

Date: 02.06.14

Our ref: QSE-14-1854-Q001-A

FHP
32-42 Woburn Place
LONDON
WC1H 0JR

For the attention of Mr Jason Smith

Dear Sirs

158a Mill Lane, Hampstead

Further to our telephone conversation and your subsequent e-mail regarding stormwater attenuation for the above site, we are pleased to supply the following information based upon the Micro Drainage program "Source Control" along with details of the proposed Hydro Stormwater Management Package.

The global variables entered into the program were as follows:

Global Variables	Value
Return Period Storm (years)	100
Rainfall Depth M5-60 (mm)	20.6
Two Day Rainfall Ratio R (r/100)	0.438
Additional Rainfall to Allow for Climate Change	+30%
Volumetric Runoff Coefficient (summer)	0.750
Volumetric Runoff Coefficient (winter)	0.840
Contributing Area (Ha)	0.016
Maximum Allowable Discharge (l/s)	5

Using modelling details specific to the Hydro-Brake Optimum® the program gave these storage volumes:

Storage Volume using the Hydro-Brake Optimum® (m ³)	0.6
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The volume(s) given in the table above are specific to the Hydro-Brake Optimum®. Alternative Flow Control units may require a greater volume to be stored.

Attached are the results from the calculations carried out in Source Control.

Turning Water Around...®

For the discharge flow control(s) we have based our initial design upon the previously given maximum allowable discharges and an upstream operating head estimated from the depth of the Storage System. We would therefore propose the use of the following Hydro-Brake Optimum®(s).

Flow Control Details	1 in 100 Year Storm
Maximum Allowable Discharge (l/s)	5
Estimated Upstream Operating Head (m)	0.35
Minimum Pipe Diameter (mm)	150
Hydro-Brake Optimum® (Product Code)	MD-SHE-0114-5000-0350-5000
Hydro-Brake Optimum®, Budget Price	£1,930.00

Using the figures shown above for the discharge control by Hydro-Brake Optimum® the estimated size of the storm storage facility could be as follows:

Storage Details	1 in 100 Year Storm
Depth of Stormbloc® Storage System (m)	0.35
Approximate Plan Size of Stormbloc® Storage (m)	2.4 x 0.8
No. of Stormbloc® Storage Modules (each module being 0.8 x 0.8 x 0.35 m deep)	1
Total Volume of Water Stored in Stormbloc® (m ³)	0.64
Stormbloc® Storage System, Budget Price	£575.00

Alterations to the size and shape of the storage system may affect the operating head acting on the Hydro-Brake Optimum® and therefore the size and type of unit required. Please contact us if the dimensions shown above cannot be accommodated and we will redesign the system to suit your restrictions and also provide details of the appropriate Hydro-Brake Optimum®.

For your information we have attached a copy of the Hydro-Brake Optimum® design drawing, characteristics sheet and modelling information for use in Micro Drainage WinDes® along with a typical installation drawing showing the Stormbloc® Storage System.


We hope our proposal is of interest to you, but if you should have any queries then please do not hesitate to contact us.

Yours sincerely

Steven Waters

Proposal Engineer

Direct Dial: 01275 337 953

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Micro Drainage		Source Control 2014.1

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.169	0.169	0.0	4.9	4.9	0.3	O K
30 min Summer	0.201	0.201	0.0	4.9	4.9	0.4	O K
60 min Summer	0.120	0.120	0.0	4.8	4.8	0.2	O K
120 min Summer	0.091	0.091	0.0	3.5	3.5	0.2	O K
180 min Summer	0.077	0.077	0.0	2.8	2.8	0.1	O K
240 min Summer	0.068	0.068	0.0	2.3	2.3	0.1	O K
360 min Summer	0.057	0.057	0.0	1.7	1.7	0.1	O K
480 min Summer	0.051	0.051	0.0	1.4	1.4	0.1	O K
600 min Summer	0.046	0.046	0.0	1.2	1.2	0.1	O K
720 min Summer	0.043	0.043	0.0	1.0	1.0	0.1	O K
960 min Summer	0.038	0.038	0.0	0.8	0.8	0.1	O K
1440 min Summer	0.032	0.032	0.0	0.6	0.6	0.1	O K
2160 min Summer	0.027	0.027	0.0	0.4	0.4	0.0	O K
2880 min Summer	0.024	0.024	0.0	0.3	0.3	0.0	O K
4320 min Summer	0.020	0.020	0.0	0.2	0.2	0.0	O K
5760 min Summer	0.018	0.018	0.0	0.2	0.2	0.0	O K
7200 min Summer	0.016	0.016	0.0	0.2	0.2	0.0	O K
8640 min Summer	0.015	0.015	0.0	0.1	0.1	0.0	O K
10080 min Summer	0.014	0.014	0.0	0.1	0.1	0.0	O K
15 min Winter	0.337	0.337	0.0	4.9	4.9	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.768	0.0	4.1	18
30 min Summer	88.351	0.0	5.3	25
60 min Summer	54.281	0.0	6.5	38
120 min Summer	32.218	0.0	7.7	68
180 min Summer	23.443	0.0	8.4	98
240 min Summer	18.608	0.0	8.9	126
360 min Summer	13.406	0.0	9.7	188
480 min Summer	10.622	0.0	10.2	244
600 min Summer	8.862	0.0	10.6	306
720 min Summer	7.639	0.0	11.0	368
960 min Summer	6.040	0.0	11.6	486
1440 min Summer	4.332	0.0	12.5	724
2160 min Summer	3.103	0.0	13.4	1092
2880 min Summer	2.446	0.0	14.1	1456
4320 min Summer	1.748	0.0	15.1	2144
5760 min Summer	1.376	0.0	15.9	2912
7200 min Summer	1.143	0.0	16.5	3608
8640 min Summer	0.981	0.0	17.0	4264
10080 min Summer	0.862	0.0	17.4	4984
15 min Winter	136.768	0.0	4.6	18

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.318	0.318	0.0	4.9	4.9	0.6	O K
60 min Winter	0.113	0.113	0.0	4.5	4.5	0.2	O K
120 min Winter	0.080	0.080	0.0	2.9	2.9	0.1	O K
180 min Winter	0.066	0.066	0.0	2.2	2.2	0.1	O K
240 min Winter	0.058	0.058	0.0	1.7	1.7	0.1	O K
360 min Winter	0.049	0.049	0.0	1.3	1.3	0.1	O K
480 min Winter	0.043	0.043	0.0	1.0	1.0	0.1	O K
600 min Winter	0.039	0.039	0.0	0.9	0.9	0.1	O K
720 min Winter	0.036	0.036	0.0	0.7	0.7	0.1	O K
960 min Winter	0.032	0.032	0.0	0.6	0.6	0.1	O K
1440 min Winter	0.027	0.027	0.0	0.4	0.4	0.0	O K
2160 min Winter	0.023	0.023	0.0	0.3	0.3	0.0	O K
2880 min Winter	0.020	0.020	0.0	0.2	0.2	0.0	O K
4320 min Winter	0.017	0.017	0.0	0.2	0.2	0.0	O K
5760 min Winter	0.015	0.015	0.0	0.1	0.1	0.0	O K
7200 min Winter	0.014	0.014	0.0	0.1	0.1	0.0	O K
8640 min Winter	0.013	0.013	0.0	0.1	0.1	0.0	O K
10080 min Winter	0.012	0.012	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.351	0.0	5.9	26
60 min Winter	54.281	0.0	7.3	36
120 min Winter	32.218	0.0	8.7	66
180 min Winter	23.443	0.0	9.5	98
240 min Winter	18.608	0.0	10.0	122
360 min Winter	13.406	0.0	10.8	188
480 min Winter	10.622	0.0	11.4	256
600 min Winter	8.862	0.0	11.9	306
720 min Winter	7.639	0.0	12.3	360
960 min Winter	6.040	0.0	13.0	492
1440 min Winter	4.332	0.0	14.0	734
2160 min Winter	3.103	0.0	15.0	1080
2880 min Winter	2.446	0.0	15.8	1484
4320 min Winter	1.748	0.0	16.9	2172
5760 min Winter	1.376	0.0	17.8	2816
7200 min Winter	1.143	0.0	18.4	3752
8640 min Winter	0.981	0.0	19.0	4216
10080 min Winter	0.862	0.0	19.5	5072

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.016

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 0.005	4	8 0.005	8	12 0.006

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Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 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	1.9	1.9	0.500	0.0	4.5
0.400	1.9	4.5			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0114-5000-0350-5000
 Design Head (m) 0.350
 Design Flow (l/s) 5.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Diameter (mm) 114
 Invert Level (m) 0.000
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.350	5.0
Flush-Flo™	0.165	4.9
Kick-Flo®	0.282	4.5
Mean Flow over Head Range	-	3.9

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	4.0	1.200	8.8	3.000	13.6	7.000	20.7
0.200	4.9	1.400	9.5	3.500	14.7	7.500	21.4
0.300	4.6	1.600	10.1	4.000	15.6	8.000	22.1
0.400	5.3	1.800	10.7	4.500	16.5	8.500	22.8
0.500	5.8	2.000	11.2	5.000	17.4	9.000	23.4
0.600	6.4	2.200	11.7	5.500	18.3	9.500	24.1
0.800	7.3	2.400	12.2	6.000	19.1		
1.000	8.1	2.600	12.7	6.500	19.9		

Technical Specification

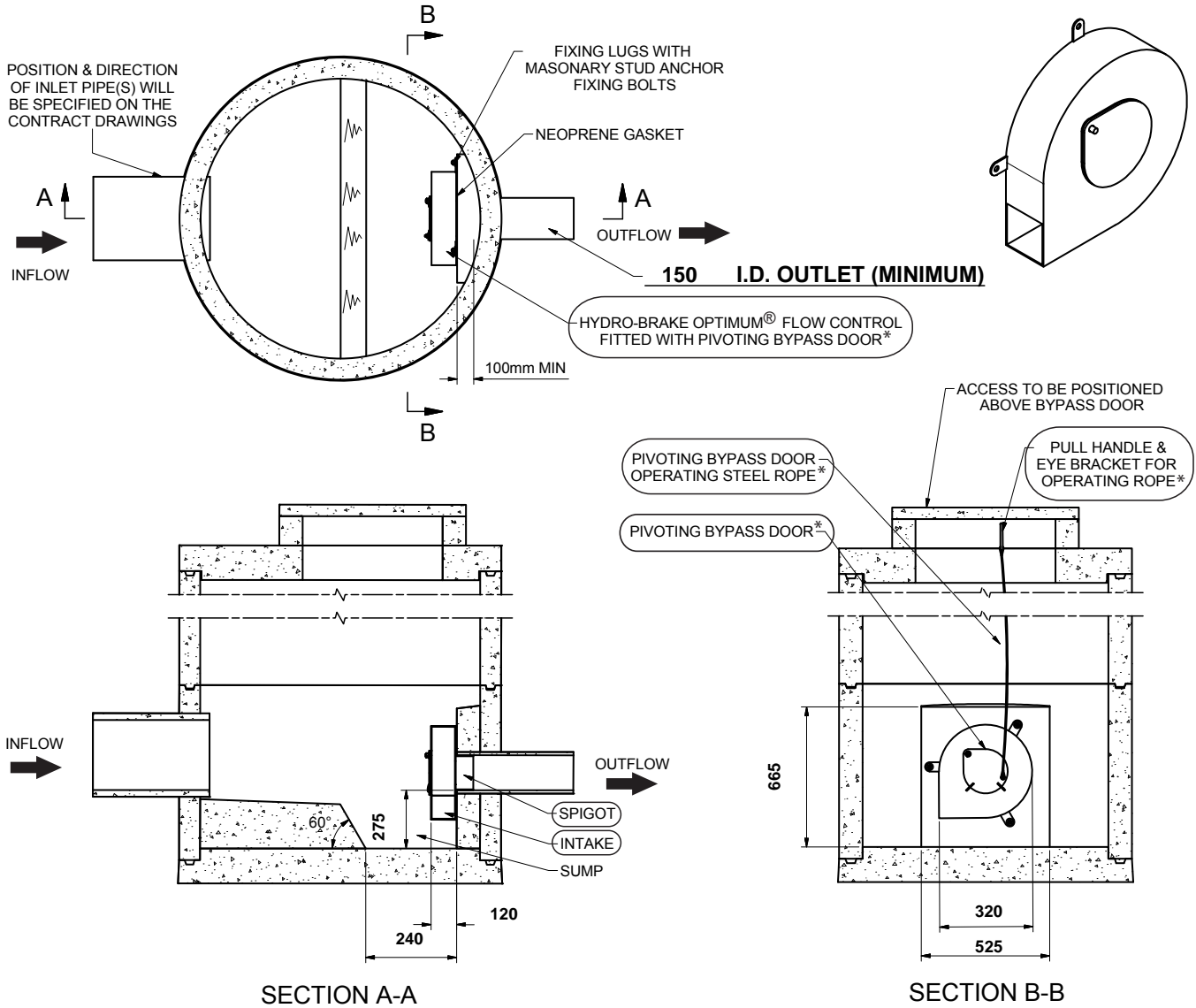
Control Point	Head (m)	Flow (l/s)
Primary Design	0.350	4.958
Flush-Flo™	0.165	4.948
Kick-Flo®	0.282	4.490
Mean Flow		3.857

Hydro-Brake Optimum® Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting bypass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Bead blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Neoprene gasket to seal outlet



PT/329/0412



IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE OPTIMUM® FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW
 CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN
 ADVICE



The head/flow characteristics of this SHE-0114-5000-0350-5000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.



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DESIGNER	swaters
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SHE-0114-5000-0350-5000
 Hydro-Brake Optimum®

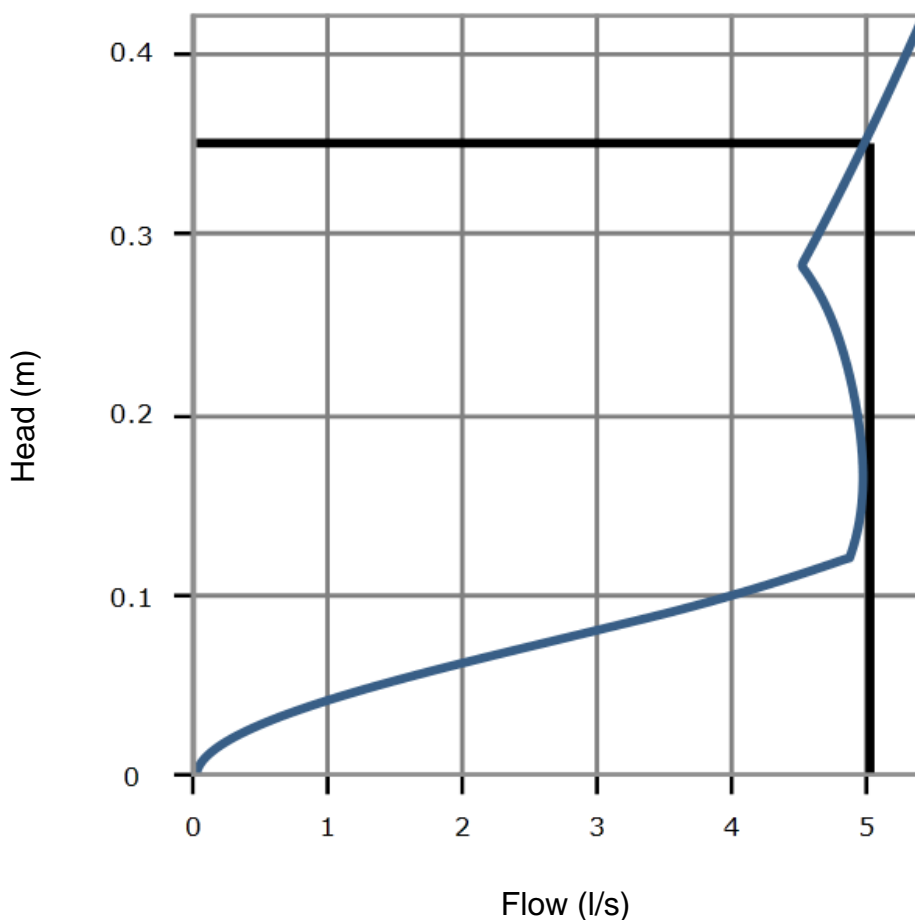
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.350	4.958
Flush-Flo™	0.165	4.948
Kick-Flo®	0.282	4.490
Mean Flow		3.857



PT/329/0412

Head (m)	Flow (l/s)
0.000	0.000
0.012	0.088
0.024	0.340
0.036	0.734
0.048	1.245
0.060	1.845
0.072	2.499
0.084	3.167
0.097	3.801
0.109	4.347
0.121	4.834
0.133	4.897
0.145	4.929
0.157	4.945
0.169	4.947
0.181	4.939
0.193	4.921
0.205	4.895
0.217	4.862
0.229	4.822
0.241	4.773
0.253	4.712
0.266	4.635
0.278	4.537
0.290	4.544
0.302	4.630
0.314	4.714
0.326	4.797
0.338	4.878
0.350	4.958



DESIGN ADVICE



The head/flow characteristics of this SHE-0114-5000-0350-5000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.



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