

CB3 Consult Ltd		Page 2
7 St James Crescent	30YRS SURFACE WATER	
Swansea	CALCULATIONS	
Wales SA1 6DP	C1941	
Date 04/01/2023	Designed by AJ	
File Storm calcs2.MDX	Checked by DH	
XP Solutions	Network 2020.1.3	
Simulation Criteria for Storm Volumetric Runoff Coeff 0.750 Manhole Headloss Coeff (Global) 0.500 Inlet Coefficient 0.800 Areal Reduction Factor 1.000 Foul Sewage per hectare (l/s) 0.000 Flow per Person per Day (l/per/day) 0.000 Hot Start (mins) 0 Additional Flow - % of Total Flow 0.000 Run Time (mins) 60 Hot Start Level (mm) 0 MADD Factor * 10m³/ha Storage 2.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR M5-60 (mm) 18.400 Cv (Summer) 0.750 Return Period (years) 2 Ratio R 0.354 Cv (Winter) 0.840 Region England and Wales Profile Type Summer Storm Duration (mins) 30		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 2, DS/PN: 1.001, Volume (m³): 1.3

Unit Reference	MD-SHE-0053-1000-0550-1000	Sump Available	Yes
Design Head (m)	0.550	Diameter (mm)	53
Design Flow (l/s)	1.0	Invert Level (m)	133.883
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	1.0	Kick-Flo®	0.358	0.8
Flush-Flo™	0.166	1.0	Mean Flow over Head Range	-	0.9

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.600	1.0	1.600	1.6	2.600	2.0	5.000	2.7	7.500	3.3
0.200	1.0	0.800	1.2	1.800	1.7	3.000	2.2	5.500	2.8	8.000	3.4
0.300	0.9	1.000	1.3	2.000	1.8	3.500	2.3	6.000	3.0	8.500	3.5
0.400	0.9	1.200	1.4	2.200	1.9	4.000	2.5	6.500	3.1	9.000	3.6
0.500	1.0	1.400	1.5	2.400	1.9	4.500	2.6	7.000	3.2	9.500	3.7

Hydro-Brake® Optimum Manhole: S18, DS/PN: 1.016, Volume (m³): 6.4

Unit Reference	MD-SHE-0064-3100-3200-3100	Sump Available	Yes
Design Head (m)	3.200	Diameter (mm)	64
Design Flow (l/s)	3.1	Invert Level (m)	128.200
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.200	3.1	Kick-Flo®	0.571	1.4
Flush-Flo™	0.280	1.7	Mean Flow over Head Range	-	2.2

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	0.600	1.4	1.600	2.3	2.600	2.8	5.000	3.8	7.500	4.6
0.200	1.7	0.800	1.6	1.800	2.4	3.000	3.0	5.500	4.0	8.000	4.8
0.300	1.7	1.000	1.8	2.000	2.5	3.500	3.2	6.000	4.2	8.500	4.9
0.400	1.7	1.200	2.0	2.200	2.6	4.000	3.4	6.500	4.3	9.000	5.0
0.500	1.6	1.400	2.1	2.400	2.7	4.500	3.6	7.000	4.5	9.500	5.2

Storage Structures for Storm

Cellular Storage Manhole: 2, DS/PN: 1.001

Invert Level (m) 133.933 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	40.0	40.0	0.500	40.0	52.6	0.501	0.0	52.7

Cellular Storage Manhole: S18, DS/PN: 1.016

Invert Level (m) 128.200 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	87.0	87.0	2.500	87.0	180.3	2.501	0.0	180.3

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.357 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 30
Climate Change (%) 10

WARNING: Half Drain Time has not been calculated as the structure is too full.

US/MH		Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow		Half Drain Time
PN	Name								(m)	(m)	(m³)	Cap.	(l/s)	(mins)
1.000	1	60 Winter	30	+10%					134.105	-0.020	0.000	0.00		
1.001	2	60 Winter	30	+10%					134.105	-0.003	0.000	0.01		
1.002	S4	15 Winter	30	+10%					133.137	-0.163	0.000	0.43		
1.003	S5	15 Winter	30	+10%					133.064	-0.156	0.000	0.40		
1.004	S6	15 Winter	30	+10%					133.017	-0.093	0.000	0.79		
1.005	S7	15 Winter	30	+10%					132.949	-0.061	0.000	0.95		
1.006	S8	15 Winter	30	+10%	30/15 Summer				132.764	0.059	0.000	1.05		
1.007	S9	15 Winter	30	+10%	30/15 Summer				132.668	0.053	0.000	1.13		
1.008	S10	15 Winter	30	+10%	30/15 Winter				132.583	0.008	0.000	1.06		
1.009	S11	15 Winter	30	+10%					132.313	-0.142	0.000	0.54		
1.010	S12	15 Winter	30	+10%					131.815	-0.135	0.000	0.58		
1.011	S13	15 Winter	30	+10%					131.416	-0.084	0.000	0.86		
1.012	S14	15 Winter	30	+10%					131.183	-0.067	0.000	0.95		
1.013	S15	15 Winter	30	+10%					130.886	-0.164	0.000	0.41		
2.000	S19	600 Winter	30	+10%	30/15 Summer				130.640	1.660	0.000	0.00		
2.001	S20	600 Winter	30	+10%	30/15 Summer				130.640	1.760	0.000	0.01		
1.014	S16	600 Winter	30	+10%	30/15 Summer				130.640	1.940	0.000	0.19		
1.015	S17	600 Winter	30	+10%	30/15 Summer				130.638	1.998	0.000	0.19		
1.016	S18	600 Winter	30	+10%	30/15 Summer				130.637	2.062	0.000	0.01		

US/MH		Pipe Flow	Status	Level Exceeded
PN	Name	(l/s)		
1.000	1	0.0	OK	
1.001	2	1.0	OK	
1.002	S4	28.7	OK	
1.003	S5	28.0	OK	
1.004	S6	54.4	OK	
1.005	S7	70.3	OK	
1.006	S8	70.4	SURCHARGED	
1.007	S9	69.3	SURCHARGED	
1.008	S10	73.2	SURCHARGED	
1.009	S11	84.1	OK	
1.010	S12	88.7	OK	
1.011	S13	107.2	OK	
1.012	S14	106.4	OK	
1.013	S15	109.7	OK	
2.000	S19	0.3	SURCHARGED	
2.001	S20	1.0	SURCHARGED	
1.014	S16	19.3	SURCHARGED	
1.015	S17	19.0	SURCHARGED	
1.016	S18	2.7	SURCHARGED	