PROPOSED BAKERY EXTENSION

HAYWOOD & PADGETT
THE BAKERY
SHAWFIELD ROAD
BARNSLEY
S71 3HS

DRAINAGE STRATEGY REPORT

HM Design 10 The Green York YO26 5LR t:07919 031289

1. INTRODUCTION

This Drainage Strategy Report has been prepared to assess the means of drainage for a proposed development at Haywood and Padgett, The Bakery, Shawfield Road, Carlton, Barnsley.

It will show that a viable means of foul and surface water disposal is available for the development. It will provide outline drainage solutions, which should be developed at detailed design stage.

2. PRE-DEVELOPMENT SITE

The pre-development site is generally a rectangular shaped site adjacent to Shawfield Road. it is immediately north of the current Haywood and Padgett premises.

The pre-development site is an access road, buildings and impermeable areas of various materials.

The site area is approximately 9700 sq m and the location pan is shown below.



Figure 2.0 Pre-Development Plan.

3. PUBLIC SEWERAGE

An enquiry has been made to Yorkshire Water for location of public sewers within the area and the public sewer map for this area is shown below.

There is a 225mm public foul sewer within Shawfield Road. This is around 2.1m deep.

There are no surface water sewers within the vicinity.



Figure 3.0 Public Sewer Records.

4. SURFACE WATER CULVERT

It has been advised that a surface water culvert is present within Shawfield Road. This culvert currently accepts the surface water discharge from the existing Haywood and Padgett site and, presumably, from the pre-development site.

Barnsley Council have supplied a plan of the location of the culvert. No depth or size information is available.

The plan of the culvert location is shown below.

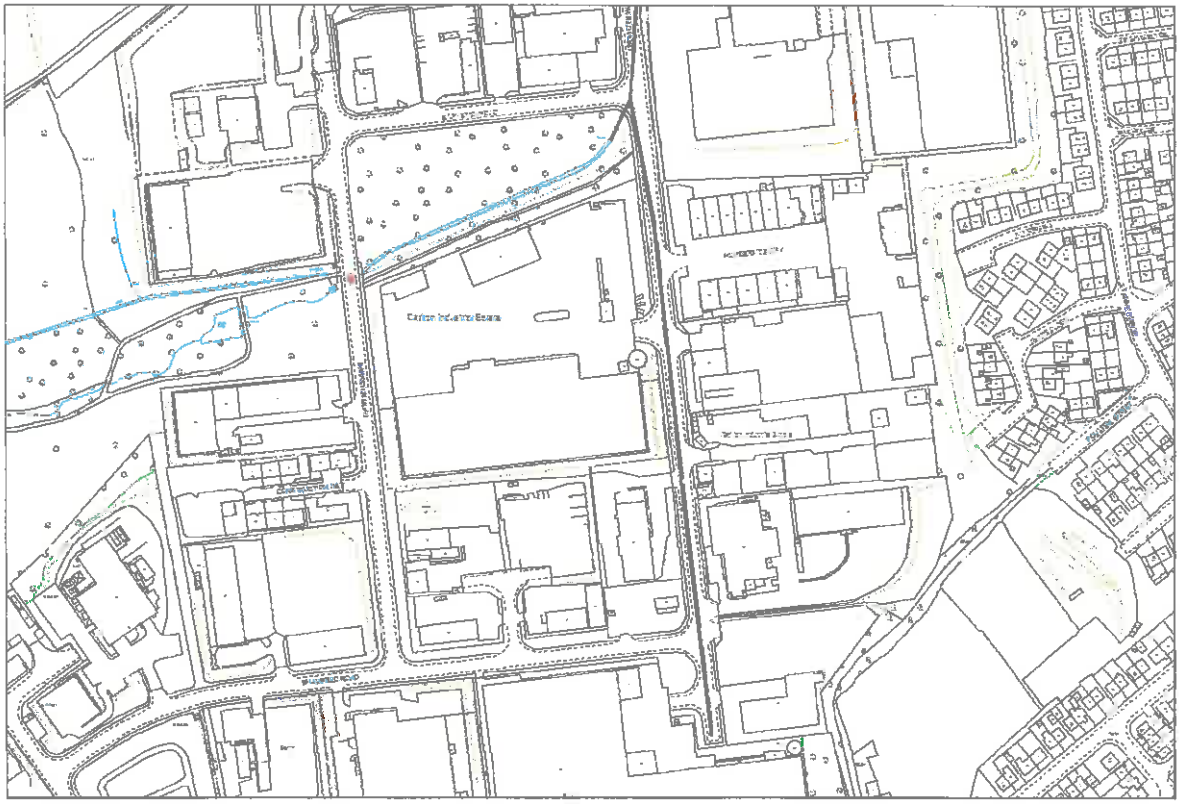


Figure 4.0 Location of Surface Water Culvert.

5. POST-DEVELOPMENT SITE

The development proposal is for an extension of the existing buildings to bakery and warehouse and a second bakery building. There will also be an access road, parking spaces and associated hard-standing. The total impermeable area of the development is approximately 8800 square metres (0.88 hectares).

An outline plan of the post-development site is shown below.

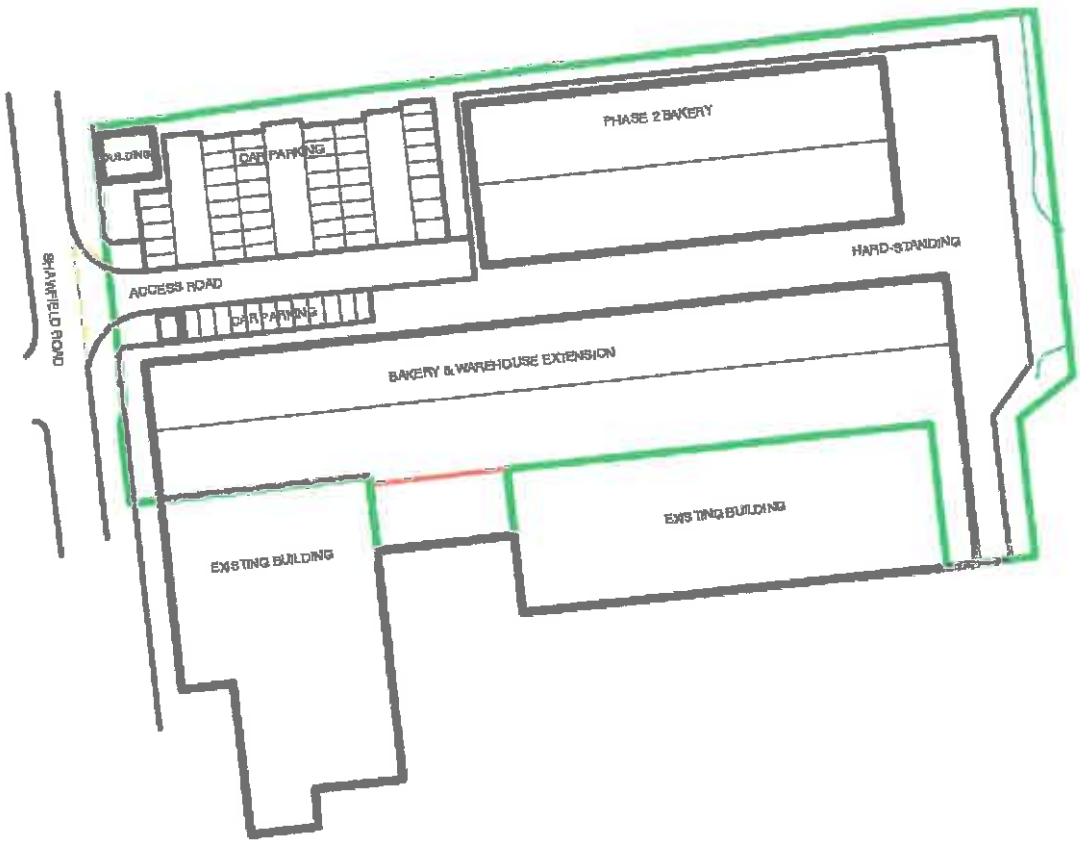


Figure 4.0 Public Sewer Records.

6. FOUL DRAINAGE DESIGN

The post-development site should be drained by a separate system of foul drainage. The outfall for the foul system should be made to the existing 225mm foul sewer in Shawfield Road. Agreement with Yorkshire Water should be obtained.

The development site falls to Shawfield Road and the public sewer is 2.1m deep. Therefore, a gravity connection should be possible.

7. SURFACE WATER

The surface water from the development site should be disposed of strictly in accordance with the hierarchy within the building regulations. That is, by infiltration, to watercourse or to sewer, in that order.

Infiltration

A stage 1 site investigation has been carried out for this site. The conclusion of the stage 1 report was that the ground conditions would be unsuitable for surface water disposal through infiltration.

Watercourse

A culverted watercourse is present in Shawfield Road. If infiltration is not possible, then this watercourse would be the outfall point for the development.

Sewer

As an outfall to a surface water culvert is available, no surface water from the development should enter the public sewerage system.

8. SUSTAINABLE DRAINAGE SYSTEMS

The development site has been assessed for the use of sustainable drainage systems (SuDS).

Infiltration: This has been ruled out through a site investigation as the ground conditions are very likely to be unsuitable.

Ponds and Wetlands: This is a relatively small development site within and urban area. As such, the construction of relatively large ponds and wetlands would be inappropriate for this location.

Infiltration Basins: Again the relatively small site within an urban area would preclude the use of this technique and the ground conditions are likely to be unsuitable for infiltration.

Detention Basins: The relatively small development site in an urban setting would make the use of a retention basin inappropriate for this development site. Land take for a detention basin, based on the attenuation requirement, on this small site would be inappropriately large.

Swales: Green SuDS on this relatively small urban site have been discounted as inappropriate. In addition, any green SuDS technique on this site would require regular maintenance for which a management company would have to be responsible. For this site, this would not be the best resolution for SuDS.

French Drains: The use of french drains may be suitable on this site. This may be in the conveyance of surface water.

Pervious Pavements: Pervious pavements on this development site would be suitable. They could be provided with a waterproof lining and an outlet to the surface water drainage system. Pervious pavements could contribute to any attenuation requirement on site as well as providing a level of pollution control.

Oversized Pipes, Tanks, Box Culverts: The use of these techniques for the attenuation system has been assessed and all may be appropriate for this development. The best technique to use should be investigated at detailed design stage.

9. SURFACE WATER DESIGN

The surface water design for this site will be carried out to the current standards for surface water drainage design, with each system being designed to not flood on site within the 1 in 30 year storm event and no flooding of any building or any water going off-site in the 1 in 100 year storm event plus an allowance for climate change.

Infiltration methods should be considered first and then, if infiltration unsuitable, a direct connection to the culverted watercourse will be required.

The infiltration methods rely on the ground conditions and so detailed design of any infiltration system should follow site testing. The attenuation of flows depend on flow rates and an estimation of required attenuation is given below in section 14.

10. SURFACE WATER DISCHARGE RATES

Pre-Development Site.

The pre-development site is an access road with road gullies; buildings with, generally, rain water down pipes and hard-standings with materials ranging from tarmac and concrete to more 'softer' materials. The site falls to Shawfield Road and it would be expected that the pre-development site drains to the culvert within Shawfield Road.

The pre-development site impermeable area amounts to approximately 7800 square metres. It is usual convention to take the peak discharge from brownfield sites at 140l/s/hectare. This rate is equivalent to the 1 in 1 year storm event.

The pre-development peak discharge rate is likely to be 140x0.78 = 109l/s.

Post-Development Site

The post-development site peak discharge should be less than the pre-development site. The generally accepted peak discharge rate should be at least 30% less than the pre-

development rate. Therefore, the post-development peak discharge rate should be less than 76l/s.

In discussion with Barnsley Council, this discharge rate has been confirmed as acceptable.

The peak rate of 76l/s should be for all storm return periods and durations through to the 1 in 100 year plus climate change condition.

11. CLIMATE CHANGE

The calculations of surface water drainage systems and attenuation should include an allowance for climate change. It is recommended that this allowance is an addition of 30%.

12. URBAN CREEP

It is usual practice to add 10% for any development to include for urban creep. However, in this case, the development takes almost the whole site and as such, no allowance for urban creep has been allowed for. It is recommended that this is also not included in the detailed design of the surface water drainage system.

13. MAINTENANCE

The surface water scheme on this development will be maintained for the lifetime of the development.

The development is a commercial site with one owner, so it would be incumbent on that owner to carry out the necessary maintenance on the surface water system.

14. CONSENTS

The surface water discharge of flows to the existing watercourse he must gain the written agreement of the Land Drainage Authority to discharge flows at an agreed rate – Contact Derek Bell (01226 787654)

Any works that need to be carried out within or in the proximity of any watercourse the developer must gain the relevant permissions from the Lead Local Flood Authority – Contact Derek Bell (01226 787654)

15. SURFACE WATER ATTENUATION SCHEME

To attenuate flows to the peak discharge rate of 76l/s, a hydro-brake would be used within the proposed drainage system. Upstream of the hydro-brake a storage system will be

required. This storage system will be capable of attenuating all the volume necessary to prevent flooding in the 1 in 100 year storm plus climate change.

To determine the surface water storage requirement, the micro-drainage program has been used, with the following parameters:-
Post-Development Impermeable Area = 8800 square metres
Peak Discharge Rate = 76l/s
Storm Details 1 in 100 year return period, all durations.
Climate Change +30%
Urban Creep = Nil.
M5-60 = 19mm
R= 0.37

The micro-drainage calculations show that to limit the peak discharge of 76l/s, the post-development surface water system should include a storage volume of approximately 220 cu m. This volume could be oversize pipes, culverts or cellular storage.

For this preliminary design, cellular storage has been used. A system 30m long x 10m wide x 0.8m deep would be satisfactory. This could be located under the car park area and a plan of this is shown below.

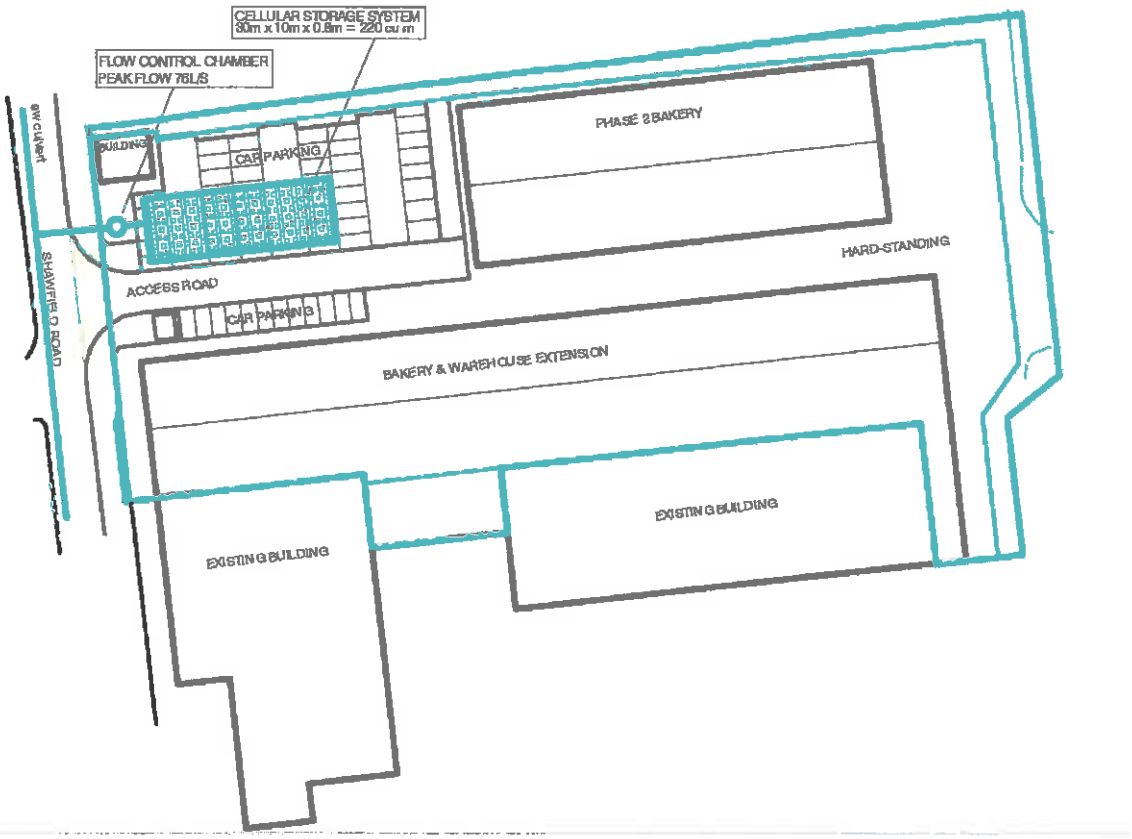
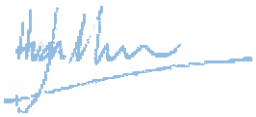


Figure 15.0 Surface Water Storage.

16. CONCLUSIONS

- This development site can be drained successfully.
- Foul water and surface water will have separate systems on site.
- Foul water flows will be connected to the combined public sewer in Shawfield Road.
- Surface water from the development will be discharged to the surface water culvert within Shawfield Road.
- The surface water will be attenuated to a maximum of 76l/s for all storm events, with surface water storage provided on site.
- Approvals from the Land Drainage Authority and Lead Local Flood Authority need to be gained prior to any work on or near the surface water culvert. This includes written consent to discharge to the watercourse and the discharge rate.

Report by



Hugh Morris BSc CEng MICE
19/09/2016

APPENDIX

- Micro-drainage surface water attenuation storage calculations.

HM Design		Page 1
10 The Green York YO26 5LR	HAYWOOD AND BADGETT SHEFFIELD ROAD BARNSLEY	Micro Drainage
Date 20-09-2016 File STORAGE ESTIMATE.srcx	Designed by HM Checked by	
Micro Drainage	Source Control 2016.1	

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

Half Drain Time : 27 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	58.185	0.535	0.0	76.0	76.0	153.4	O K
30 min Summer	58.241	0.641	0.0	75.9	75.9	182.7	O K
60 min Summer	58.286	0.686	0.0	75.9	75.9	195.5	O K
120 min Summer	58.231	0.631	0.0	76.0	76.0	180.0	O K
180 min Summer	58.143	0.543	0.0	76.0	76.0	154.7	O K
240 min Summer	58.062	0.462	0.0	75.9	75.9	131.5	O K
360 min Summer	57.951	0.351	0.0	78.8	78.8	100.1	O K
480 min Summer	57.902	0.302	0.0	66.8	66.8	86.2	O K
600 min Summer	57.873	0.273	0.0	58.1	58.1	77.8	O K
720 min Summer	57.852	0.252	0.0	51.5	51.5	71.8	O K
960 min Summer	57.822	0.222	0.0	42.4	42.4	63.2	O K
1440 min Summer	57.787	0.187	0.0	31.7	31.7	53.2	O K
2160 min Summer	57.757	0.157	0.0	23.8	23.8	44.7	O K
2880 min Summer	57.739	0.139	0.0	18.7	18.7	39.5	O K
4320 min Summer	57.717	0.117	0.0	13.6	13.6	33.2	O K
5760 min Summer	57.703	0.103	0.0	10.8	10.8	29.4	O K
7200 min Summer	57.694	0.094	0.0	9.0	9.0	26.7	O K
8640 min Summer	57.687	0.087	0.0	7.8	7.8	24.7	O K
10080 min Summer	57.681	0.081	0.0	6.9	6.9	23.1	O K
15 min Winter	58.218	0.618	0.0	75.9	75.9	174.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	116.116	0.0	194.8	18
30 min Summer	78.624	0.0	258.6	28
60 min Summer	49.987	0.0	329.2	48
120 min Summer	30.659	0.0	404.2	78
180 min Summer	22.729	0.0	449.5	108
240 min Summer	18.263	0.0	481.6	138
360 min Summer	13.347	0.0	528.1	194
480 min Summer	10.659	0.0	563.9	252
600 min Summer	8.990	0.0	592.8	312
720 min Summer	7.801	0.0	617.8	372
960 min Summer	6.230	0.0	657.9	492
1440 min Summer	4.631	0.0	716.6	736
2160 min Summer	3.289	0.0	781.1	1100
2880 min Summer	2.617	0.0	828.7	1468
4320 min Summer	1.893	0.0	898.9	2196
5760 min Summer	1.503	0.0	952.2	2912
7200 min Summer	1.256	0.0	994.5	3672
8640 min Summer	1.084	0.0	1028.9	4400
10080 min Summer	0.957	0.0	1060.4	5196
15 min Winter	116.116	0.0	217.4	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 Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	58.329	0.729	0.0	75.9	75.9	107.6	O K
60 min Winter	58.364	0.764	0.0	75.9	75.9	117.7	O K
120 min Winter	58.252	0.652	0.0	75.9	75.9	185.3	O K
180 min Winter	58.210	0.610	0.0	76.0	76.0	145.3	O K
240 min Winter	57.997	0.397	0.0	75.0	75.0	112.3	O K
360 min Winter	57.897	0.297	0.0	65.0	65.0	84.8	O K
480 min Winter	57.858	0.258	0.0	58.5	58.5	73.5	O K
600 min Winter	57.832	0.232	0.0	45.5	45.5	66.2	O K
720 min Winter	57.814	0.214	0.0	39.5	39.5	60.9	O K
960 min Winter	57.788	0.188	0.0	32.0	32.0	52.4	O K
1440 min Winter	57.757	0.157	0.0	23.8	23.8	44.7	O K
2160 min Winter	57.732	0.132	0.0	17.0	17.0	37.5	O K
2880 min Winter	57.717	0.117	0.0	13.6	13.6	33.2	O K
4320 min Winter	57.695	0.095	0.0	9.9	9.9	27.9	O K
5760 min Winter	57.687	0.087	0.0	7.9	7.9	24.5	O K
7200 min Winter	57.679	0.079	0.0	6.5	6.5	22.5	O K
8640 min Winter	57.673	0.073	0.0	5.6	5.6	20.8	O K
10080 min Winter	57.669	0.069	0.0	5.0	5.0	19.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	78.624	0.0	289.7	28
60 min Winter	49.937	0.0	368.7	46
120 min Winter	30.854	0.0	452.8	82
180 min Winter	22.728	0.0	508.8	114
240 min Winter	18.080	0.0	539.5	142
360 min Winter	13.347	0.0	591.5	196
480 min Winter	10.689	0.0	631.6	256
600 min Winter	8.990	0.0	664.0	314
720 min Winter	7.801	0.0	691.4	376
960 min Winter	6.230	0.0	736.0	494
1440 min Winter	4.581	0.0	808.1	738
2160 min Winter	3.285	0.0	874.9	1100
2880 min Winter	2.627	0.0	928.1	1472
4320 min Winter	1.893	0.0	1006.9	2176
5760 min Winter	1.503	0.0	1058.8	2928
7200 min Winter	1.256	0.0	1113.8	3684
8640 min Winter	1.084	0.0	1158.5	4400
10080 min Winter	0.957	0.0	1187.8	5064

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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)	19.000	Shortest Storm (mins)	15
Ratio R	0.371	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.890

Time (mins) From:	To:	Area (ha)
0	4	0.890

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Model Details

Storage is Online Cover Level (m) 59.600

Cellular Storage Structure

Invert Level (m) 57.600 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	300.0	0.501	0.0	368.8
0.500	300.0	335.4			

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0352-7600-0900-7600
Design Head (m)	0.900
Design Flow (l/s)	76.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	352
Invert Level (m)	57.600
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	76.0
Flush-Flo™	0.498	76.0
Kick-Flo®	0.761	72.1
Mean Flow over Head Range	-	37.5

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	12.2	1.200	87.3	3.000	136.4	7.000	206.6
0.200	38.8	1.400	94.1	3.500	147.1	7.500	213.7
0.300	65.7	1.600	100.4	4.000	157.0	8.000	220.5
0.400	78.1	1.800	106.4	4.500	166.3	8.500	227.0
0.500	76.9	2.000	112.0	5.000	175.1	9.000	233.3
0.600	75.0	2.200	117.2	5.500	183.5	9.500	237.9
0.800	71.5	2.400	122.4	6.000	191.5		
1.000	80.0	2.600	127.2	6.500	199.2		

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