



BELL MUNRO CONSULTING LTD.

J8426
Wuerdle Street,
Rochdale
Hydraulic Calculations
Condition Discharge
June 2025

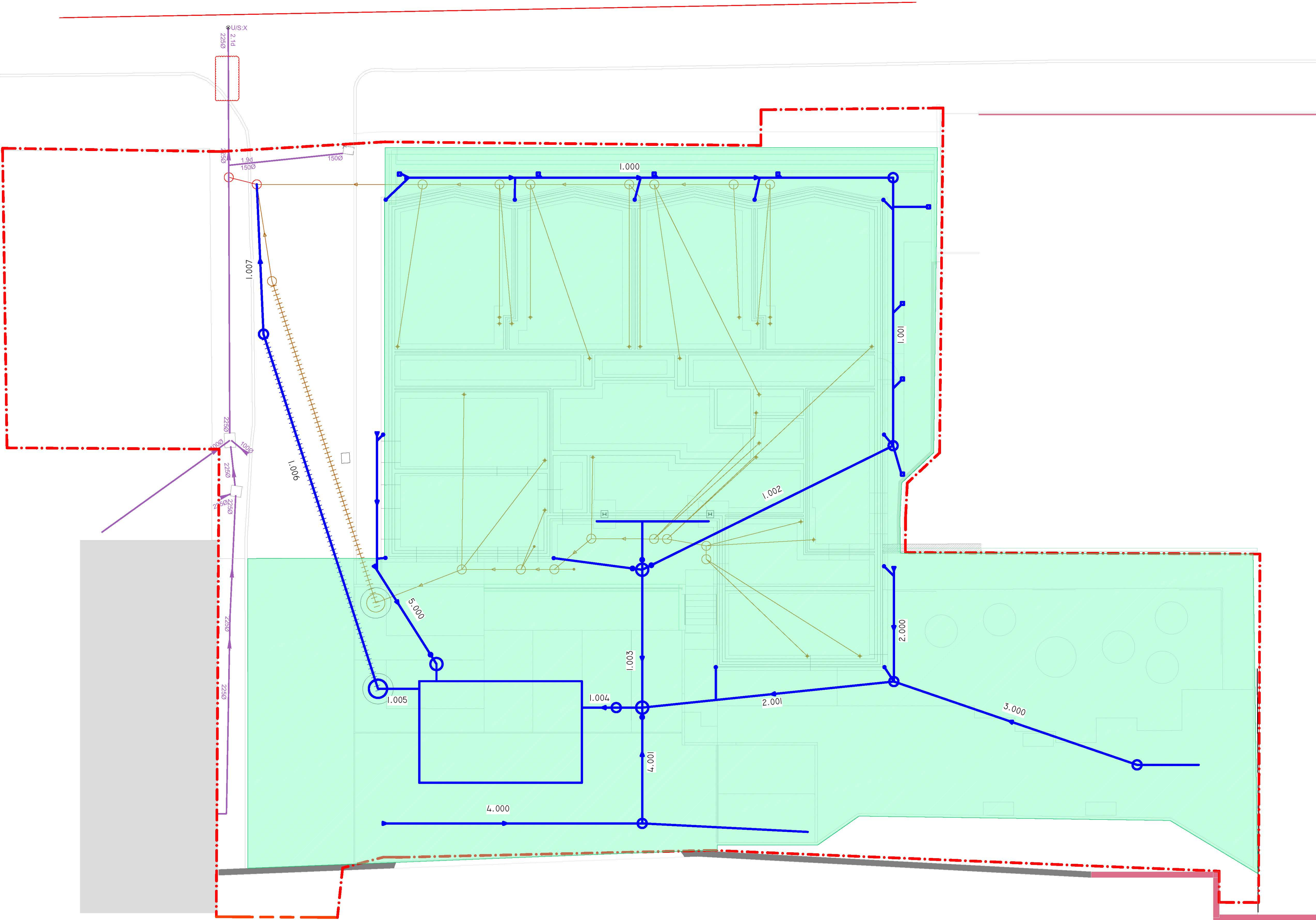
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DRAINAGE

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DRAINAGE REFERENCE DRAWING SHOWING PIPE LOCATIONS AND DRAINED AREAS
1:100 @ A1
1:200 @ A3

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CLIENT:
POSSABILITIES

PROJECT:
WUERDLE STREET, ROCHDALE

TITLE:
DRAINAGE REFERENCE DRAWING

DRAWN BY: WR	CHECKED BY: SJB	SCALE: 1:100	DATE: 06/25
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	45
Ratio R	0.278	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.911	0.297	80.4	0.028	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.195	0.273	48.3	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	13.780	0.172	80.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	6.780	0.085	80.0	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	5.548	0.096	57.8	0.004	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	12.658	0.158	80.0	0.026	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.36	153.900	0.028	0.0	0.0	1.7	1.12	19.8	5.5
1.001	50.00	4.51	153.603	0.036	0.0	0.0	2.2	1.45	25.6	7.1
1.002	50.00	4.71	153.215	0.036	0.0	0.0	2.2	1.12	19.9	7.1
1.003	50.00	4.79	152.500	0.055	0.0	0.0	3.3	1.46	58.2	10.7
2.000	50.00	4.07	152.418	0.004	0.0	0.0	0.3	1.33	23.4	0.9
3.000	50.00	4.14	152.198	0.026	0.0	0.0	1.6	1.46	58.2	5.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	154.350	0.450	Open Manhole	450	1.000	153.900	150				
2	154.350	0.747	Open Manhole	450	1.001	153.603	150	1.000	153.603	150	
3	154.350	1.135	Open Manhole	450	1.002	153.215	150	1.001	153.330	150	115
4	154.500	2.000	Open Manhole	600	1.003	152.500	225	1.002	153.043	150	468
5	152.718	0.300	Open Manhole	150	2.000	152.418	150				
6	152.648	0.450	Open Manhole	600	3.000	152.198	225				
6	153.310	1.270	Open Manhole	600	2.001	152.040	225	2.000	152.322	150	207
								3.000	152.040	225	
7	153.985	0.450	Open Manhole	450	4.000	153.535	225				
8	153.351	0.615	Open Manhole	600	4.001	152.736	225	4.000	152.736	225	
5	153.798	2.398	Open Manhole	450	1.004	151.400	300	1.003	152.415	225	940
								2.001	151.884	225	409
								4.001	152.649	225	1174
4	154.755	0.450	Open Manhole	100	5.000	154.305	100				
13	154.269	2.913	Open Manhole	600	1.005	151.356	300	1.004	151.356	300	
								5.000	153.709	100	2153
6	154.197	3.500	Open Manhole	1000	1.006	150.697	225	1.005	151.333	300	711
7	155.000	1.400	Open Manhole	450	1.007	153.600	225	1.006	153.620	225	20
	155.200	1.782	Open Manhole	450		OUTFALL		1.007	153.418	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	2803.272	-137.647	2803.272	-137.647	Required	
2	2827.183	-137.622	2827.183	-137.622	Required	
3	2827.160	-150.817	2827.160	-150.817	Required	
4	2814.813	-156.934	2814.813	-156.934	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
5	2827.221	-156.879	2827.221	-156.879	Required	
6	2839.174	-166.530	2839.174	-166.530	Required	
6	2827.199	-162.427	2827.199	-162.427	Required	
7	2802.265	-169.390	2802.265	-169.390	Required	
8	2814.816	-169.413	2814.816	-169.413	Required	
5	2814.811	-163.714	2814.811	-163.714	Required	
4	2801.531	-156.691	2801.531	-156.691	Required	
13	2804.673	-161.594	2804.673	-161.594	Required	
6	2801.845	-162.814	2801.845	-162.814	Required	
7	2796.181	-145.294	2796.181	-145.294	Required	
2795.848	-137.968				No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	o	150	1	154.350	153.900	0.300	Open Manhole		450
1.001	o	150	2	154.350	153.603	0.597	Open Manhole		450
1.002	o	150	3	154.350	153.215	0.985	Open Manhole		450
1.003	o	225	4	154.500	152.500	1.775	Open Manhole		600
2.000	o	150	5	152.718	152.418	0.150	Open Manhole		150
3.000	o	225	6	152.648	152.198	0.225	Open Manhole		600
2.001	o	225	6	153.310	152.040	1.045	Open Manhole		600
4.000	o	225	7	153.985	153.535	0.225	Open Manhole		450
4.001	o	225	8	153.351	152.736	0.390	Open Manhole		600
1.004	o	300	5	153.798	151.400	2.098	Open Manhole		450
5.000	o	100	4	154.755	154.305	0.350	Open Manhole		100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	23.911	80.4	2	154.350	153.603	0.597	Open Manhole		450
1.001	13.195	48.3	3	154.350	153.330	0.870	Open Manhole		450
1.002	13.780	80.0	4	154.500	153.043	1.307	Open Manhole		600
1.003	6.780	80.0	5	153.798	152.415	1.158	Open Manhole		450
2.000	5.548	57.8	6	153.310	152.322	0.838	Open Manhole		600
3.000	12.658	80.0	6	153.310	152.040	1.045	Open Manhole		600
2.001	12.455	80.0	5	153.798	151.884	1.689	Open Manhole		450
4.000	12.552	15.7	8	153.351	152.736	0.390	Open Manhole		600
4.001	5.699	65.5	5	153.798	152.649	0.924	Open Manhole		450
1.004	10.357	235.4	13	154.269	151.356	2.613	Open Manhole		600
5.000	5.823	9.8	13	154.269	153.709	0.460	Open Manhole		600

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.005	o	300	13	154.269	151.356	2.613	Open Manhole	600
1.006	o	225	6	154.197	150.697	3.275	Open Manhole	1000
1.007	o	225	7	155.000	153.600	1.175	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.005	3.080	133.9	6	154.197	151.333	2.564	Open Manhole	1000
1.006	18.412	-6.3	7	155.000	153.620	1.155	Open Manhole	450
1.007	7.334	40.3		155.200	153.418	1.557	Open Manhole	450

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.007		155.200	153.418	0.000	450	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.900	Storm Duration (mins)	30
Ratio R	0.303		

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Online Controls for Storm

Pump Manhole: 6, DS/PN: 1.006, Volume (m³): 2.9

Invert Level (m) 151.333

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.500	5.0000	2.000	5.0000
0.150	5.0000	1.000	5.0000	2.500	5.0000

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Storage Structures for Storm

Cellular Storage Manhole: 5, DS/PN: 1.004

Invert Level (m) 151.400 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	40.0	40.0	1.300	0.0	71.2
1.200	40.0	71.2			

Simulation Criteria

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

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

									Water
	US/MH		Return Climate	First (X)	First (Y)	First (Z)	Overflow	Level	
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	1	15 Winter	100	+45%					154.006
2.001	2	15 Winter	100	+45%					153.711
3.002	3	15 Winter	100	+45%	100/15 Summer				153.403
4.003	4	15 Winter	100	+45%					152.646
5.000	5	120 Winter	100	+45%					152.478
6.000	6	120 Winter	100	+45%	100/120 Winter				152.479
7.001	6	120 Winter	100	+45%	100/60 Summer				152.477
8.000	7	15 Winter	100	+45%					153.594
9.001	8	15 Winter	100	+45%					152.839
10.004	5	120 Winter	100	+45%	100/15 Summer				152.476
11.000	4	15 Winter	100	+45%					154.330
12.005	13	120 Winter	100	+45%	100/15 Summer				152.581
13.006	6	120 Winter	100	+45%	100/15 Summer				152.615
14.007	7	15 Winter	100	+45%					153.642

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

PN	US/MH Name	Surcharged		Flooded		Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow	Overflow					
1.000	1	-0.044	0.000	0.84				15.9	OK	
1.001	2	-0.041	0.000	0.87				20.4	OK	
1.002	3	0.038	0.000	1.11				20.3	SURCHARGED	
1.003	4	-0.079	0.000	0.75				30.6	OK	
2.000	5	-0.090	0.000	0.05				0.9	FLOOD RISK	
3.000	6	0.056	0.000	0.11				5.4	FLOOD RISK	
2.001	6	0.212	0.000	0.13				6.3	SURCHARGED	
4.000	7	-0.166	0.000	0.16				17.9	OK	
4.001	8	-0.122	0.000	0.43				17.9	OK	
1.004	5	0.776	0.000	0.21			92	11.7	SURCHARGED	
5.000	4	-0.075	0.000	0.14				2.5	OK	
1.005	13	0.925	0.000	0.19				10.4	SURCHARGED	
1.006	6	1.693	0.000	0.50				5.0	SURCHARGED	
1.007	7	-0.180	0.000	0.08				5.0	OK	