Tullys

25 April 2023

Engineering Note

12153

St Clare Business Park – Hampton Hill

1 Introduction

1.1 This engineering note has been prepared in response to comments received from the LLFA regarding the proposed drainage strategy at the St Clare Business Park in Hampton Hill.

2 Proposed Runoff Rates

2.1 In response to the LLFA requesting surface water runoff rates to be restricted to a maximum of 2.0 l/s, we have been in discussions with pump suppliers who have advised that they do not recommend pumping surface water at a rate lower than 2.7 l/s for a situation such as this due to concerns over the potential long running times. The minimum discharge rate they have recommended is 2.7 l/s and to protect the pump set, a hydro-brake has been added upstream of the pump chamber. We have re-run the MicroDrainage calculations based upon a discharge rate of 2.7 l/s, which has resulted in a required increase in surface water attenuation of 74m³. To accommodate this, both of the below ground attenuation tanks will be increased in width by 0.5m. To summarise:

- Attenuation required at 5 l/s = 634m³
- Attenuation required at 2.7 l/s = 707m³
- Attenuation provided by increasing tank width by 0.5m = 713m³

2.2 Refer to Appendix A for an updated Drainage Strategy drawing and MicroDrainage calculations.

3 Existing Runoff Rates

3.1 Regarding the existing surface water flow rates, the majority of the site currently discharges to soakaway. However, approximately 240m² of surface water currently discharges unrestricted to the adopted surface water sewer in Windmill Road.

3.2 The existing unrestricted surface water runoff rates have been calculated using the Modified Rational Method with rainfall intensity from Microdrainage Windes for a storm of 30 minutes' duration:

- Q = 2.78 x Cv x CR x A x i

Where:

- Q = Flow (l/s)
- CR = Routing coefficient = 1.3
- Cv = Coefficient of runoff = 0.9
- A = Area drained (hectares) = 0.024
- i = Rainfall intensity (mm/hr) (determined from Microdrainage Windes)

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3.3 Based upon the above:

- 1-year Return Period = 1.75 l/s) where i = 22.4 mm/hr)
- 30-year Return Period = 4.3 l/s where i = 55.5 mm/hr)
- 100-year Return Period = 5.76 l/s where i = 73.8 mm/hr)

3.4 It is recognised that with a restricted flow rate of 2.7 l/s there may be a nominal increase in flows during the low intensity rainfall events. However, for the more onerous storms there will be a betterment which should reduce the risk of sewer flooding downstream of the site.

3.5 A Pre-Development Enquiry application was not previously made to Thames Water; though, Thames were a consultee of the planning application and as far as we are aware they have made no objections to the drainage proposals based upon the 5.0 l/s surface water discharge rate.

4 Groundwater Flooding

4.1 With regard to the risk of groundwater flooding, the detailed ground investigation report advised that the anticipated depth to the groundwater table is in the order of 2m to 3m below ground level, coincidental with the occurrence of the granular Taplow gravel formation. The report goes on to say *...'Shallow groundwater on the site is anticipated to flow westward towards the unconfined soils of the abounding railway cutting or more regionally southwards towards the Longford River (<100m south), a tributary to the river Thames located 1.5km south of the subject site. Shallow and localised perched water is anticipated to be present in the underlying made ground. The presence of low permeability clay at relatively shallow depths beneath the site, while restricting downwards migration, may increase the potential for lateral migration of shallow groundwater.'*

4.2 Intrusive investigations established that below a depth of made ground (1.5m to 3.5m thick) the natural geology is gravels (1.5-3.5m bgl.), over London Clay. Groundwater levels recorded across the site varied between 1.3m and 3.5m below the existing ground level, which combined with the variable ground suggests that there is perched groundwater on the site.

4.3 Ground levels of the adjacent railway cutting (to the west) are significantly lower and as a result it is anticipated that the cutting is likely to have a significant impact on the natural groundwater levels within the site.

4.4 The basement is to be constructed in open cut with reinforced concrete walls and slabs, where piled foundations are to be provided to support the building. The basement is approximately 50mx47m which is cut into the slope, retaining in the order of 3.0m to the east and 1.5m to the west (adjacent to the railway). To mitigate the risk of groundwater flooding to the new building, the basement will be constructed using water resistant measures (such waterproof concrete) to form a watertight structure which will prevent groundwater entering the basement.

4.5 Network Rail have advised that there is a history of flooding within the railway cutting. Drainage investigations has established that the majority of site (7800m²) currently discharges surface water via soakaways, which is likely to be contributing to the flooding of the railway cutting. Due to the potential contamination issues associated with the made ground and concerns of flooding within the adjacent railway cutting, the surface water from the new development will discharge to surface water sewers rather than soakaways.

4.6 It is recognised that the basement construction may be located below the groundwater table and potentially forming an obstruction for groundwater flowing to the railway cutting. However the western boundary covers a length of 113m whereas the basement is 53m in length and is located centrally on the western boundary. Consequently the obstruction is only localised within the site.

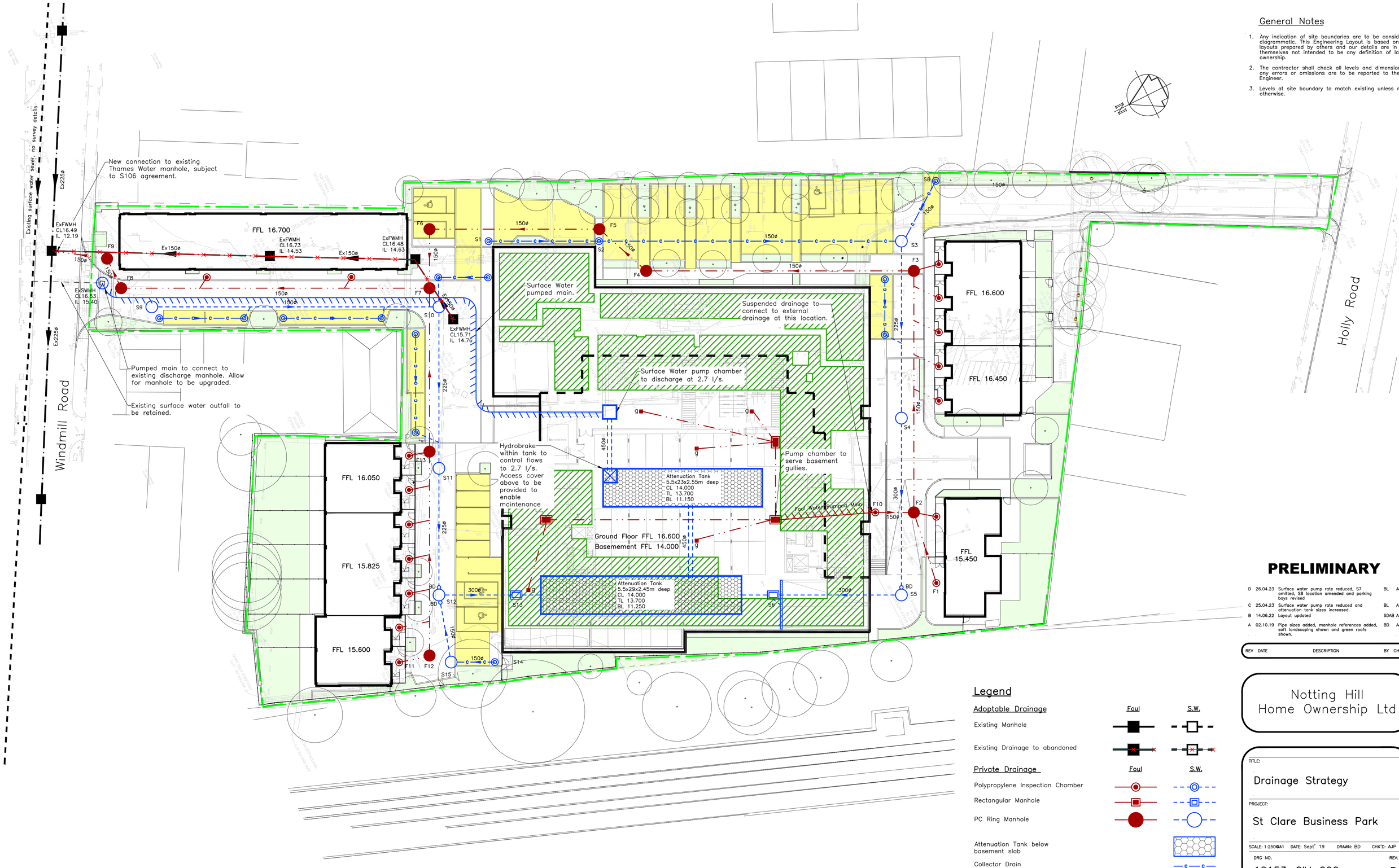
4.7 With the removal of approximately 7800m² of impermeable surfacing discharging to the onsite soakaways, it is anticipated that the risk of groundwater flooding within the site and in the railway cutting should reduce as a result of the new development.

Tullys

Appendix A - Drainage Strategy and MicroDrainage Calculations

General Notes

1. Any indication of site boundaries are to be considered diagrammatic. This Engineering Layout is based on layouts prepared by others and our details are in themselves not intended to be any definition of land ownership.
2. The contractor shall check all levels and dimensions, any errors or omissions are to be reported to the Engineer.
3. Levels at site boundary to match existing unless noted otherwise.



Drainage Notes

1. Infiltration of surface water is not considered appropriate for this site due to thickness of made ground and depth of groundwater levels.
2. Surface water will discharge to the adjacent adopted surface water sewer. Due to site levels relative to the sewer it will be necessary to provide a pumped surface water system. Discharge will be restricted to 5 l/s.
3. Surface water attenuation will provided onsite to accommodate a 1 in 100 +40% CC event. This will be provided in below ground attenuation tanks located below Block 1.

Legend

Adoptable Drainage	Foul	S.W.
Existing Manhole		
Existing Drainage to abandoned		

Private Drainage	Foul	S.W.
Polypropylene Inspection Chamber		
Rectangular Manhole		
PC Ring Manhole		
Attenuation Tank below basement slab		
Collector Drain		

Other	
Site Boundary	
Permeable Paving	
Soft Landscaping	
Green Roof	

PRELIMINARY

REV	DATE	DESCRIPTION	BY	CHK'D
D	26.04.23	Surface water pump rate reduced, S7 omitted, S8 location amended and parking bays revised	BL	AJP
C	25.04.23	Surface water pump rate reduced and attenuation tank sizes increased.	BL	AJP
B	14.06.22	Layout updated	SDAB	AJP
A	02.10.19	Pipe sizes added, manhole references added, soft landscaping shown and green roofs shown.	BD	AJP

Notting Hill Home Ownership Ltd

TITLE: Drainage Strategy

PROJECT: St Clare Business Park

SCALE: 1:250@A1 DATE: Sept' 19 DRAWN: BD CHK'D: AJP

DRG NO. 12153–CIV–200 REV. D

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	12.065	0.915	1.8	261.8	O K
30 min Summer	12.332	1.182	2.0	338.1	O K
60 min Summer	12.603	1.453	2.2	415.6	O K
120 min Summer	12.965	1.815	2.4	519.1	O K
180 min Summer	13.175	2.025	2.5	579.1	O K
240 min Summer	13.312	2.162	2.6	618.3	O K
360 min Summer	13.470	2.320	2.6	663.6	O K
480 min Summer	13.552	2.402	2.7	687.1	O K
600 min Summer	13.595	2.445	2.7	699.3	O K
720 min Summer	13.614	2.464	2.7	704.8	O K
960 min Summer	13.611	2.461	2.7	703.8	O K
1440 min Summer	13.532	2.382	2.7	681.2	O K
2160 min Summer	13.363	2.213	2.6	633.0	O K
2880 min Summer	13.221	2.071	2.5	592.3	O K
4320 min Summer	13.019	1.869	2.4	534.6	O K
5760 min Summer	12.894	1.744	2.3	498.7	O K
7200 min Summer	12.805	1.655	2.3	473.4	O K
8640 min Summer	12.737	1.587	2.2	453.9	O K
10080 min Summer	12.681	1.531	2.2	437.8	O K
15 min Winter	12.065	0.915	1.8	261.8	O K
30 min Winter	12.332	1.182	2.0	338.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	157.295	0.0	139.4	23
30 min Summer	101.874	0.0	155.7	38
60 min Summer	62.992	0.0	307.4	68
120 min Summer	39.741	0.0	344.7	128
180 min Summer	29.845	0.0	364.6	186
240 min Summer	24.124	0.0	377.1	246
360 min Summer	17.585	0.0	390.9	366
480 min Summer	13.911	0.0	397.8	486
600 min Summer	11.537	0.0	401.2	604
720 min Summer	9.871	0.0	402.5	724
960 min Summer	7.674	0.0	401.5	964
1440 min Summer	5.344	0.0	392.9	1442
2160 min Summer	3.711	0.0	717.1	1928
2880 min Summer	2.871	0.0	710.3	2280
4320 min Summer	2.019	0.0	680.0	3064
5760 min Summer	1.585	0.0	1022.2	3872
7200 min Summer	1.325	0.0	1067.2	4688
8640 min Summer	1.151	0.0	1113.0	5536
10080 min Summer	1.027	0.0	1074.9	6352
15 min Winter	157.295	0.0	139.4	23
30 min Winter	101.874	0.0	155.7	37

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	12.603	1.453	2.2	415.7	O K
120 min Winter	12.966	1.816	2.4	519.3	O K
180 min Winter	13.176	2.026	2.5	579.5	O K
240 min Winter	13.314	2.164	2.6	618.9	O K
360 min Winter	13.473	2.323	2.6	664.5	O K
480 min Winter	13.557	2.407	2.7	688.3	O K
600 min Winter	13.600	2.450	2.7	700.8	O K
720 min Winter	13.621	2.471	2.7	706.7	O K
960 min Winter	13.621	2.471	2.7	706.6	O K
1440 min Winter	13.551	2.401	2.7	686.6	O K
2160 min Winter	13.395	2.245	2.6	642.0	O K
2880 min Winter	13.243	2.093	2.5	598.6	O K
4320 min Winter	13.020	1.870	2.4	534.8	O K
5760 min Winter	12.864	1.714	2.3	490.2	O K
7200 min Winter	12.744	1.594	2.3	455.9	O K
8640 min Winter	12.643	1.493	2.2	427.0	O K
10080 min Winter	12.557	1.407	2.1	402.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	62.992	0.0	307.4	66
120 min Winter	39.741	0.0	344.6	126
180 min Winter	29.845	0.0	364.5	184
240 min Winter	24.124	0.0	376.9	244
360 min Winter	17.585	0.0	390.7	360
480 min Winter	13.911	0.0	397.5	478
600 min Winter	11.537	0.0	400.8	596
720 min Winter	9.871	0.0	402.0	712
960 min Winter	7.674	0.0	400.8	942
1440 min Winter	5.344	0.0	391.5	1396
2160 min Winter	3.711	0.0	715.0	2036
2880 min Winter	2.871	0.0	706.5	2332
4320 min Winter	2.019	0.0	676.6	3240
5760 min Winter	1.585	0.0	1021.9	4152
7200 min Winter	1.325	0.0	1067.4	5048
8640 min Winter	1.151	0.0	1113.2	5960
10080 min Winter	1.027	0.0	1077.0	6768

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.900
FEH Rainfall Version	2013	Cv (Winter)	0.900
Site Location	GB 514183 170874	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.746

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.373	4	8	0.373

Model Details

Storage is Online Cover Level (m) 14.000

Tank or Pond Structure

Invert Level (m) 11.150

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	286.0	1.400	286.0	2.800	286.0	4.200	286.0
0.200	286.0	1.600	286.0	3.000	286.0	4.400	286.0
0.400	286.0	1.800	286.0	3.200	286.0	4.600	286.0
0.600	286.0	2.000	286.0	3.400	286.0	4.800	286.0
0.800	286.0	2.200	286.0	3.600	286.0	5.000	286.0
1.000	286.0	2.400	286.0	3.800	286.0		
1.200	286.0	2.600	286.0	4.000	286.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0062-2700-2650-2700
Design Head (m)	2.650
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	10.950
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.650	2.7
Flush-Flo™	0.274	1.6
Kick-Flo®	0.557	1.3
Mean Flow over Head Range	-	2.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.2
0.200	1.6	1.400	2.0	3.500	3.1	7.500	4.4
0.300	1.6	1.600	2.1	4.000	3.3	8.000	4.5
0.400	1.6	1.800	2.3	4.500	3.4	8.500	4.6
0.500	1.5	2.000	2.4	5.000	3.6	9.000	4.8
0.600	1.4	2.200	2.5	5.500	3.8	9.500	4.9
0.800	1.6	2.400	2.6	6.000	3.9		
1.000	1.7	2.600	2.7	6.500	4.1		