

Technical Note: 001a

Date: 3rd June 2020

Site: Pennine Filling Station Huddersfield

Reference: 2019/2497

Pennine Filling Station off Bradley Road Huddersfield
Surface Water Onsite Runoff

Existing Runoff from the Site

The total site area affected by this development has been estimated at approximately 960m² (0.096 ha). The site was previously occupied by a commercial development. The building has been demolished; however, the paved areas are still visible and also a formalised surface water and foul water drainage system. The existing site plan is provided at Appendix A.

The existing impermeable area within the site has been estimated at 761m².

There is combined sewer located within Bradley Road adjacent to the site entrance. The sewer is 375mm in diameter and Yorkshire Water could not provide a sewer depth. The Yorkshire Water sewer plan is provided at Appendix B of this report.

During the site visit manholes were lifted and the site appears to discharge into the combined sewer via a 150mm diameter pipe. The pipe is approximately 1.3m deep within the manhole.

There are no open or culverted watercourse close to the site.

The site is within an area with an SPR value of 38.9% suggesting that the site will not allow adequate infiltration.

Table 1: Modified Rational Method flows from existing site 0.0761 hectares

Return Period	Flow in litres per second (l/s)
1 in 1 year	9.06
1 in 30 year	31.78
1 in 100 year	46.02

The Modified Rational Method has been used to calculate the existing peak runoff from the site. The calculation sheet is provided at Appendix C of this report.

The LLFA have requested a 30% reduction in peak runoff rate. Therefore, a peak discharge rate of 6.3l/s has been adopted for this development.

Discharge to combined water sewer

It is proposed that the roofed and paved areas within the site is directed to the combined sewer located within Bradley Road via a crate tank located within the site. The discharge into the combined sewer will be restricted to 6.3l/s. The impermeable area has been calculated at 930m² (0.093 hectares). This area will be 100% roofed and paved.

An assessment of the required balance volume has been made using the estimated post development impermeable area of 0.093 hectares discharging to the combined 375mm diameter sewer at a peak rate of 6.3ls. Using WinDes Source Control software developed by

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Microdrainage the required attenuation has been calculated for the 1 in 100 year plus climate change (30%) event.

Reference should be made to Appendix E where the calculation sheets are provided. The attenuation size has been tabulated below in Table 2. It is estimated that during the 1 in 100 year plus climate change (30%) event that the maximum volume which will occur during a critical 30 minute duration is 29.9m³. Therefore, the peak volume required to be stored at any time will be less than this and can be accommodated in the storage tank which is 36m² by 0.8m deep assuming a void ratio of 95%. The drainage strategy drawing provided at Appendix D shows the drainage design for the site which includes the tank.

Table 2: WinDes 1 in 100 year+CC Storage Volume

Return Period	Required Attenuation	Approx Volume (m³) across 30 min duration
1 in 100 year + CC	36m ² of 0.8m deep crate tank	29.9

Foul Sewerage

It is proposed that the foul sewerage will be directed to the combined sewer located within Bradley Road to the south of the site.

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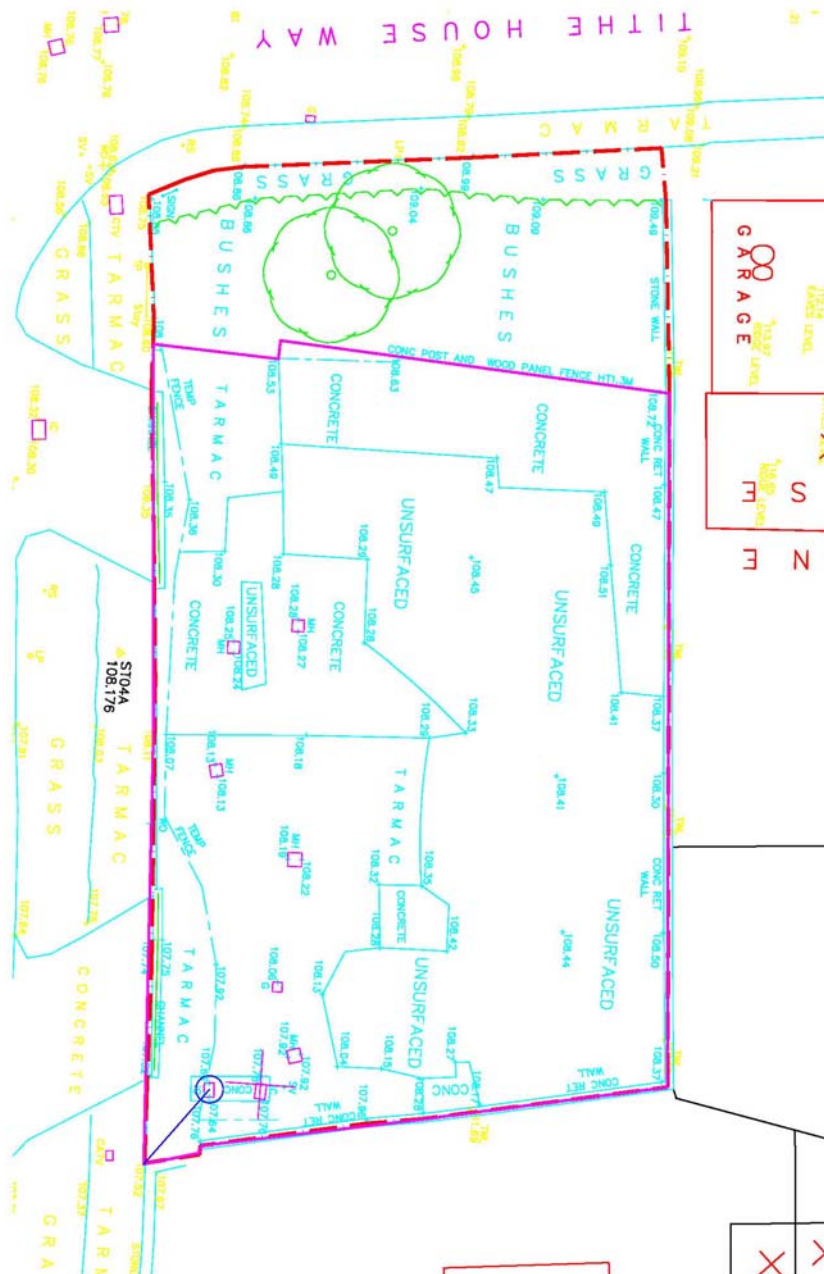
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Attachment A – Existing Site Plan



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Attachment B – Yorkshire Water Sewer Plan



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Attachment C – Modified Rational Runoff Calculation

Modified Rational Method				Return Period		Flood		1		2		30		100	
				Post Development		Rainfall		Effective		Rainfall Intensity		FLOW (l/s)		FLOW (l/s)	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	FLOW (l/s)	FLOW (l/s)	FLOW (l/s)	FLOW (l/s)
Length (m)	37	m		0.15	0.006	6.3	6.3	42.0	6.3	42.0	6.3	119.1	119.1	119.1	119.1
Area (ha)	0.076	ha		0.25	0.010	8.22	8.4	32.9	8.4	32.9	8.4	93.2	93.2	93.2	93.2
Max Height	108.7	m		0.5	0.021	10.52	10.7	21.0	10.7	21.0	10.7	59.6	59.6	59.6	59.6
Min Height	107.5	m		0.75	0.031	12.13	12.4	16.2	12.4	16.2	12.4	45.8	45.8	45.8	45.8
DeltaH	1.2	m		1	0.042	13.42	13.7	13.4	13.7	13.4	13.7	39.0	39.0	39.0	39.0
Slope (%)	3.27	%		1.25	0.052	14.51	14.8	11.6	14.8	11.6	14.8	32.9	32.9	32.9	32.9
Ta (mins)	8.68	mins		1.5	0.063	15.46	15.8	10.3	15.8	10.3	15.8	29.2	29.2	29.2	29.2
ARF	0.999			1.75	0.073	16.31	16.6	9.3	16.6	9.3	2.0	26.4	26.4	26.4	26.4
SAAR	816.000	mm		2	0.083	17.09	17.4	8.5	17.4	8.5	1.8	24.2	24.2	24.2	24.2
UCWI	80	mm		2.25	0.094	17.8	18.2	7.9	18.2	7.9	1.7	22.4	22.4	22.4	22.4
PIMP	100.0	%		2.5	0.104	18.46	18.8	7.4	18.8	7.4	1.6	20.9	20.9	20.9	20.9
SOIL	0.40	%		2.75	0.115	19.08	19.5	6.9	19.5	6.9	1.5	19.7	19.7	19.7	19.7
Percentage Runoff PR	76.44	%		3	0.125	19.67	20.1	6.6	20.1	6.6	1.4	18.6	18.6	18.6	18.6
DEEPSTOR	0.40	%		3.25	0.135	20.22	20.6	6.2	20.6	6.2	1.3	17.6	17.6	17.6	17.6
Cv	0.7644			3.5	0.146	20.74	21.1	5.9	21.1	5.9	1.3	16.8	16.8	16.8	16.8
Cz	1.3			3.75	0.156	21.24	21.7	5.7	21.7	5.7	1.2	16.1	16.1	16.1	16.1
30 year	9.06	%		4	0.167	21.72	22.1	5.4	22.1	5.4	1.2	15.4	15.4	15.4	15.4
1 year	9.06	%		4.25	0.177	22.18	22.6	5.2	22.6	5.2	1.1	14.8	14.8	14.8	14.8

Modified Rational Method				Return Period		Flood		30		100		140	
				Post Development		Rainfall		Effective		Rainfall Intensity		FLOW (l/s)	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	FLOW (l/s)	FLOW (l/s)
Length (m)	37	m		0.15	0.006	22.1	22.1	147.3	22.1	147.3	22.1	311.7	311.7
Area (ha)	0.076	ha		0.25	0.010	26.8	27.3	107.2	27.3	107.2	27.3	303.9	303.9
Max Height	108.7	m		0.5	0.021	32.34	33.0	64.7	33.0	64.7	33.0	183.4	183.4
Min Height	107.5	m		0.75	0.031	36.94	38.5	48.1	38.5	48.1	38.5	156.2	156.2
DeltaH	1.2	m		1	0.042	38.9	39.7	38.9	39.7	38.9	39.7	110.3	110.3
Slope (%)	3.27	%		1.25	0.052	41.27	42.1	33.0	42.1	33.0	42.1	93.6	93.6
Ta (mins)	8.68	mins		1.5	0.063	43.3	44.2	28.9	44.2	28.9	44.2	81.8	81.8
ARF	0.999			1.75	0.073	45.99	46.9	25.6	46.9	25.6	46.9	73.0	73.0
SAAR	816.000	mm		2	0.083	46.7	47.6	23.4	47.6	23.4	47.6	66.2	66.2
UCWI	80	mm		2.25	0.094	48.17	49.1	21.4	49.1	21.4	49.1	60.7	60.7
PIMP	100.0	%		2.5	0.104	49.51	50.5	19.8	50.5	19.8	50.5	56.1	56.1
SOIL	0.40	%		2.75	0.115	50.76	51.8	18.5	51.8	18.5	51.8	52.3	52.3
Percentage Runoff PR	76.44	%		3	0.125	51.93	53.0	17.3	53.0	17.3	53.0	49.1	49.1
DEEPSTOR	0.40	%		3.25	0.135	53.03	54.1	16.3	54.1	16.3	54.1	46.3	46.3
Cv	0.7644			3.5	0.146	54.06	55.1	15.4	55.1	15.4	55.1	43.8	43.8
Cz	1.3			3.75	0.156	55.04	56.1	14.7	56.1	14.7	56.1	41.6	41.6
30 year	31.78	%		4	0.167	55.97	57.1	14.0	57.1	14.0	57.1	39.7	39.7
1 year	31.78	%		4.25	0.177	56.86	58.0	13.4	58.0	13.4	58.0	37.9	37.9

Modified Rational Method				Return Period		Flood		100		140			
				Post Development		Rainfall		Effective		Rainfall Intensity		FLOW (l/s)	
				Rainfall Duration (hours)	Rainfall Duration (days)	Rainfall Depth (mm)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	Rainfall Intensity (mm/hr)	Effective Depth (mm)	FLOW (l/s)	FLOW (l/s)
Length (m)	37	m		0.15	0.006	37.9	38.6	151.6	38.6	151.6	38.6	429.9	429.9
Area (ha)	0.076	ha		0.25	0.010	44.94	45.8	99.9	45.8	99.9	45.8	354.9	354.9
Max Height	108.7	m		0.5	0.021	49.59	50.6	86.1	50.6	86.1	50.6	307.4	307.4
Min Height	107.5	m		0.75	0.031	53.14	54.2	73.1	54.2	73.1	54.2	250.6	250.6
DeltaH	1.2	m		1	0.042	56.06	57.2	64.8	57.2	64.8	57.2	227.1	227.1
Slope (%)	3.27	%		1.25	0.052	58.55	59.7	59.0	59.7	59.0	59.7	210.7	210.7
Ta (mins)	8.68	mins		1.5	0.063	60.74	61.9	54.7	61.9	54.7	61.9	198.4	198.4
ARF	0.999			1.75	0.073	62.7	63.9	51.4	63.9	51.4	63.9	188.9	188.9
SAAR	816.000	mm		2	0.083	64.48	65.8	48.7	65.8	48.7	65.8	181.2	181.2
UCWI	80	mm		2.25	0.094	66.11	67.4	46.4	67.4	46.4	67.4	175.0	175.0
PIMP	100.0	%		2.5	0.104	67.52	68.9	44.6	68.9	44.6	68.9	169.7	169.7
SOIL	0.40	%		2.75	0.115	69.02	70.4	43.0	70.4	43.0	70.4	165.2	165.2
Percentage Runoff PR	76.44	%		3	0.125	70.34	71.7	41.6	71.7	41.6	71.7	161.4	161.4
DEEPSTOR	0.40	%		3.25	0.135	71.58	73.0	40.5	73.0	40.5	73.0	158.0	158.0
Cv	0.7644			3.5	0.146	72.75	74.2	39.4	74.2	39.4	74.2	155.0	155.0
Cz	1.3			3.75	0.156	73.87	75.3	38.5	75.3	38.5	75.3	152.4	152.4
100 year	46.03	%		4	0.167	74.93	76.4	37.6	76.4	37.6	76.4	150.0	150.0
1 year	46.03	%		4.25	0.177	76.00	77.5	36.7	77.5	36.7	77.5	147.6	147.6

Attachment D – Drainage Drawings



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Attachment E – WinDes Calculations discharge to combined sewer

EWE Associates Ltd					Page 1		
Windy Ridge Barn							
Thealby Lane							
Winterton DN15 9TG							
Date 03/06/2020 12:31						Designed By Windows7	
File 100yr+CC30% tank ...			Checked By				
Micro Drainage			Source Control W.12.4				
<u>Summary of Results for 100 year Return Period (+30%)</u>							
Half Drain Time : 50 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	107.320	0.720	0.0	5.7	5.7	24.6	O K
30 min Summer	107.367	0.767	0.0	5.9	5.9	26.2	O K
60 min Summer	107.364	0.764	0.0	5.9	5.9	26.1	O K
120 min Summer	107.315	0.715	0.0	5.7	5.7	24.5	O K
180 min Summer	107.256	0.656	0.0	5.5	5.5	22.4	O K
240 min Summer	107.199	0.599	0.0	5.3	5.3	20.5	O K
360 min Summer	107.094	0.494	0.0	5.3	5.3	16.9	O K
480 min Summer	106.997	0.397	0.0	5.3	5.3	13.6	O K
600 min Summer	106.893	0.293	0.0	5.3	5.3	10.0	O K
720 min Summer	106.810	0.210	0.0	5.3	5.3	7.2	O K
960 min Summer	106.761	0.161	0.0	5.0	5.0	5.5	O K
1440 min Summer	106.727	0.127	0.0	4.0	4.0	4.3	O K
2160 min Summer	106.705	0.105	0.0	3.1	3.1	3.6	O K
2880 min Summer	106.693	0.093	0.0	2.5	2.5	3.2	O K
4320 min Summer	106.678	0.078	0.0	1.8	1.8	2.7	O K
5760 min Summer	106.669	0.069	0.0	1.4	1.4	2.3	O K
7200 min Summer	106.663	0.063	0.0	1.2	1.2	2.1	O K
8640 min Summer	106.658	0.058	0.0	1.0	1.0	2.0	O K
Storm Event	Rain (mm/hr)		Time-Peak (mins)				
15 min Summer	163.309		17				
30 min Summer	96.460		30				
60 min Summer	56.975		48				
120 min Summer	33.653		82				
180 min Summer	24.732		116				
240 min Summer	19.877		150				
360 min Summer	14.608		216				
480 min Summer	11.741		282				
600 min Summer	9.910		338				
720 min Summer	8.628		384				
960 min Summer	7.072		494				
1440 min Summer	5.342		736				
2160 min Summer	4.036		1100				
2880 min Summer	3.308		1468				
4320 min Summer	2.374		2184				
5760 min Summer	1.876		2880				
7200 min Summer	1.562		3640				
8640 min Summer	1.346		4408				
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EWE Associates Ltd

Windy Ridge Barn

Thealby Lane

Winterton DN15 9TG

Date 03/06/2020 12:31

File 100yr+CC30% tank ...

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Checked By

Micro Drainage

Source Control W.12.4

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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 Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	106.655	0.055	0.0	0.9	0.9	1.9	O K
15 min Winter	107.414	0.814	0.0	6.1	6.1	27.8	O K
30 min Winter	107.499	0.899	0.0	6.4	6.4	29.9	O K
60 min Winter	107.490	0.890	0.0	6.4	6.4	29.7	O K
120 min Winter	107.398	0.798	0.0	6.0	6.0	27.3	O K
180 min Winter	107.308	0.708	0.0	5.7	5.7	24.2	O K
240 min Winter	107.221	0.621	0.0	5.3	5.3	21.2	O K
360 min Winter	107.062	0.462	0.0	5.3	5.3	15.8	O K
480 min Winter	106.873	0.273	0.0	5.3	5.3	9.3	O K
600 min Winter	106.773	0.173	0.0	5.1	5.1	5.9	O K
720 min Winter	106.746	0.146	0.0	4.6	4.6	5.0	O K
960 min Winter	106.724	0.124	0.0	3.8	3.8	4.2	O K
1440 min Winter	106.702	0.102	0.0	2.9	2.9	3.5	O K
2160 min Winter	106.687	0.087	0.0	2.2	2.2	3.0	O K
2880 min Winter	106.678	0.078	0.0	1.8	1.8	2.7	O K
4320 min Winter	106.666	0.066	0.0	1.3	1.3	2.2	O K
5760 min Winter	106.658	0.058	0.0	1.0	1.0	2.0	O K
7200 min Winter	106.653	0.053	0.0	0.9	0.9	1.8	O K
8640 min Winter	106.650	0.050	0.0	0.7	0.7	1.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	1.186	5000
15 min Winter	163.309	17
30 min Winter	96.460	30
60 min Winter	56.975	50
120 min Winter	33.653	88
180 min Winter	24.732	124
240 min Winter	19.877	160
360 min Winter	14.608	232
480 min Winter	11.741	290
600 min Winter	9.910	322
720 min Winter	8.628	376
960 min Winter	7.072	492
1440 min Winter	5.342	736
2160 min Winter	4.036	1100
2880 min Winter	3.308	1468
4320 min Winter	2.374	2188
5760 min Winter	1.876	2912
7200 min Winter	1.562	3672
8640 min Winter	1.346	4360

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Windy Ridge Barn

Thealby Lane

Winterton DN15 9TG

Date 03/06/2020 12:31

File 100yr+CC30% tank ...

Designed By Windows7

Checked By

Micro Drainage

Source Control W.12.4

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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 Z Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	106.647	0.047	0.0	0.7	0.7	1.6	O K
		Storm Event		Rain (mm/hr)	Time-Peak (mins)		
		10080 min Winter		1.186	5136		

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EWE Associates Ltd		Page 4				
Windy Ridge Barn						
Thealby Lane						
Winterton DN15 9TG						
Date 03/06/2020 12:31	Designed By Windows7					
File 100yr+CC30% tank ...	Checked By					
Micro Drainage	Source Control W.12.4					
<u>Rainfall Details</u>						
Rainfall Model FEH						
Return Period (years) 100						
Site Location 417350 419950 SE 17350 19950						
C (1km) -0.026						
D1 (1km) 0.360						
D2 (1km) 0.428						
D3 (1km) 0.301						
E (1km) 0.307						
F (1km) 2.368						
Summer Storms Yes						
Winter Storms Yes						
Cy (Summer) 0.750						
Cy (Winter) 0.840						
Shortest Storm (mins) 15						
Longest Storm (mins) 10080						
Climate Change % +30						
<u>Time / Area Diagram</u>						
Total Area (ha) 0.093						
<table><thead><tr><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.093</td></tr></tbody></table>			Time (mins)	Area (ha)	0-4	0.093
Time (mins)	Area (ha)					
0-4	0.093					
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Thealby Lane

Winterton DN15 9TG

Date 03/06/2020 12:31

File 100yr+CC30% tank ...

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Micro Drainage

Source Control W.12.4

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Model Details

Storage is Online Cover Level (m) 108.000

Cellular Storage Structure

Invert Level (m) 106.600

Safety Factor 2.0

Infiltration Coefficient Base (m/hr) 0.00000

Porosity 0.95

Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m³)	Depth (m)	Area (m²)	Inf. Area (m³)
0.000	36.0	36.0	2.600	0.0	57.6
0.200	36.0	40.8	2.800	0.0	57.6
0.400	36.0	45.6	3.000	0.0	57.6
0.600	36.0	50.4	3.200	0.0	57.6
0.800	36.0	55.2	3.400	0.0	57.6
1.000	0.0	57.6	3.600	0.0	57.6
1.200	0.0	57.6	3.800	0.0	57.6
1.400	0.0	57.6	4.000	0.0	57.6
1.600	0.0	57.6	4.200	0.0	57.6
1.800	0.0	57.6	4.400	0.0	57.6
2.000	0.0	57.6	4.600	0.0	57.6
2.200	0.0	57.6	4.800	0.0	57.6
2.400	0.0	57.6	5.000	0.0	57.6

Hydro-Brake® Outflow Control

Design Head (m) 0.900

Hydro-Brake® Type Md4

Invert Level (m) 106.600

Design Flow (l/s) 6.3

Diameter (mm) 93

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.8	1.200	7.4	3.000	11.7	7.000	17.8
0.200	5.3	1.400	8.0	3.500	12.6	7.500	18.5
0.300	4.5	1.600	8.5	4.000	13.5	8.000	19.1
0.400	4.4	1.800	9.0	4.500	14.3	8.500	19.7
0.500	4.8	2.000	9.5	5.000	15.1	9.000	20.2
0.600	5.2	2.200	10.0	5.500	15.8	9.500	20.8
0.800	6.0	2.400	10.4	6.000	16.5		
1.000	6.7	2.600	10.9	6.500	17.2		

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