5,	59.2,	69.0,	75.4,	80.3,	96.0,	113.2,	124.2,	139.4,	152.6,	162.7,	178.0,	189.7,	199.3,	232.3,
6 days	47.3,	61.7,	69.1,	79.7,	86.7,	92.0,	108.8,	127.0,	138.6,	154.4,	168.2,	178.6,	194.3,	206.3,	216.1,	249.5,
8 days	54.2,	69.8,	77.8,	89.1,	96.6,	102.2,	119.9,	139.0,	151.1,	167.5,	181.7,	192.4,	208.6,	220.8,	230.8,	264.7,
10 days	60.5,	77.2,	85.6,	97.7,	105.5,	111.4,	130.0,	149.8,	162.3,	179.3,	193.9,	204.9,	221.4,	233.9,	244.1,	278.6,
12 days	66.4,	84.1,	93.0,	105.6,	113.8,	119.9,	139.2,	159.7,	172.7,	190.1,	205.1,	216.4,	233.3,	246.0,	256.4,	291.3,
16 days	77.3,	96.8,	106.4,	120.1,	128.9,	135.5,	156.1,	177.9,	191.5,	209.8,	225.4,	237.2,	254.7,	267.9,	278.6,	314.5,
20 days	87.5,	108.5,	118.8,	133.4,	142.7,	149.7,	171.5,	194.3,	208.5,	227.6,	243.8,	255.9,	274.0,	287.6,	298.6,	335.3,
25 days	99.4,	122.0,	133.1,	148.7,	158.7,	166.1,	189.1,	213.1,	228.0,	247.9,	264.8,	277.4,	296.1,	310.1,	321.4,	359.1,

NOTES:

N/A Data not available

These values are derived from a Depth Duration Frequency (DDF) Model

For details refer to:

'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin', Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

STORMTECH MC-3500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-3500 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
90" x 77" x 45"
2,286 mm x 1,956 mm x 1,143 mm

Chamber Storage
109.9 ft^3 (3.11 m^3)

Min. Installed Storage*
175.0 ft^3 (4.96 m^3)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 6" (150 mm) of stone between chambers/end caps and 40% stone porosity.

STORMTECH MC-3500 END CAP
(not to scale)

Nominal End Cap Specifications

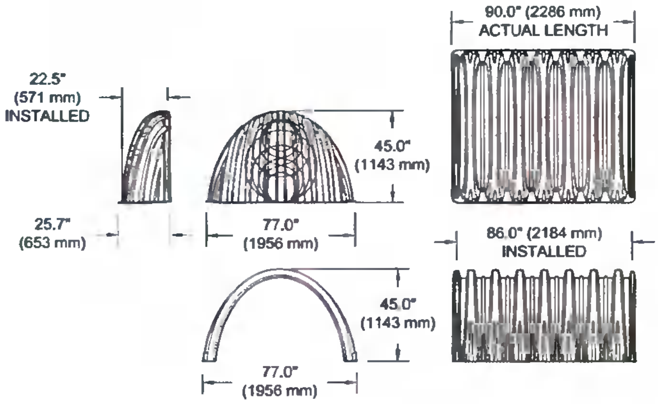
Size (L x W x H)
26.5" x 71" x 45.1"
673 mm x 1,803 mm x 1,145 mm

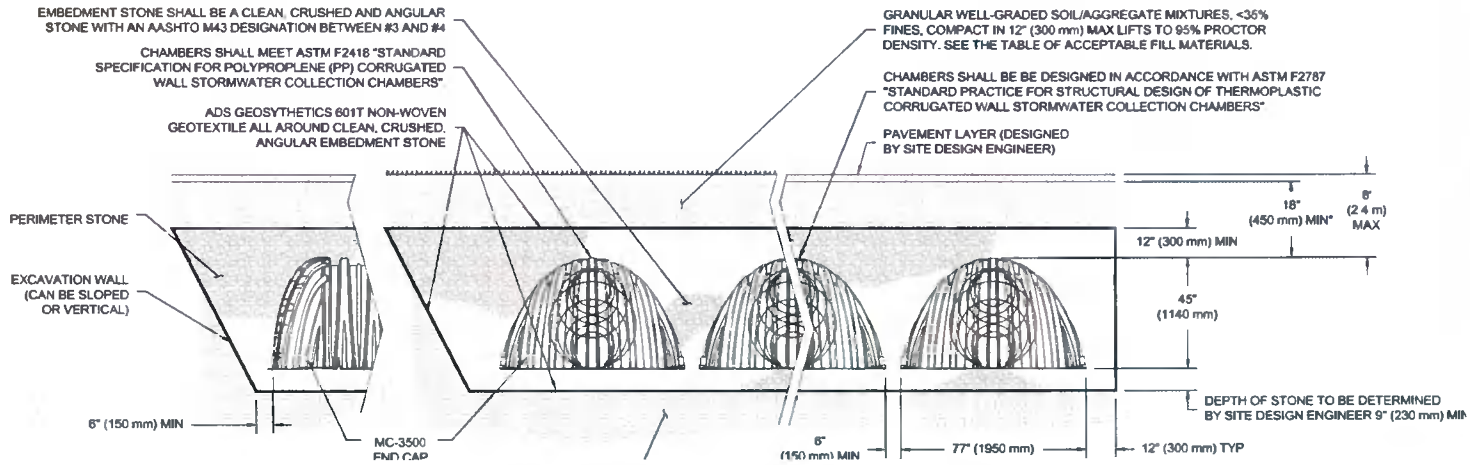
End Cap Storage
14.9 ft^3 (0.42 m^3)

Min. Installed Storage*
45.1 ft^3 (1.28 m^3)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 6" (150 mm) of stone between chambers/end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

StormTech

MC-3500 CHAMBER SPECIFICATION

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500 Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
MC-3500 End Cap	14.9 (.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

AMOUNT OF STONE PER CHAMBER

ENGLISH TONS (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-3500 Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
MC-3500 End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
METRIC KILOGRAMS (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
MC-3500 Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
MC-3500 End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375mm)	18" (450 mm)
MC-3500 Chamber	11.9 (9.1)	12.4 (9.5)	12.8(9.8)	13.3 (10.2)
MC-3500 End Cap	4.0 (3.1)	4.1 (3.2)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

Working on a project?
Visit us at www.stormtech.com
and utilize the StormTech Design Tool

For more information on the StormTech MC-3500 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710

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Kingspan Klargester

SEPARATORS

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

ADVANCED ROTOMOULDED CONSTRUCTION ON SELECTED MODELS!

Let us help!
Free professional site visit with friendly support and advice.
helpingyou@klargester.com to make the right decision or call 028 302 66799

Kingspan Environmental

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention or bypass separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

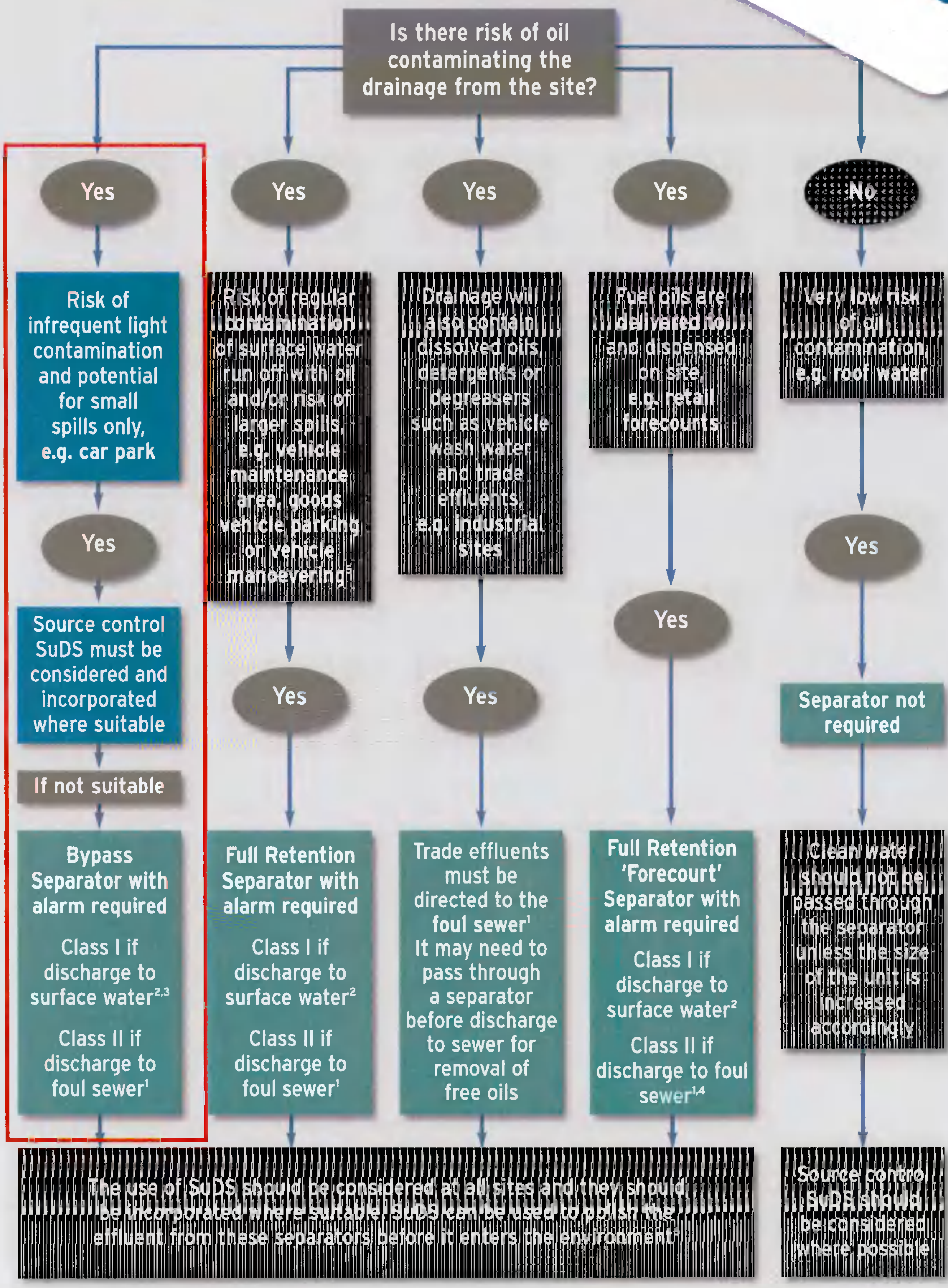
SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.

Kingspan Klargester



1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.
2 You must seek prior permission from the relevant environmental body before you decide which separator to install.
3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.
5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.
6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

Bypass NSB RANGE

APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Klargester full retention separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Silt storage capacity.
- Oil storage volume.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

Class II separators are designed to achieve a concentration of 100mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Class I and Class II designs.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped .
- The required discharge standard. This will decide whether a Class I or Class II unit is required.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m^2)	STORAGE CAPACITY (litres) SILT	OIL	UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA. (mm)
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction   *GRP chamber construction*   ** Some units have more than one access shaft – diameter of largest shown.*

PROFESSIONAL INSTALLERS

Klargester Accredited Installers

Experience shows that correct installation is a prerequisite for the long-lasting and successful operation of any wastewater treatment product. This is why using an installer with the experience and expertise to install your product is highly recommended.

Services include :

- Site survey to establish ground conditions and soil types
- Advice on system design and product selection
- Assistance on gaining environmental consents and building approvals
- Tank and drainage system installation
- Connection to discharge point and electrical networks
- Waste emptying and disposal

Discover more about the Accredited Installers and locate your local expert online.

www.klargester.com/installers

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- **PUMPSTOR24** PUMPING SYSTEMS
- STORMWATER ATTENUATION SYSTEMS
- OIL/WATER SEPARATORS
- BELOW GROUND STORAGE TANKS
- GREASE & SILT TRAPS

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RIBA CPD Providers Network

BRITISH WATER

UK GREEN BUILDING COUNCIL Founding Member

Issue No. 20: August 2014

CDS TECHNOLOGIES

Specialists in Wastewater Treatment & Stormwater Management

Surface Water Treatment SUDs Protector

The CDS Non Blocking screening technology is an innovative method of liquid / solid separation for Surface Water, Combined Sewer Overflows (CSO) and Foul Sewage Systems.

- ***SurfSep*** for Surface Water applications
- ***OverSep*** for Combined Sewer Overflow applications.

The technology accomplishes high efficiency separation of settleable particulate matter and capture of floatable material.

A unique feature of the CDS Technology is it's compact design. Both the *SurfSep* and *OverSep* are available as packaged systems, which can either be installed inside pre-cast concrete chamber rings, or complete BBA Approved Polyethylene Chambers unit.

Applications

- Storm-water Treatment
- Combined Sewer Overflow Treatment
- Parking Area Run-Off Treatment
- Vehicle Service Yard Areas
- Pre-treatment for Wetlands, Ponds and Swales
- Rainwater Harvesting
- Pre-treatment for Oil Separators
- Pre-treatment for media and Ground In-filtration Systems

Rapid installation

Primary features

- **Effective**: Capturing more than 95% of solid pollutants.
- **Non-Blocking**: Unique design takes advantage of indirect filtration and properly proportioned hydraulic forces that virtually makes the unit unblockable.
- **Non-Mechanical**: The unit has no moving parts and requires no mechanical devices to support the solid separation function.
- **Low Maintenance Costs**: The system has no moving parts and is fabricated of durable materials.
- **Compact & Flexible**: Design and size flexibility enables the use of various configurations.
- **High Flow Effectiveness**: The technology remains highly effective across a broad spectrum of flow ranges.
- **Assured Pollutant Capture**: All materials captured are retained during high flow conditions.
- **Safe & Easy Pollutant Removal**: Extraction methods allow safe and easy removal of pollutants without manual handling.

Surface Water System

Hydraulic Analysis

In storm water applications, an analysis of the catchment in terms of its size, topography and land use will provide information for determining flow to be expected for various return periods.

The *SurfSep* is designed for the flow that mobilizes the gross pollutants within the catchment. Since there are variations in catchment response due to region, land use and topography, it is recommended that the selection of flow to be treated will be for return periods of between 3 months and 1 year.

Balancing the cost to the operator against the benefits to the environment

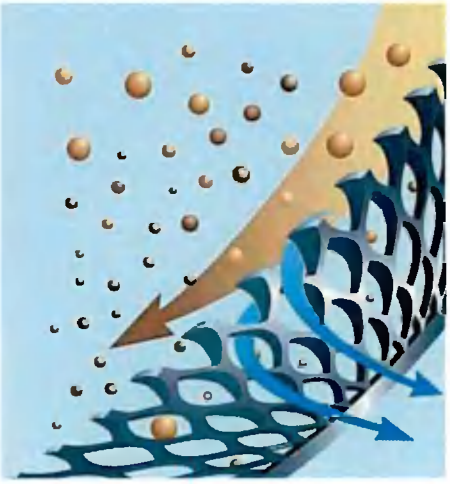
Field evaluations to determine pollutant mobilization have found that the vast majority of pollutants are mobilized in flows that are well below the design capacity' for the conveyance facility - typically known as the 'first flush'.

Therefore it is typical not to design the *SurfSep* models to process the conveyance system's maximum flow in order to achieve a very high level of pollutant removal.

The added value benefit to the operator is reduced civil costs without compromising the benefits to the environment.

How it works

Water and pollutants enter the system and are introduced tangentially inside the separation chamber forming a circular flow motion. Floatables and suspended solids are diverted to the slow moving centre of the flow. Negatively buoyant solids settle out to an undisturbed sump chamber below, while the water passes countercurrently through the separation screen. Floatables remain at the water surface and retained within the screen.



Surface Water Treatment Systems

Hydraulic Design

Every application requires a detailed hydraulic analysis to ensure the final installation will perform to effect optimum solids separation without blocking the screen.

After the design flow has been determined, the appropriate standard model can be selected. A selection table is provided on page 7.

The Ultimate SUDs Protector

There a four principal areas of proprietary SUDs technology;

• Infiltration • Flow Control • Storage/attenuation • Treatment

SurfSeps, although a common form of treatment are unique. When installed upstream of any proprietary SUDs technology, the *SurfSep* protects the receiving SUDs from fine solids and debris that would otherwise accumulate over time rendering the SUDs non-operational, as the worst case.

SurfSeps have been successfully installed in front of;

- Soakaways
- Infiltration Trenches
- Filters
- Wetlands
- Ponds and Water Features
- Detention and Retention Systems
- Oil Separators
- Create storage storage systems

to remove fine solids and debris that would otherwise accumulate over time reducing the down stream effectiveness of downstream SUDs assets.

Various independent field trials have shown that the *SurfSep* can remove high levels of Phosphates, Heavy Metals and PolyAramatic Hydrocarbons (PAH's) from the flow.

Infiltration

SurfSeps have been successfully installed in front of ground Infiltration systems to remove grit, fine solids and debris which accumulates in and around the SUDs causing visual degradation in the short term and accumulation of silt and grits leading to reduced volume in the long term.

Studies have also shown that Heavy metals & PAH's accumulate within the SUDs over time before being released back to the environment resulting in elevated concentrations.

Detention & Retention Systems

SurfSeps have been successfully installed in front of collection and attenuation SUDs to remove grit, fine solids and debris which accumulates in the SUDs leading to potential blockage of flow regulators resulting in increased Occupational Health & Safety risk during the treatment of blockages and during the periodic cleaning operations.

Applications

- Rainwater Harvesting
- Road run off
- New Developments
- Motorways
- A / B Roads
- Local Roads
- Residential
- Industrial
- Commercial

Purpose

Removal of plastics, oil, grit, fine solids, organic and inorganic debris, from point source pollution.

Flow Control Systems

Flow Control

Flow control is often required to reduce flooding of downstream sewer networks or receiving water courses. There are a number of ways to achieve this. The Hydroslide - Float controlled, constant flow regulator, as detailed below is ideally suited to the providing an efficient and reliable means of flow control.

There are four types of standard Hydroslide flow regulators as pictured.

1) Mini
2) HydroLimiter
3) VS - Vertical Standard
4) Combi - self flushing, can be mounted on the dry or wet side of the flow chamber.

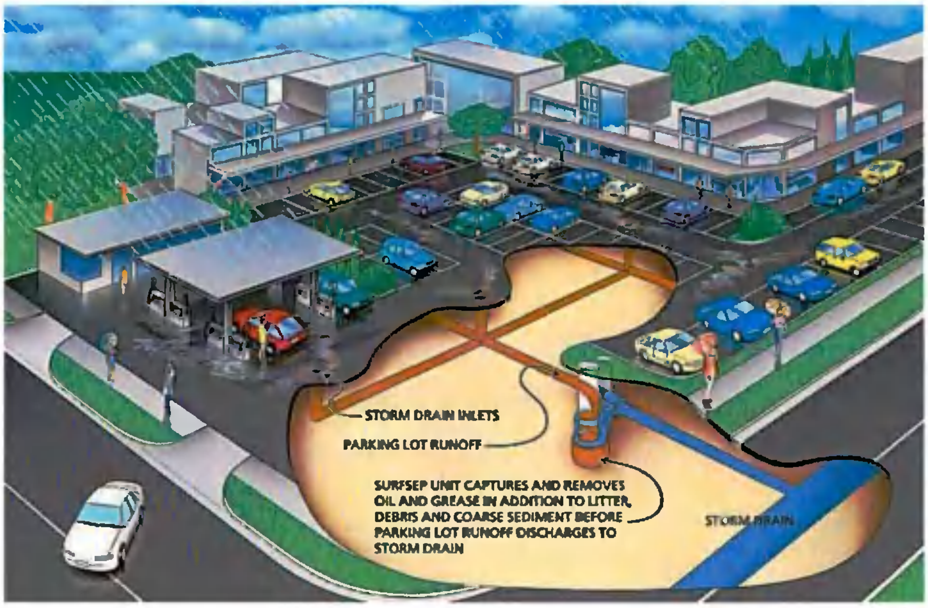
Most applications can be dealt with using any of the four models to suit the flow. An accuracy of +/-5% is achievable.


1


2


3


4



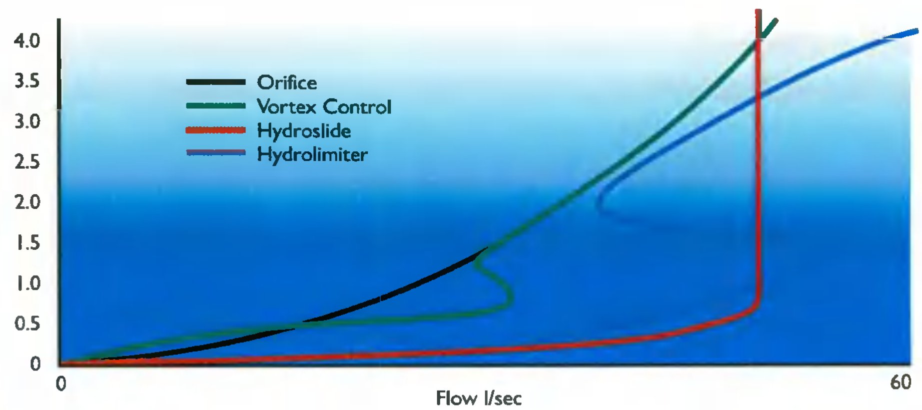
Typical SurfSep installation

Flow Control Technical Design

The Hydroslide regulator does not affect the flow until the flow is approaching the set discharge limit, this allows all flow (the first flush) to be discharged to the sewer. Because the flow to the sewer can be optimised at it's maximum permitted capacity the attentuation/storage capacity can be reduced over other methods of flow control, thus giving cost savings in storage provision. This is best explained by looking at a single storm event and comparing the 3 flow regulation processes as was done independantly by WRc in the report titled 'REDUCING THE COST OF STORMWATER STORAGE', Report No. PT1052, March 1995. The chart below represents 50 l/s control and up to 4m of head. The area difference between the curves being the detention volume saving.

Typically the volume saving when using a Hydroslide regulator is between 7% to 40%

Representation of flow through an orifice



Operation & Performance

Performance Criteria

Note: Screen apertures of 4.8 mm , 2.4 mm and 1.2 mm are available.

The 4.8 and 2.4 mm screens are generally used for Surface Water applications, with foul applications using either 2.4 or 1.2 mm aperture units.

Typical 1.2 mm aperture Performance

- shall remove all solids with a single dimension greater than 1.2 mm and positively contain those solids until the unit is cleaned.
- shall remove and positively contain 100 percent of all neutrally buoyant particles with a single dimension greater than 1.2 mm for all flow conditions to design capacity.
- shall remove and positively contain 100 percent of all floating trash and debris with a single dimension greater than 1.2 mm for all flow conditions to the design capacity.
- shall remove a minimum of 50 percent of oil and grease (as defined as the floating portion of total hexane extractable materials) for all flow conditions to the design capacity, without the addition of absorbents.
- shall provide the following minimum particle removal efficiencies (based on a specific gravity of 2.65):

a) 100 percent of all particles greater than 1100 microns.

b) 95 percent of all particles greater than 550 microns.

c) 90 percent of all particles greater than 367 microns.

d) 20 percent of all particles greater than 200 microns.

Maintenance

SurfSep maintenance can be site and drainage area specific. The installation should be inspected periodically to assure its condition to handle anticipated runoff. If pollutant loadings are known, then a preventive maintenance schedule can be developed based on runoff volumes processed.

Since this is seldom the case we recommend;

New Installations

Check the condition of the installation after the first few events. This includes a visual inspection to ascertain that the unit is operating correctly and measuring the amount of deposition that has occurred in the unit. This may be achieved using a 'Dip Stick'.

Ongoing Operation

For the first 12 months the installations sump full volume should be inspected monthly and recorded. When the inspection indicates that the sump full volume is approaching the top of the sump (base of screen) a cleanout should be undertaken.

Cleaning Methods

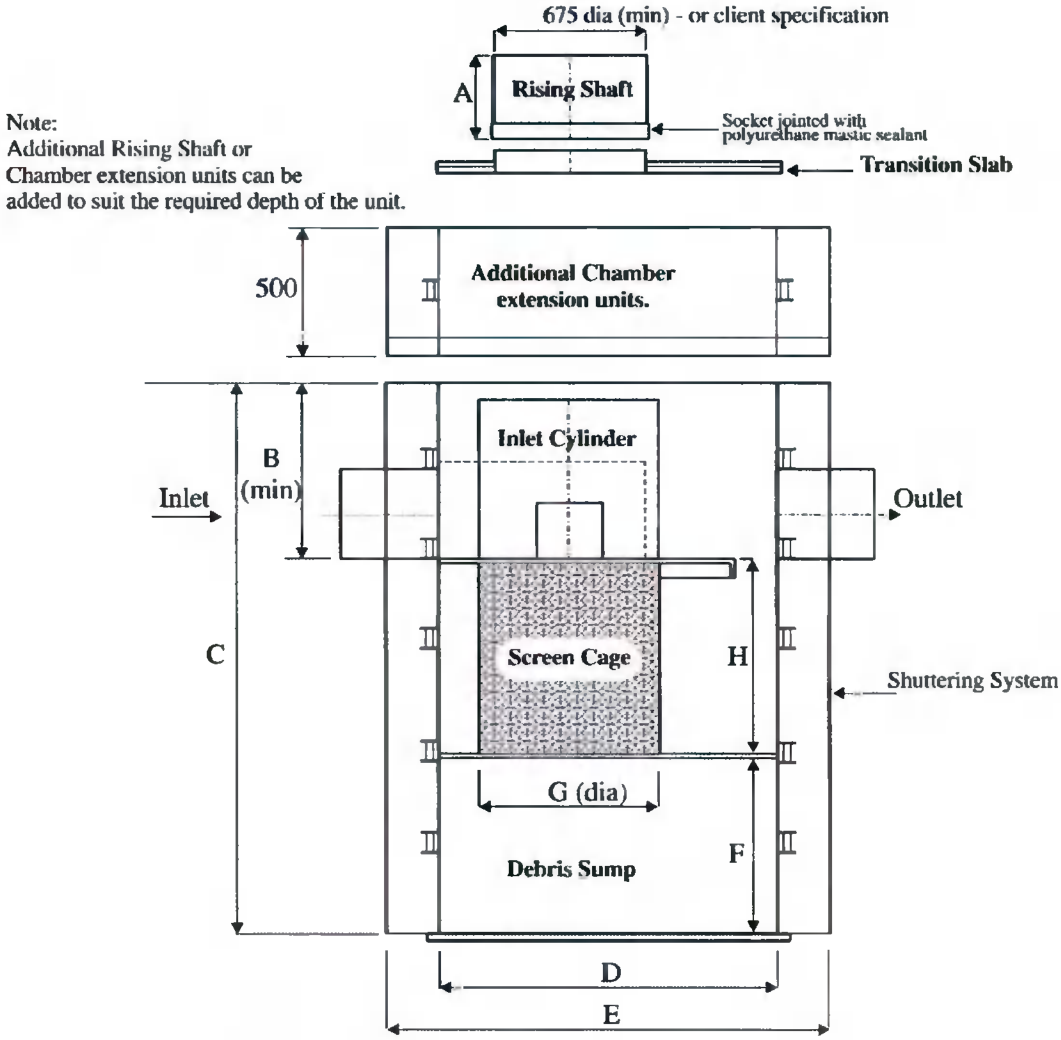
- Eduction (Suction)
- Basket Removal
- Mechanical Grab

Maintenance Cycle

Minimum once per year. Depending on the pollutant load it may be necessary to maintain the installation more frequently.

The operator shall be able to devise the most efficient maintenance schedule for any particular installation over a 12 month operating cycle.

SurfSep Dimensions



***SurfSep* Dimensions (mm)**

	SW0404	SW0604	SW0606	SW0804	SW0806	SW0808	SW1010	SW1012	SW1015
A	370	370	370	370	370	370	500	500	500
B	444	815	615	810	830	810	800	800	830
C	1250	1985	1985	2080	2300	2480	2800	3000	3330
D	800	1200	1200	1500	1500	1500	2000	2000	2000
E	1112	1665	1665	1966	1966	1966	2475	2475	2475
F	400	700	700	700	700	800	1000	1000	1000
G (dia)	400	600	600	800	800	800	1000	1000	1000
H	400	400	600	400	600	800	1000	1200	1500

Selection Table - *SurfSep*

Model Reference	Hydraulic Peak Flow Rate l/s	Drainage Area - Impermeable m^2	Chamber Diameter (mm)	Internal Pipe Diameter (mm)
SWI 0404	30	2,000	900	150 / 225
SWI 0604	70	5,000	1200	225
SWI 0606 / 01	140	10,000	1200	225 - 375
SWI 0606 / 02	200	15,000	1200	225 - 375
SWI 0804	275	20,000	1500	300
SWI 0806	350	25,000	1500	450
SWI 0808	400	30,000	1500	450
SWI 1010	480	35,000	2000	450
SWI 1012	550	40,000	2000	450 / 750
SWI 1015	700	50,000	2000	450 / 750

* Proposed Peak Flow Rate for each model calculated using Rational Lloyd Davies with a rainfall intensity of 50mm/hr. For greater flows - special design / construction required.

In-Line *SurfSep* Units (SWI)

These units are used with in the drainage system in-line and are supplied as BBA Approved complete Polyethylene Chamber units from the selection table above.

Off-Line *SurfSep* Units (SWO)

These can be designed either using pre-cast concrete or specially designed Polyethylene chambers.

Model Designation

SurfSep models are firstly identified by the letters SW for Surface Water followed by a letter (**I** or **O**) representing the configuration (**I**nline or **O**ffline).

A four digit number representing the screen diameter and screen height then follows to give the standard model designation for a *SurfSep* screen for installation into standard commercially available pre-fabricated manhole chambers i.e SWI 0806. Example: SWI 0806 designates Surface Water Inline with a separation screen dia 0.8 m and screen height of 0.6m.

Surface Water Treatment

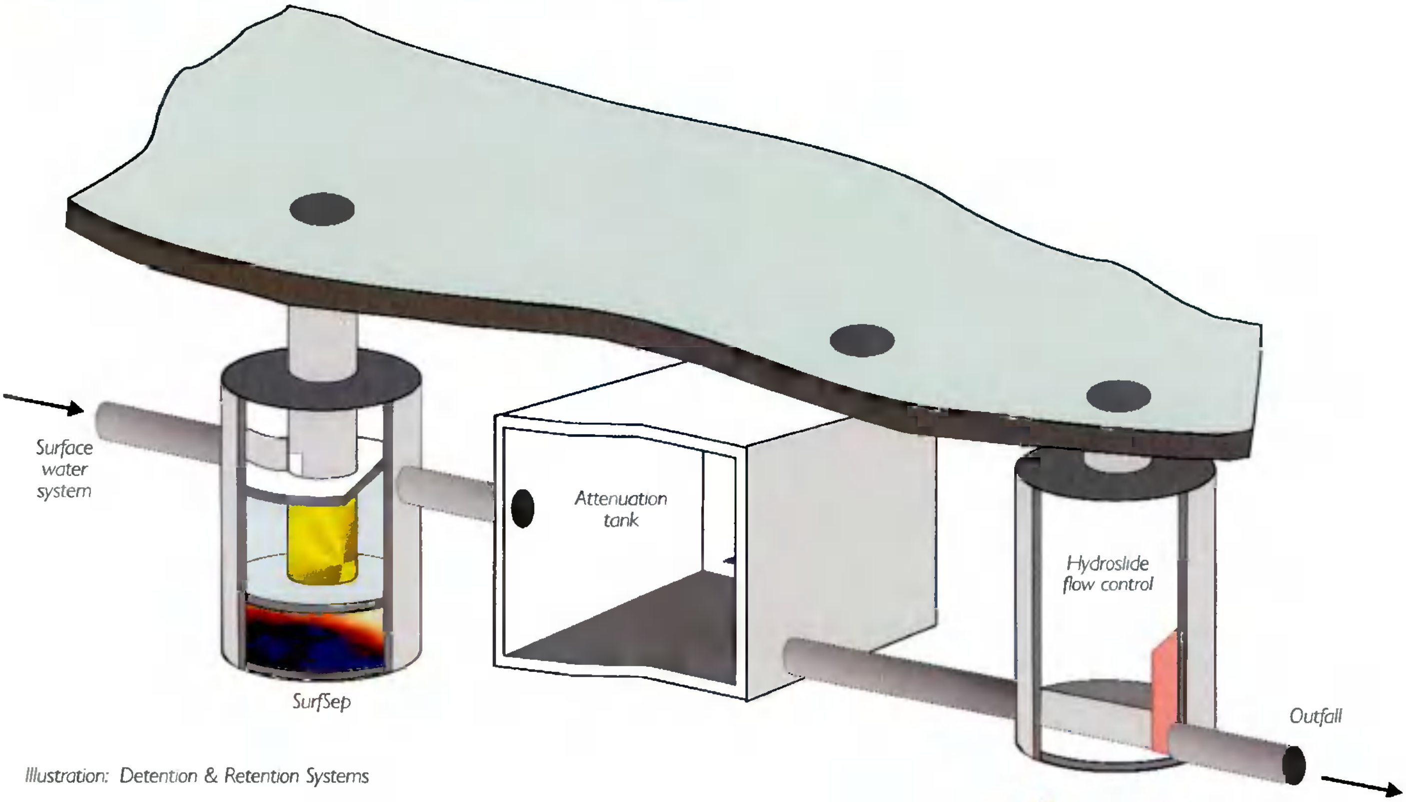


Illustration: Detention & Retention Systems

SurfSeps unit installed in front of attenuation tank / cellular storage system, to remove grit, fine sediments and floating debris which can accumulate within surface water systems. Hydroslide flow control regulating the discharge to the outfall. The Hydroslide can be supplied for installation in an insitu constructed chamber, or as a complete unit housed within a pre-fabricated polyethylene manhole chamber.

* BBA - THIS CERTIFICATE RELATES TO PIPEX UNIVERSAL MANHOLES AND ACCESS CHAMBERS, WHICH ARE MANUFACTURED FROM WELDED POLYPROPYLENE. This Certificate covers the use of the manholes and chambers for drain and sewer applications where they are used for maintenance to depths of 6 mtrs.

Approved Suppliers

If you would like more information please contact:

PROVIDE SURFSEP SILT TRAP

REF. SWI 0606/01.

CDS Technologies is a multi disciplined, international, company offering a comprehensive product range of; wastewater treatment technologies and processes, and stormwater management solutions for attenuation, infiltration, flow control and overflow treatment. CDS have an established network of Distributors and Representatives. Further information can be found on our website www.cdstech.com.au
Alternatively please contact our approved supplier detailed left.

Hydro-Brake® Flow Control

Modelling Guide

Unit Selection Design Guide

Overview

Hydro-Brake® Flow Controls restrict the flow in surface/storm water or foul/combined sewer systems by inducing a vortex flow pattern in the water passing through the device, having the effect of increasing back-pressure.

Their 'hydrodynamic' rather than 'physical restriction' based operation provides flow regulation whilst maintaining larger clearances than most other types of flow control, making them less susceptible to blockage. Their unique "S"-shaped head-flow characteristic also enables them to pass greater flows at lower heads, which can enable more efficient use of upstream storage facilities.

This document provides guidance relating to the selection and use of Hydro-Brake® Flow Controls for use in surface/storm water and foul/combined sewer systems.

The information provided here is intended for the purposes of general guidance only - individual application requirements may differ. If in doubt, or to enquire about new product additions, please contact HRD Technologies Ltd.

STH Range of Hydro-Brake® Flow Controls

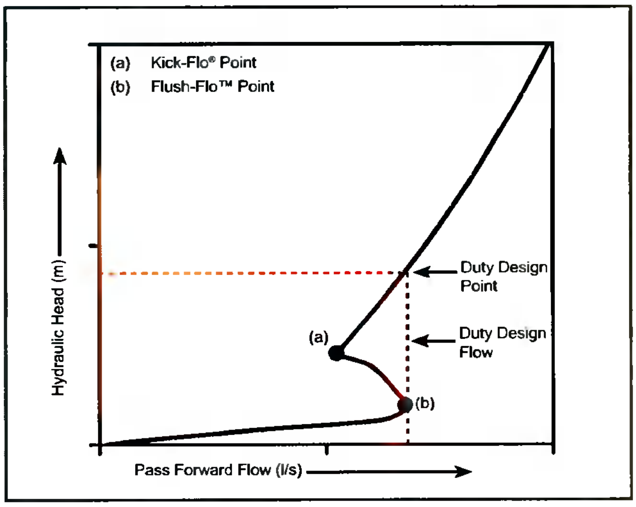
BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

See back cover for details.

Hydraulic Characteristics and Specification

Hydro-Brake® Flow Controls should be selected such that the duty/design flow is not exceeded at any point on the head-flow curve, see illustration right. If this is not achievable using the initially selected unit, it may be appropriate to select an alternative option (see selection guidance overleaf).

While the primary aim of a flow control is to provide a particular flow rate at a given upstream head (giving a design/duty point), it is important to note that secondary opportunities, such as potential for optimised storage use, derive from consideration of the full hydraulic characteristic. It is therefore important to ensure that the same flow control, or one confirmed to provide equivalent hydraulic performance, is implemented in any final installation.



Typical Hydro-Brake® Head Versus Flow Characteristics

To ensure correct implementation a multiple design-point specification, defining the main hydraulic features of the selected flow control, can be provided by HRD Technologies Ltd. This should include at least the following information:

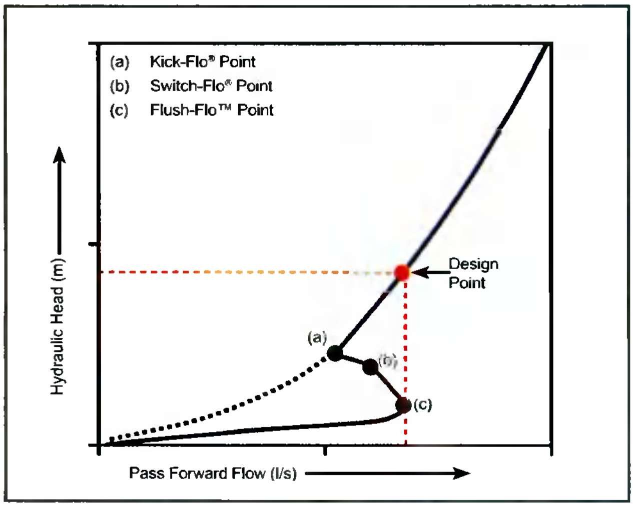
- outlet size and model of Hydro-Brake® Flow Control
- definition of the duty/design point (head and flow)
- definition of the Flush-Flo™ point (head and flow)
- definition of the Kick-Flo® point (head and flow)

To ensure that a drainage system performs as designed, it is strongly recommended that this information is reproduced on any technical specifications.

STH Type Hydro-Brake® Flow Control with BBA Approval

Now included in Win*Des*® W.12.6!

The new STH type Hydro-Brake® Flow Control range has a unique head / discharge performance curve which introduces a very important feature - the Switch-Flo® Point. This point illustrates the unique performance feature of the STH range which can lead to further savings in upstream storage, whilst also enabling increased inlet / outlet size to further reduce the risk of blockage.



Typical STH Head Versus Flow Characteristics

Kick-Flo® (a) - the point at which the vortex has initiated and at which the curve begins to return back to follow the orifice curve and reach the same design point or desired head / flow condition.

NEW Switch-Flo® (b) - marks the transition between the Kick-Flo® and Flush-Flo™, from vortex initiation to stabilisation. This point adds a new layer of resolution to the Hydro-Brake® curve that has implications to upstream storage savings.

Flush-Flo™ (c) - the point at which the vortex begins to initiate and have a throttling effect. This point on the Hydro-Brake® curve is usually much nearer to the maximum design flow (Design Point), than other vortex flow controls leading to more water passing through the unit during the earlier stages of a storm, thus reducing the amount of water that needs to be stored upstream.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

STH Range of Hydro-Brake® Flow Controls

The STH Hydro-Brake® Flow Control is the only vortex flow control available today that has been given the prestigious BBA Approval Certificate. The BBA assessment procedure entails rigorous assessment of production and manufacturing standards, and confirms that the hydraulic performance of the Hydro-Brake® Flow Control matches the data given to designers by HRD Technologies with their head / discharge curves.

A worked example showing the steps to model a Hydro-Brake® Flow Control and associated Stormcell® Storage System within Micro Drainage Win*Des*® is available on our website:

www.hrdtec.com

Take a Look at Our New Stormwater Web Resource

PROVIDE THE FOLLOWING FLOW CONTROL DEVICE ON THE OUTFALL OF

SW MH 13: Qbar = 2.05 l/sec

Engineering Nature's Way is a brand new resource for people working with Sustainable Drainage and flood management in the UK.

The site provides an opportunity to share news, opinion, information and best practice for people working in local and central Government; developers, consulting engineers and contractors. Do you have something to share? We would be delighted to receive your contributions.

turning water around ...®

HRD Technologies Ltd

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KAVANAGH BURKE
CONSULTING ENGINEERS

Discharge Units Calculation

KAVANAGH BURKE
CONSULTING ENGINEERS

INPUT FOR FOUL SEWER NETWORK DESIGN

Client: Airtraks Limited T/A ATC Computer Transport
Project: SITE DEVELOPMENT AT BALDONNELL BUSINESS PARK, BALDONNELL, DUBLIN 22

Project Ref: **D1660 - PL2**

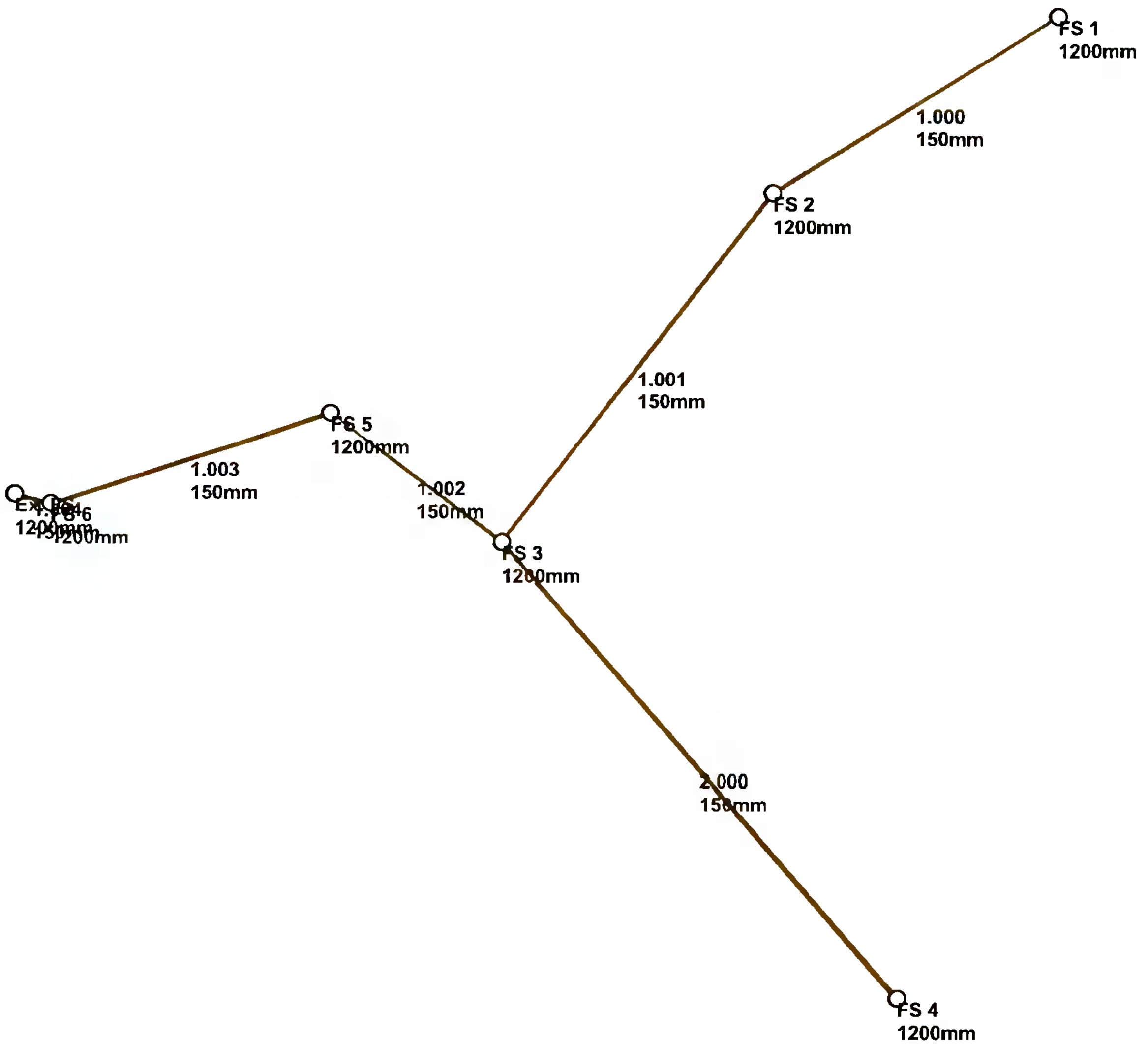
Floors	Type of Applience	Discharge Unit per Applience	No of Applie.	Discharge Units
OFFICE/STAFF FACILITIES GROUND FLOOR PLAN:	WB	0.6	7	4.2
	WC	2.5	6	15.0
	URINAL	0.8	3	2.4
	DISHWASH	0.8	1	*0.8*
	SINK	1.3	1	1.3
		TOTAL:		***22.9***
OFFICE/STAFF FACILITIES FIRST FLOOR PLAN:	WB	0.6	6	3.6
	WC	2.5	5	12.5
	URINAL	0.8	3	2.4
	DISHWASH	0.8	0	*0.0*
	SINK	1.3	1	1.3
		TOTAL:		***19.8***
TOTAL NO OF DICHARGE UNITS FOR DEVELOPMENT:				***43***
			Q (l/sec) =	*4.57*

NOTE:
Discharge units calculated as per Table C.2. Typical values of discharge units of BS EN 752-4.
Typical frequency factors are taken from Table C.1. (k_{DU}=0.7)
Design flow rate is given by the equation: $Q = kDU \sqrt{\Sigma DU}$

KAVANAGH BURKE
CONSULTING ENGINEERS

Foul Sewer Network Design

KAVANAGH BURKE CONSULTING ENGINEERS	Kavanagh Burke Ltd Unit F3 Calmount Park, Ballymount, Dublin 12	File: D1660 - FS Network_PL2 Network: FOUL SEWER Netw Elena Dragoje 01/07/2021	Page 1 Foul Sewer Network



Design Settings

Frequency of use (kDU)	0.70	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	2700	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.200
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Units	Add Inflow (l/s)	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
FS 1	43.0		96.950	Adoptable	703982.633	728466.294	0.950
FS 2			96.600	Adoptable	703961.329	728453.211	0.950
FS 3			96.600	Adoptable	703941.024	728427.198	1.450
FS 4		2.0	97.000	Adoptable	703970.530	728393.223	0.900
FS 5	3.7		96.675	Adoptable	703928.234	728436.812	1.675
FS 6			96.700	Adoptable	703907.294	728430.066	1.900
Ex. FS			96.650	Adoptable	703904.623	728430.776	1.950

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	FS 1	FS 2	25.001	1.500	96.000	95.650	0.350	71.4	150
1.001	FS 2	FS 3	33.000	1.500	95.650	95.150	0.500	66.0	150
2.000	FS 4	FS 3	44.999	1.500	96.100	95.150	0.950	47.4	150
1.002	FS 3	FS 5	16.000	1.500	95.150	95.000	0.150	106.7	150
1.003	FS 5	FS 6	22.000	1.500	95.000	94.800	0.200	110.0	150
1.004	FS 6	Ex. FS	2.764	1.500	94.800	94.700	0.100	27.6	150

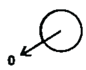
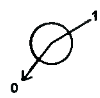
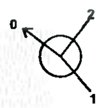
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Velocity (m/s)
1.000	1.037	18.3	4.6	0.800	0.800	0.800	0.000	0	43.0	0.0	0.861
1.001	1.079	19.1	4.6	0.800	1.300	1.300	0.000	0	43.0	0.0	0.885
2.000	1.275	22.5	2.0	0.750	1.300	1.300	0.000	0	0.0	2.0	0.777
1.002	0.848	15.0	6.6	1.300	1.525	1.525	0.000	0	43.0	2.0	0.819
1.003	0.835	14.8	6.8	1.525	1.750	1.750	0.000	0	46.7	2.0	0.816
1.004	1.670	29.5	6.8	1.750	1.800	1.800	0.000	0	46.7	2.0	1.353

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	25.001	71.4	150	Circular	96.950	96.000	0.800	96.600	95.650	0.800
1.001	33.000	66.0	150	Circular	96.600	95.650	0.800	96.600	95.150	1.300
2.000	44.999	47.4	150	Circular	97.000	96.100	0.750	96.600	95.150	1.300
1.002	16.000	106.7	150	Circular	96.600	95.150	1.300	96.675	95.000	1.525
1.003	22.000	110.0	150	Circular	96.675	95.000	1.525	96.700	94.800	1.750
1.004	2.764	27.6	150	Circular	96.700	94.800	1.750	96.650	94.700	1.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	FS 1	1200	Manhole	Adoptable	FS 2	1200	Manhole	Adoptable
1.001	FS 2	1200	Manhole	Adoptable	FS 3	1200	Manhole	Adoptable
2.000	FS 4	1200	Manhole	Adoptable	FS 3	1200	Manhole	Adoptable
1.002	FS 3	1200	Manhole	Adoptable	FS 5	1200	Manhole	Adoptable
1.003	FS 5	1200	Manhole	Adoptable	FS 6	1200	Manhole	Adoptable
1.004	FS 6	1200	Manhole	Adoptable	Ex. FS	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
FS 1	703982.633	728466.294	96.950	0.950	1200		0	1.000	96.000	150
FS 2	703961.329	728453.211	96.600	0.950	1200		1	1.000	95.650	150
							0	1.001	95.650	150
FS 3	703941.024	728427.198	96.600	1.450	1200		1	2.000	95.150	150
							2	1.001	95.150	150
							0	1.002	95.150	150
FS 4	703970.530	728393.223	97.000	0.900	1200		0	2.000	96.100	150
FS 5	703928.234	728436.812	96.675	1.675	1200		1	1.002	95.000	150
							0	1.003	95.000	150
FS 6	703907.294	728430.066	96.700	1.900	1200		1	1.003	94.800	150
							0	1.004	94.800	150
Ex. FS	703904.623	728430.776	96.650	1.950	1200		1	1.004	94.700	150