SURFACE WATER DRIANAGE CALCULATIONS

UPON

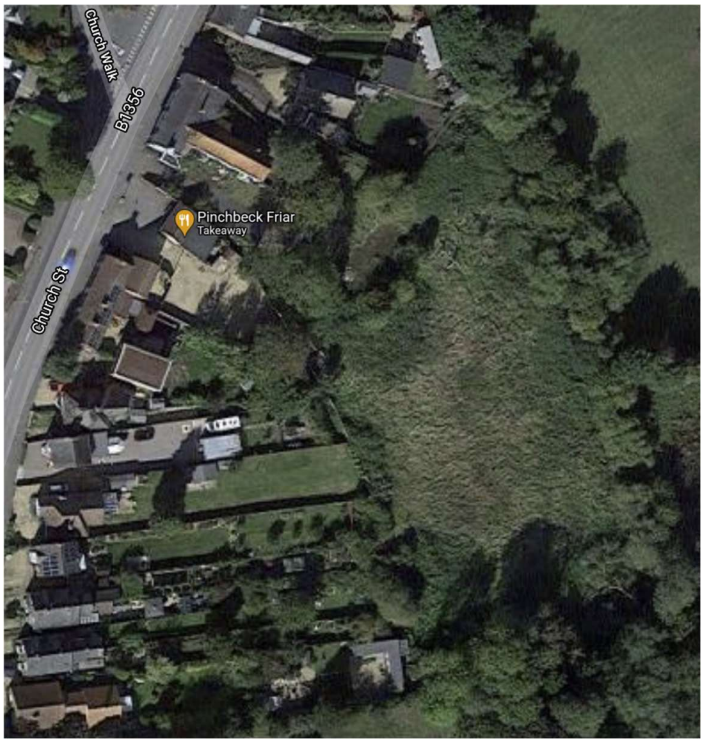
FORMER BELL INN

CHURCH STREET, PINCHBECK,

SPALDING, LINCOLNSHIRE

PROJECT No: SW 21-199

DOCUMENT REF: SW 21-199-CAL-01



CHARLOTTE PROPERTIES LTD.

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SUMMARY

The following set of calculations cover the design of the surface water drainage system for the proposed 9 plot residential development on the site of a former pub standing off Church Lane, Pinchbeck.

The system follows the principles of the SUDs hierarchy.

Infiltration has been considered, however onsite testing highlighted infiltration to be an unsuitable technique for surface water disposal due to the clay strata encountered and unmeasurable soakaway testing.

The site is bound on the East and South by an existing riparian watercourse, which discharges into Welland and Deepings IDB system downstream. Therefore, it is proposed to discharge surface water from the site into the watercourse on the Eastern boundary at a restricted rate.

Source control features are to be used to improve water quality discharging to the existing watercourse. Permeable paving will be utilised to collect runoff from the driveways and parking areas, prior to discharge into the proposed Anglian Water sewer beneath the road.

As the site is small, approximately 0.54ha, the QBar rate will be an unachievable flow for the proposed restriction off site. Therefore, as the system is to be adopted by Anglian Water the proposed discharge rate is to be 5 litres per second, which is a known acceptable practical minimum by the authority.

Attenuation is to be provided in the form of tanks under the shared parking areas and the stone media. The proposals are shown on our drawing, 21-199-100.

Contained in the following document are hydraulic modelling calculations. The calculations have been undertaken using both FSR and FEH rainfall data for the site, both outputs are included.

A 10% allowance has been made for Urban Creep for all the simulations modelled.

The outputs demonstrate that there is no surface water flooding for any of the storm events including the 1:100 year plus 40% allowance for climate change.

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FSR RAINFALL DATA HYDRAULIC MODEL OUTPUT

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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PARKING	0.083	5.00	3.250	1200	524232.776	325676.822	1.080
SW01	0.043	5.00	3.285	1200	524231.033	325683.836	1.235
SW02	0.057	5.00	3.000	1200	524213.816	325722.624	1.120
H01	0.003	5.00	3.750	1200	524160.516	325745.009	1.525
H02			3.350	1200	524178.853	325734.945	1.250
SW05	0.042	5.00	3.060	1200	524194.281	325732.832	1.055
SW03	0.021	5.00	2.955	1200	524207.311	325729.077	1.110
TANK 1		5.00	3.200	1200	524204.160	325738.041	1.340
SW04	0.024	5.00	2.925	1200	524215.227	325732.733	1.115
HW01			2.750	1200	524236.741	325742.294	1.100

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PARKING	SW01	7.227	0.600	2.170	2.125	0.045	160.6	225	5.12	50.0
1.001	SW01	SW02	42.437	0.600	2.050	1.880	0.170	249.6	300	5.83	50.0
1.002	SW02	SW03	9.163	0.600	1.880	1.845	0.035	261.8	300	5.99	50.0
2.000	H01	H02	20.917	0.600	2.225	2.100	0.125	167.3	225	5.35	50.0
2.001	H02	SW05	15.572	0.600	2.100	2.005	0.095	163.9	225	5.60	50.0
2.002	SW05	SW03	13.560	0.600	2.005	1.920	0.085	159.5	225	5.82	50.0
1.003	SW03	SW04	8.719	0.600	1.845	1.810	0.035	249.1	300	6.14	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.029	40.9	11.2	0.855	0.935	0.083	0.0	80	0.881
1.001	0.990	70.0	17.1	0.935	0.820	0.126	0.0	100	0.821
1.002	0.967	68.3	24.7	0.820	0.810	0.182	0.0	125	0.891
2.000	1.008	40.1	0.4	1.300	1.025	0.003	0.0	16	0.326
2.001	1.018	40.5	0.4	1.025	0.830	0.003	0.0	16	0.329
2.002	1.032	41.0	6.1	0.830	0.810	0.045	0.0	58	0.745
1.003	0.991	70.1	33.6	0.810	0.815	0.248	0.0	146	0.981

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	TANK 1	SW04	12.274	0.600	1.860	1.810	0.050	245.5	300	5.20	50.0
1.004	SW04	HW01	23.543	0.600	1.810	1.650	0.160	147.1	150	6.61	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	0.999	70.6	0.0	1.040	0.815	0.000	0.0	0	0.000
1.004	0.826	14.6	36.8	0.965	0.950	0.272	0.0	150	0.842

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	7.227	160.6	225	Circular	3.250	2.170	0.855	3.285	2.125	0.935
1.001	42.437	249.6	300	Circular	3.285	2.050	0.935	3.000	1.880	0.820
1.002	9.163	261.8	300	Circular	3.000	1.880	0.820	2.955	1.845	0.810
2.000	20.917	167.3	225	Circular	3.750	2.225	1.300	3.350	2.100	1.025
2.001	15.572	163.9	225	Circular	3.350	2.100	1.025	3.060	2.005	0.830
2.002	13.560	159.5	225	Circular	3.060	2.005	0.830	2.955	1.920	0.810
1.003	8.719	249.1	300	Circular	2.955	1.845	0.810	2.925	1.810	0.815
3.000	12.274	245.5	300	Circular	3.200	1.860	1.040	2.925	1.810	0.815
1.004	23.543	147.1	150	Circular	2.925	1.810	0.965	2.750	1.650	0.950

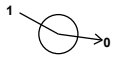
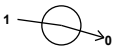
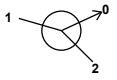
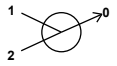
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PARKING	1200	Manhole	Adoptable	SW01	1200	Manhole	Adoptable
1.001	SW01	1200	Manhole	Adoptable	SW02	1200	Manhole	Adoptable
1.002	SW02	1200	Manhole	Adoptable	SW03	1200	Manhole	Adoptable
2.000	H01	1200	Manhole	Adoptable	H02	1200	Manhole	Adoptable
2.001	H02	1200	Manhole	Adoptable	SW05	1200	Manhole	Adoptable
2.002	SW05	1200	Manhole	Adoptable	SW03	1200	Manhole	Adoptable
1.003	SW03	1200	Manhole	Adoptable	SW04	1200	Manhole	Adoptable
3.000	TANK 1	1200	Manhole	Adoptable	SW04	1200	Manhole	Adoptable
1.004	SW04	1200	Manhole	Adoptable	HW01	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
PARKING	524232.776	325676.822	3.250	1.080	1200		0	1.000	2.170	225
SW01	524231.033	325683.836	3.285	1.235	1200		1 0	1.000 1.001	2.125 2.050	225 300
SW02	524213.816	325722.624	3.000	1.120	1200		1 0	1.001 1.002	1.880 1.880	300 300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
H01	524160.516	325745.009	3.750	1.525	1200				
						0	2.000	2.225	225
H02	524178.853	325734.945	3.350	1.250	1200		1	2.000	2.100	225
						0	2.001	2.100	225
SW05	524194.281	325732.832	3.060	1.055	1200		1	2.001	2.005	225
						0	2.002	2.005	225
SW03	524207.311	325729.077	2.955	1.110	1200		1	2.002	1.920	225
							2	1.002	1.845	300
						0	1.003	1.845	300
TANK 1	524204.160	325738.041	3.200	1.340	1200				
						0	3.000	1.860	300
SW04	524215.227	325732.733	2.925	1.115	1200		1	3.000	1.810	300
							2	1.003	1.810	300
						0	1.004	1.810	150
HW01	524236.741	325742.294	2.750	1.100	1200		1	1.004	1.650	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
30	0	10	0
100	0	10	0
100	40	10	0

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Node SW04 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.810	Product Number	CTL-SHE-0104-5000-1115-5000
Design Depth (m)	1.115	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node PARKING Online Orifice Control

Flap Valve	x	Design Depth (m)	1.080	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	3.0		
Invert Level (m)	2.170	Diameter (m)	0.037		

Node TANK 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.860
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	152

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	146.3	0.0	1.000	146.3	0.0	1.001	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.540
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	176

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	125.0	0.0	0.300	125.0	0.0	0.301	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.540
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	176

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	114.0	0.0	0.300	114.0	0.0	0.301	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.840
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	239.0	0.0	0.300	239.0	0.0	0.301	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

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Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m^3)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year +10% A 15 minute summer	141.566	40.058
2 year +10% A 15 minute winter	99.345	40.058
2 year +10% A 30 minute summer	91.753	25.963
2 year +10% A 30 minute winter	64.388	25.963
2 year +10% A 60 minute summer	61.301	16.200
2 year +10% A 60 minute winter	40.727	16.200
2 year +10% A 120 minute summer	37.449	9.897
2 year +10% A 120 minute winter	24.880	9.897
2 year +10% A 180 minute summer	28.672	7.378
2 year +10% A 180 minute winter	18.637	7.378
2 year +10% A 240 minute summer	22.636	5.982
2 year +10% A 240 minute winter	15.039	5.982
2 year +10% A 360 minute summer	17.235	4.435
2 year +10% A 360 minute winter	11.203	4.435
2 year +10% A 480 minute summer	13.550	3.581
2 year +10% A 480 minute winter	9.003	3.581
2 year +10% A 600 minute summer	11.088	3.033
2 year +10% A 600 minute winter	7.576	3.033
2 year +10% A 720 minute summer	9.878	2.647
2 year +10% A 720 minute winter	6.639	2.647
2 year +10% A 960 minute summer	8.113	2.136
2 year +10% A 960 minute winter	5.374	2.136
2 year +10% A 1440 minute summer	5.891	1.579
2 year +10% A 1440 minute winter	3.959	1.579
30 year +10% A 15 minute summer	268.706	76.035
30 year +10% A 15 minute winter	188.566	76.035
30 year +10% A 30 minute summer	174.929	49.499
30 year +10% A 30 minute winter	122.757	49.499
30 year +10% A 60 minute summer	116.589	30.811
30 year +10% A 60 minute winter	77.459	30.811
30 year +10% A 120 minute summer	70.438	18.615
30 year +10% A 120 minute winter	46.797	18.615
30 year +10% A 180 minute summer	53.298	13.715

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +10% A 180 minute winter	34.645	13.715
30 year +10% A 240 minute summer	41.604	10.995
30 year +10% A 240 minute winter	27.641	10.995
30 year +10% A 360 minute summer	31.221	8.034
30 year +10% A 360 minute winter	20.295	8.034
30 year +10% A 480 minute summer	24.324	6.428
30 year +10% A 480 minute winter	16.160	6.428
30 year +10% A 600 minute summer	19.756	5.404
30 year +10% A 600 minute winter	13.498	5.404
30 year +10% A 720 minute summer	17.490	4.687
30 year +10% A 720 minute winter	11.754	4.687
30 year +10% A 960 minute summer	14.215	3.743
30 year +10% A 960 minute winter	9.416	3.743
30 year +10% A 1440 minute summer	10.161	2.723
30 year +10% A 1440 minute winter	6.829	2.723
100 year +10% A 15 minute summer	348.738	98.681
100 year +10% A 15 minute winter	244.728	98.681
100 year +10% A 30 minute summer	228.965	64.789
100 year +10% A 30 minute winter	160.677	64.789
100 year +10% A 60 minute summer	153.288	40.510
100 year +10% A 60 minute winter	101.841	40.510
100 year +10% A 120 minute summer	92.562	24.461
100 year +10% A 120 minute winter	61.496	24.461
100 year +10% A 180 minute summer	69.806	17.964
100 year +10% A 180 minute winter	45.376	17.964
100 year +10% A 240 minute summer	54.269	14.342
100 year +10% A 240 minute winter	36.055	14.342
100 year +10% A 360 minute summer	40.484	10.418
100 year +10% A 360 minute winter	26.315	10.418
100 year +10% A 480 minute summer	31.414	8.302
100 year +10% A 480 minute winter	20.871	8.302
100 year +10% A 600 minute summer	25.431	6.956
100 year +10% A 600 minute winter	17.376	6.956
100 year +10% A 720 minute summer	22.452	6.017
100 year +10% A 720 minute winter	15.089	6.017
100 year +10% A 960 minute summer	18.166	4.784
100 year +10% A 960 minute winter	12.033	4.784
100 year +10% A 1440 minute summer	12.896	3.456
100 year +10% A 1440 minute winter	8.667	3.456
100 year +40% CC +10% A 15 minute summer	488.233	138.153
100 year +40% CC +10% A 15 minute winter	342.620	138.153
100 year +40% CC +10% A 30 minute summer	320.551	90.705
100 year +40% CC +10% A 30 minute winter	224.948	90.705
100 year +40% CC +10% A 60 minute summer	214.603	56.713
100 year +40% CC +10% A 60 minute winter	142.577	56.713
100 year +40% CC +10% A 120 minute summer	129.587	34.246
100 year +40% CC +10% A 120 minute winter	86.094	34.246
100 year +40% CC +10% A 180 minute summer	97.729	25.149
100 year +40% CC +10% A 180 minute winter	63.526	25.149
100 year +40% CC +10% A 240 minute summer	75.977	20.078
100 year +40% CC +10% A 240 minute winter	50.477	20.078
100 year +40% CC +10% A 360 minute summer	56.677	14.585

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC +10% A 360 minute winter	36.841	14.585
100 year +40% CC +10% A 480 minute summer	43.979	11.622
100 year +40% CC +10% A 480 minute winter	29.219	11.622
100 year +40% CC +10% A 600 minute summer	35.604	9.738
100 year +40% CC +10% A 600 minute winter	24.327	9.738
100 year +40% CC +10% A 720 minute summer	31.433	8.424
100 year +40% CC +10% A 720 minute winter	21.125	8.424
100 year +40% CC +10% A 960 minute summer	25.432	6.697
100 year +40% CC +10% A 960 minute winter	16.847	6.697
100 year +40% CC +10% A 1440 minute summer	18.055	4.839
100 year +40% CC +10% A 1440 minute winter	12.134	4.839

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Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 98.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PARKING	50	2.585	0.415	8.4	7.0551	0.0000	SURCHARGED
15 minute winter	SW01	11	2.150	0.100	10.4	0.1135	0.0000	OK
15 minute winter	SW02	10	2.141	0.261	21.4	0.2956	0.0000	OK
15 minute summer	H01	10	2.245	0.020	0.6	0.0223	0.0000	OK
15 minute winter	H02	11	2.146	0.046	1.9	0.0519	0.0000	OK
15 minute summer	SW05	11	2.137	0.132	7.9	0.1494	0.0000	OK
15 minute winter	SW03	10	2.135	0.290	41.3	0.3278	0.0000	OK
120 minute winter	TANK 1	94	1.986	0.126	9.0	17.7149	0.0000	OK
15 minute winter	SW04	10	2.123	0.313	48.0	0.3543	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	PARKING	Orifice	SW01	1.8				
15 minute winter	SW01	1.001	SW02	10.7	0.430	0.152	1.7815	
15 minute winter	SW02	1.002	SW03	27.1	0.462	0.397	0.6178	
15 minute summer	H01	2.000	H02	0.6	0.404	0.015	0.0673	
15 minute winter	H02	2.001	SW05	1.5	0.142	0.037	0.2251	
15 minute summer	SW05	2.002	SW03	9.7	0.545	0.236	0.4224	
15 minute winter	SW03	1.003	SW04	44.3	0.681	0.632	0.6109	
120 minute winter	TANK 1	3.000	SW04	-9.0	-0.416	-0.127	0.4373	
15 minute winter	SW04	Hydro-Brake®	HW01	5.0				24.0

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Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 98.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PARKING	60	2.654	0.484	16.0	17.3030	0.0000	SURCHARGED
15 minute winter	SW01	10	2.273	0.223	18.0	0.2522	0.0000	OK
15 minute summer	SW02	10	2.258	0.378	39.7	0.4278	0.0000	SURCHARGED
15 minute summer	H01	11	2.261	0.036	1.1	0.0404	0.0000	OK
15 minute winter	H02	10	2.264	0.164	6.8	0.1850	0.0000	OK
15 minute winter	SW05	10	2.260	0.255	20.4	0.2888	0.0000	SURCHARGED
15 minute summer	SW03	10	2.237	0.392	68.2	0.4435	0.0000	SURCHARGED
120 minute winter	TANK 1	116	2.150	0.290	17.9	40.6644	0.0000	OK
15 minute summer	SW04	10	2.193	0.383	77.2	0.4327	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	PARKING	Orifice	SW01	2.0				
15 minute winter	SW01	1.001	SW02	21.5	0.432	0.306	2.6858	
15 minute summer	SW02	1.002	SW03	41.7	0.592	0.610	0.6453	
15 minute summer	H01	2.000	H02	2.0	0.438	0.049	0.3228	
15 minute winter	H02	2.001	SW05	-6.0	-0.315	-0.148	0.5504	
15 minute winter	SW05	2.002	SW03	21.4	0.582	0.521	0.5393	
15 minute summer	SW03	1.003	SW04	68.9	0.979	0.984	0.6140	
120 minute winter	TANK 1	3.000	SW04	-17.9	-0.477	-0.254	0.8603	
15 minute summer	SW04	Hydro-Brake®	HW01	5.0				41.0

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Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 98.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PARKING	116	2.707	0.537	12.9	25.0892	0.0000	SURCHARGED
15 minute winter	SW01	10	2.367	0.317	22.7	0.3580	0.0000	SURCHARGED
15 minute winter	SW02	10	2.347	0.467	50.1	0.5277	0.0000	SURCHARGED
15 minute winter	H01	10	2.370	0.145	7.1	0.1643	0.0000	OK
15 minute winter	H02	10	2.359	0.259	9.4	0.2932	0.0000	SURCHARGED
15 minute winter	SW05	10	2.353	0.348	24.7	0.3939	0.0000	SURCHARGED
15 minute winter	SW03	10	2.314	0.469	85.8	0.5307	0.0000	SURCHARGED
180 minute winter	TANK 1	176	2.276	0.416	16.5	58.3254	0.0000	SURCHARGED
180 minute winter	SW04	172	2.277	0.467	21.8	0.5279	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PARKING	Orifice	SW01	2.0				
15 minute winter	SW01	1.001	SW02	23.4	0.446	0.335	2.9884	
15 minute winter	SW02	1.002	SW03	50.5	0.717	0.739	0.6453	
15 minute winter	H01	2.000	H02	-5.7	0.415	-0.142	0.6994	
15 minute winter	H02	2.001	SW05	-8.3	-0.255	-0.206	0.6193	
15 minute winter	SW05	2.002	SW03	25.7	0.645	0.625	0.5393	
15 minute winter	SW03	1.003	SW04	86.8	1.232	1.238	0.6140	
180 minute winter	TANK 1	3.000	SW04	-16.5	-0.357	-0.234	0.8643	
180 minute winter	SW04	Hydro-Brake®	HW01	5.0				116.0

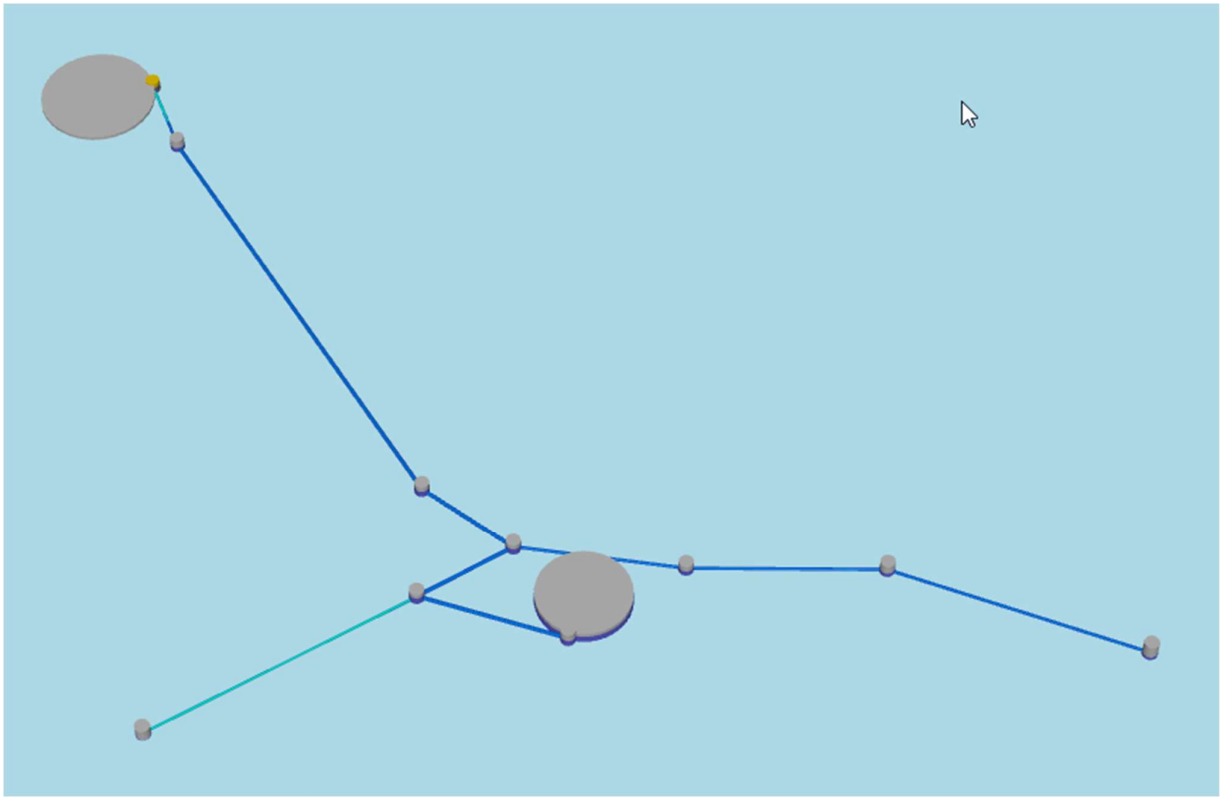
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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 98.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PARKING	120	2.811	0.641	18.1	40.2834	0.0000	SURCHARGED
15 minute winter	SW01	10	2.623	0.573	30.0	0.6483	0.0000	SURCHARGED
15 minute winter	SW02	10	2.584	0.704	68.9	0.7958	0.0000	SURCHARGED
15 minute winter	H01	10	2.597	0.372	13.6	0.4204	0.0000	SURCHARGED
15 minute winter	H02	10	2.596	0.496	17.6	0.5609	0.0000	SURCHARGED
15 minute winter	SW05	10	2.591	0.586	31.8	0.6623	0.0000	SURCHARGED
240 minute winter	SW03	232	2.527	0.682	20.8	0.7716	0.0000	SURCHARGED
240 minute winter	TANK 1	236	2.527	0.667	18.6	93.4663	0.0000	SURCHARGED
240 minute winter	SW04	236	2.527	0.717	23.7	0.8108	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PARKING	Orifice	SW01	2.0				
15 minute winter	SW01	1.001	SW02	30.3	0.450	0.433	2.9884	
15 minute winter	SW02	1.002	SW03	68.9	0.979	1.009	0.6453	
15 minute winter	H01	2.000	H02	-11.9	0.447	-0.298	0.8319	
15 minute winter	H02	2.001	SW05	-17.6	-0.443	-0.435	0.6193	
15 minute winter	SW05	2.002	SW03	33.2	0.834	0.808	0.5393	
240 minute winter	SW03	1.003	SW04	20.6	0.350	0.294	0.6140	
240 minute winter	TANK 1	3.000	SW04	-18.6	-0.281	-0.264	0.8643	
240 minute winter	SW04	Hydro-Brake®	HW01	5.0				123.7

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FSR MODEL – 1 IN 100 Year + 10% + 40% - No Flooding

Copyright Shields Wilson Limited.

FEH RAINFALL DATA HYDRAULIC MODEL OUTPUT

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Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.900
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PARKING	0.083	5.00	3.250	1200	524232.776	325676.822	1.080
SW01	0.043	5.00	3.285	1200	524231.033	325683.836	1.235
SW02	0.057	5.00	3.000	1200	524213.816	325722.624	1.120
H01	0.003	5.00	3.750	1200	524160.516	325745.009	1.525
H02			3.350	1200	524178.853	325734.945	1.250
SW05	0.042	5.00	3.060	1200	524194.281	325732.832	1.055
SW03	0.021	5.00	2.955	1200	524207.311	325729.077	1.110
TANK 1		5.00	3.200	1200	524204.160	325738.041	1.340
SW04	0.024	5.00	2.925	1200	524215.227	325732.733	1.115
HW01			2.750	1200	524236.741	325742.294	1.100

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PARKING	SW01	7.227	0.600	2.170	2.125	0.045	160.6	225	5.12	50.0
1.001	SW01	SW02	42.437	0.600	2.050	1.880	0.170	249.6	300	5.83	50.0
1.002	SW02	SW03	9.163	0.600	1.880	1.845	0.035	261.8	300	5.99	50.0
2.000	H01	H02	20.917	0.600	2.225	2.100	0.125	167.3	225	5.35	50.0
2.001	H02	SW05	15.572	0.600	2.100	2.005	0.095	163.9	225	5.60	50.0
2.002	SW05	SW03	13.560	0.600	2.005	1.920	0.085	159.5	225	5.82	50.0
1.003	SW03	SW04	8.719	0.600	1.845	1.810	0.035	249.1	300	6.14	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.029	40.9	11.2	0.855	0.935	0.083	0.0	80	0.881
1.001	0.990	70.0	17.1	0.935	0.820	0.126	0.0	100	0.821
1.002	0.967	68.3	24.7	0.820	0.810	0.182	0.0	125	0.891
2.000	1.008	40.1	0.4	1.300	1.025	0.003	0.0	16	0.326
2.001	1.018	40.5	0.4	1.025	0.830	0.003	0.0	16	0.329
2.002	1.032	41.0	6.1	0.830	0.810	0.045	0.0	58	0.745
1.003	0.991	70.1	33.6	0.810	0.815	0.248	0.0	146	0.981

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	TANK 1	SW04	12.274	0.600	1.860	1.810	0.050	245.5	300	5.20	50.0
1.004	SW04	HW01	23.543	0.600	1.810	1.650	0.160	147.1	150	6.61	49.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	0.999	70.6	0.0	1.040	0.815	0.000	0.0	0	0.000
1.004	0.826	14.6	36.8	0.965	0.950	0.272	0.0	150	0.842

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	7.227	160.6	225	Circular	3.250	2.170	0.855	3.285	2.125	0.935
1.001	42.437	249.6	300	Circular	3.285	2.050	0.935	3.000	1.880	0.820
1.002	9.163	261.8	300	Circular	3.000	1.880	0.820	2.955	1.845	0.810
2.000	20.917	167.3	225	Circular	3.750	2.225	1.300	3.350	2.100	1.025
2.001	15.572	163.9	225	Circular	3.350	2.100	1.025	3.060	2.005	0.830
2.002	13.560	159.5	225	Circular	3.060	2.005	0.830	2.955	1.920	0.810
1.003	8.719	249.1	300	Circular	2.955	1.845	0.810	2.925	1.810	0.815
3.000	12.274	245.5	300	Circular	3.200	1.860	1.040	2.925	1.810	0.815
1.004	23.543	147.1	150	Circular	2.925	1.810	0.965	2.750	1.650	0.950

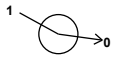
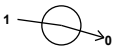
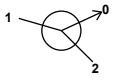
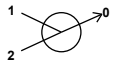
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PARKING	1200	Manhole	Adoptable	SW01	1200	Manhole	Adoptable
1.001	SW01	1200	Manhole	Adoptable	SW02	1200	Manhole	Adoptable
1.002	SW02	1200	Manhole	Adoptable	SW03	1200	Manhole	Adoptable
2.000	H01	1200	Manhole	Adoptable	H02	1200	Manhole	Adoptable
2.001	H02	1200	Manhole	Adoptable	SW05	1200	Manhole	Adoptable
2.002	SW05	1200	Manhole	Adoptable	SW03	1200	Manhole	Adoptable
1.003	SW03	1200	Manhole	Adoptable	SW04	1200	Manhole	Adoptable
3.000	TANK 1	1200	Manhole	Adoptable	SW04	1200	Manhole	Adoptable
1.004	SW04	1200	Manhole	Adoptable	HW01	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
PARKING	524232.776	325676.822	3.250	1.080	1200		0	1.000	2.170	225
SW01	524231.033	325683.836	3.285	1.235	1200		1 0	1.000 1.001	2.125 2.050	225 300
SW02	524213.816	325722.624	3.000	1.120	1200		1 0	1.001 1.002	1.880 1.880	300 300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
H01	524160.516	325745.009	3.750	1.525	1200				
						0	2.000	2.225	225
H02	524178.853	325734.945	3.350	1.250	1200		1	2.000	2.100	225
						0	2.001	2.100	225
SW05	524194.281	325732.832	3.060	1.055	1200		1	2.001	2.005	225
						0	2.002	2.005	225
SW03	524207.311	325729.077	2.955	1.110	1200		1	2.002	1.920	225
							2	1.002	1.845	300
						0	1.003	1.845	300
TANK 1	524204.160	325738.041	3.200	1.340	1200				
						0	3.000	1.860	300
SW04	524215.227	325732.733	2.925	1.115	1200		1	3.000	1.810	300
							2	1.003	1.810	300
						0	1.004	1.810	150
HW01	524236.741	325742.294	2.750	1.100	1200		1	1.004	1.650	150

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
30	0	10	0
100	0	10	0
100	40	10	0

Node SW04 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.810	Product Number	CTL-SHE-0104-5000-1115-5000
Design Depth (m)	1.115	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

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Node PARKING Online Orifice Control

Flap Valve	x	Design Depth (m)	1.080	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	3.0		
Invert Level (m)	2.170	Diameter (m)	0.037		

Node TANK 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.860
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	146.3	0.0	1.000	146.3	0.0	1.001	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.540
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	125.0	0.0	0.300	125.0	0.0	0.301	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.540
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	114.0	0.0	0.300	114.0	0.0	0.301	0.0	0.0

Node PARKING Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.840
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	176

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	239.0	0.0	0.300	239.0	0.0	0.301	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Crossings	✓
Node Losses	✓	Cover Depth	✓
Link Size	✓	Minimum Cover Depth (m)	
Minimum Diameter (mm)	150	Maximum Cover Depth (m)	3.000
Link Length	✓	Backdrops	✓
Maximum Length (m)	100.000	Minimum Backdrop Height (m)	
Coordinates	✓	Maximum Backdrop Height (m)	1.500
Accuracy (m)	1.000	Full Bore Velocity	✓

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Approval Settings

Minimum Full Bore Velocity (m/s)		Maximum Surcharged Depth (m)	0.100
Maximum Full Bore Velocity (m/s)	3.000	Flooding	✓
Proportional Velocity	✓	Return Period (years)	30
Return Period (years)		Time to Half Empty	x
Minimum Proportional Velocity (m/s)	0.750	Discharge Rates	✓
Maximum Proportional Velocity (m/s)	3.000	Discharge Volume	✓
Surcharged Depth	✓	100 year 360 minute (m^3)	
Return Period (years)			

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year +10% A 15 minute summer	111.768	31.626
2 year +10% A 15 minute winter	78.434	31.626
2 year +10% A 30 minute summer	71.387	20.200
2 year +10% A 30 minute winter	50.096	20.200
2 year +10% A 60 minute summer	47.300	12.500
2 year +10% A 60 minute winter	31.425	12.500
2 year +10% A 120 minute summer	32.766	8.659
2 year +10% A 120 minute winter	21.769	8.659
2 year +10% A 180 minute summer	26.243	6.753
2 year +10% A 180 minute winter	17.059	6.753
2 year +10% A 240 minute summer	21.127	5.583
2 year +10% A 240 minute winter	14.036	5.583
2 year +10% A 360 minute summer	16.268	4.186
2 year +10% A 360 minute winter	10.575	4.186
2 year +10% A 480 minute summer	12.758	3.372
2 year +10% A 480 minute winter	8.476	3.372
2 year +10% A 600 minute summer	10.368	2.836
2 year +10% A 600 minute winter	7.084	2.836
2 year +10% A 720 minute summer	9.162	2.455
2 year +10% A 720 minute winter	6.157	2.455
2 year +10% A 960 minute summer	7.397	1.948
2 year +10% A 960 minute winter	4.900	1.948
2 year +10% A 1440 minute summer	5.229	1.401
2 year +10% A 1440 minute winter	3.514	1.401
30 year +10% A 15 minute summer	311.560	88.161
30 year +10% A 15 minute winter	218.639	88.161
30 year +10% A 30 minute summer	202.933	57.423
30 year +10% A 30 minute winter	142.409	57.423
30 year +10% A 60 minute summer	134.901	35.650
30 year +10% A 60 minute winter	89.625	35.650
30 year +10% A 120 minute summer	84.821	22.416
30 year +10% A 120 minute winter	56.353	22.416
30 year +10% A 180 minute summer	65.993	16.982
30 year +10% A 180 minute winter	42.897	16.982
30 year +10% A 240 minute summer	52.469	13.866
30 year +10% A 240 minute winter	34.859	13.866
30 year +10% A 360 minute summer	39.989	10.291
30 year +10% A 360 minute winter	25.994	10.291
30 year +10% A 480 minute summer	31.189	8.242
30 year +10% A 480 minute winter	20.721	8.242
30 year +10% A 600 minute summer	25.216	6.897

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +10% A 600 minute winter	17.229	6.897
30 year +10% A 720 minute summer	22.169	5.942
30 year +10% A 720 minute winter	14.899	5.942
30 year +10% A 960 minute summer	17.712	4.664
30 year +10% A 960 minute winter	11.733	4.664
30 year +10% A 1440 minute summer	12.252	3.284
30 year +10% A 1440 minute winter	8.234	3.284
100 year +10% A 15 minute summer	421.146	119.170
100 year +10% A 15 minute winter	295.541	119.170
100 year +10% A 30 minute summer	276.057	78.115
100 year +10% A 30 minute winter	193.724	78.115
100 year +10% A 60 minute summer	185.028	48.897
100 year +10% A 60 minute winter	122.928	48.897
100 year +10% A 120 minute summer	118.435	31.299
100 year +10% A 120 minute winter	78.685	31.299
100 year +10% A 180 minute summer	93.145	23.969
100 year +10% A 180 minute winter	60.547	23.969
100 year +10% A 240 minute summer	74.479	19.683
100 year +10% A 240 minute winter	49.482	19.683
100 year +10% A 360 minute summer	56.931	14.650
100 year +10% A 360 minute winter	37.007	14.650
100 year +10% A 480 minute summer	44.364	11.724
100 year +10% A 480 minute winter	29.474	11.724
100 year +10% A 600 minute summer	35.803	9.793
100 year +10% A 600 minute winter	24.462	9.793
100 year +10% A 720 minute summer	31.413	8.419
100 year +10% A 720 minute winter	21.111	8.419
100 year +10% A 960 minute summer	25.003	6.584
100 year +10% A 960 minute winter	16.563	6.584
100 year +10% A 1440 minute summer	17.191	4.607
100 year +10% A 1440 minute winter	11.553	4.607
100 year +40% CC +10% A 15 minute summer	589.604	166.838
100 year +40% CC +10% A 15 minute winter	413.757	166.838
100 year +40% CC +10% A 30 minute summer	386.480	109.361
100 year +40% CC +10% A 30 minute winter	271.214	109.361
100 year +40% CC +10% A 60 minute summer	259.039	68.456
100 year +40% CC +10% A 60 minute winter	172.099	68.456
100 year +40% CC +10% A 120 minute summer	165.809	43.818
100 year +40% CC +10% A 120 minute winter	110.159	43.818
100 year +40% CC +10% A 180 minute summer	130.404	33.557
100 year +40% CC +10% A 180 minute winter	84.766	33.557
100 year +40% CC +10% A 240 minute summer	104.270	27.556
100 year +40% CC +10% A 240 minute winter	69.275	27.556
100 year +40% CC +10% A 360 minute summer	79.703	20.510
100 year +40% CC +10% A 360 minute winter	51.809	20.510
100 year +40% CC +10% A 480 minute summer	62.110	16.414
100 year +40% CC +10% A 480 minute winter	41.264	16.414
100 year +40% CC +10% A 600 minute summer	50.124	13.710
100 year +40% CC +10% A 600 minute winter	34.247	13.710
100 year +40% CC +10% A 720 minute summer	43.978	11.787
100 year +40% CC +10% A 720 minute winter	29.556	11.787
100 year +40% CC +10% A 960 minute summer	35.005	9.218

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC +10% A 960 minute winter	23.188	9.218
100 year +40% CC +10% A 1440 minute summer	24.067	6.450
100 year +40% CC +10% A 1440 minute winter	16.174	6.450

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Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 97.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PARKING	29	2.571	0.401	9.9	5.0000	0.0000	SURCHARGED
15 minute winter	SW01	10	2.119	0.069	8.5	0.0781	0.0000	OK
15 minute winter	SW02	11	2.111	0.231	17.2	0.2617	0.0000	OK
15 minute winter	H01	10	2.243	0.018	0.5	0.0204	0.0000	OK
15 minute winter	H02	12	2.117	0.017	0.5	0.0194	0.0000	OK
15 minute summer	SW05	11	2.107	0.102	6.6	0.1152	0.0000	OK
15 minute winter	SW03	11	2.107	0.262	29.1	0.2959	0.0000	OK
180 minute winter	TANK 1	132	1.968	0.108	5.3	15.1190	0.0000	OK
15 minute winter	SW04	11	2.098	0.288	34.6	0.3256	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	PARKING	Orifice	SW01	1.8				
15 minute winter	SW01	1.001	SW02	8.3	0.425	0.118	1.4961	
15 minute winter	SW02	1.002	SW03	19.5	0.447	0.286	0.5659	
15 minute winter	H01	2.000	H02	0.5	0.379	0.013	0.0295	
15 minute winter	H02	2.001	SW05	0.5	0.119	0.012	0.1422	
15 minute summer	SW05	2.002	SW03	7.6	0.552	0.185	0.3501	
15 minute winter	SW03	1.003	SW04	31.6	0.592	0.450	0.5871	
180 minute winter	TANK 1	3.000	SW04	-5.3	-0.317	-0.075	0.3703	
15 minute winter	SW04	Hydro-Brake®	HW01	5.0				19.2

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Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 97.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PARKING	114	2.686	0.516	11.8	21.9181	0.0000	SURCHARGED
15 minute winter	SW01	10	2.321	0.271	20.6	0.3061	0.0000	OK
15 minute winter	SW02	10	2.301	0.421	46.5	0.4757	0.0000	SURCHARGED
15 minute winter	H01	10	2.318	0.093	1.4	0.1049	0.0000	OK
15 minute winter	H02	10	2.300	0.200	8.6	0.2263	0.0000	OK
15 minute winter	SW05	10	2.294	0.289	22.5	0.3274	0.0000	SURCHARGED
15 minute winter	SW03	10	2.271	0.426	79.1	0.4821	0.0000	SURCHARGED
240 minute winter	TANK 1	204	2.246	0.386	12.1	54.1428	0.0000	SURCHARGED
240 minute winter	SW04	200	2.247	0.437	17.3	0.4946	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PARKING	Orifice	SW01	2.0				
15 minute winter	SW01	1.001	SW02	22.7	0.439	0.324	2.9140	
15 minute winter	SW02	1.002	SW03	47.0	0.667	0.687	0.6453	
15 minute winter	H01	2.000	H02	3.0	0.427	0.074	0.5515	
15 minute winter	H02	2.001	SW05	-7.7	-0.294	-0.190	0.6002	
15 minute winter	SW05	2.002	SW03	23.6	0.594	0.575	0.5393	
15 minute winter	SW03	1.003	SW04	80.0	1.136	1.142	0.6140	
240 minute winter	TANK 1	3.000	SW04	-12.1	-0.283	-0.171	0.8643	
240 minute winter	SW04	Hydro-Brake®	HW01	5.0				128.8

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Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 97.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	PARKING	176	2.791	0.621	12.7	37.3937	0.0000	SURCHARGED
15 minute winter	SW01	10	2.516	0.466	26.6	0.5275	0.0000	SURCHARGED
240 minute winter	SW02	236	2.508	0.628	13.7	0.7103	0.0000	SURCHARGED
240 minute winter	H01	236	2.509	0.284	0.4	0.3211	0.0000	SURCHARGED
240 minute winter	H02	236	2.508	0.408	0.7	0.4618	0.0000	SURCHARGED
240 minute winter	SW05	232	2.508	0.503	5.3	0.5688	0.0000	SURCHARGED
240 minute winter	SW03	232	2.509	0.664	20.4	0.7511	0.0000	SURCHARGED
240 minute winter	TANK 1	236	2.508	0.648	18.1	90.8213	0.0000	SURCHARGED
240 minute winter	SW04	236	2.508	0.698	23.8	0.7892	0.0000	SURCHARGED
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	PARKING	Orifice	SW01	2.0				
15 minute winter	SW01	1.001	SW02	27.2	0.453	0.389	2.9884	
240 minute winter	SW02	1.002	SW03	13.3	0.415	0.194	0.6453	
240 minute winter	H01	2.000	H02	0.4	0.327	0.010	0.8319	
240 minute winter	H02	2.001	SW05	-0.6	0.092	-0.014	0.6193	
240 minute winter	SW05	2.002	SW03	4.7	0.530	0.114	0.5393	
240 minute winter	SW03	1.003	SW04	20.8	0.353	0.297	0.6140	
240 minute winter	TANK 1	3.000	SW04	-18.1	-0.278	-0.257	0.8643	
240 minute winter	SW04	Hydro-Brake®	HW01	5.0				124.9

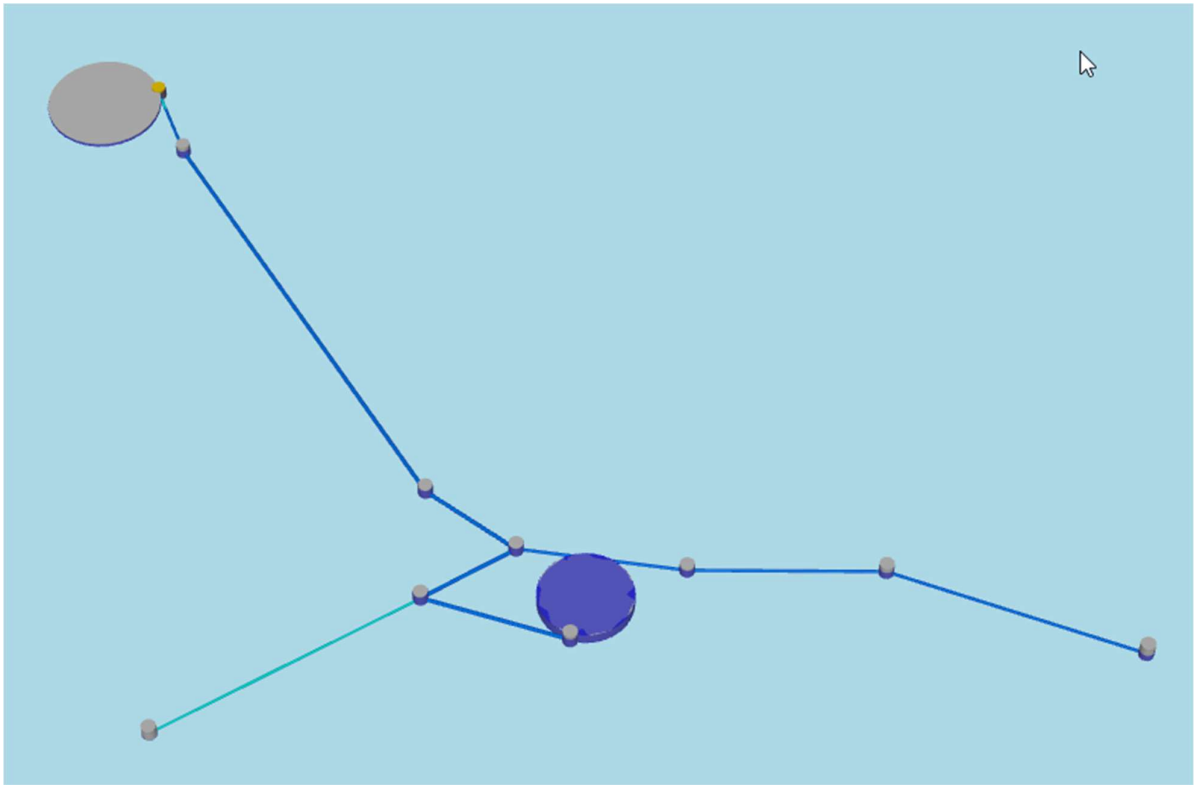
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Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 97.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	PARKING	352	3.084	0.914	11.0	62.4178	0.0000	FLOOD RISK
360 minute winter	SW01	344	2.909	0.859	7.4	0.9718	0.0000	SURCHARGED
360 minute winter	SW02	344	2.909	1.029	14.7	1.1639	0.0000	FLOOD RISK
360 minute winter	H01	344	2.909	0.684	0.6	0.7733	0.0000	SURCHARGED
360 minute winter	H02	344	2.909	0.809	0.9	0.9155	0.0000	SURCHARGED
360 minute winter	SW05	344	2.909	0.904	5.5	1.0228	0.0000	FLOOD RISK
360 minute winter	SW03	344	2.910	1.065	22.3	1.2041	0.0000	FLOOD RISK
360 minute winter	TANK 1	344	2.909	1.049	20.6	140.2404	0.0000	FLOOD RISK
360 minute winter	SW04	344	2.909	1.099	25.5	1.2426	0.0000	FLOOD RISK
15 minute summer	HW01	1	1.650	0.000	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	PARKING	Orifice	SW01	1.9				
360 minute winter	SW01	1.001	SW02	7.2	0.409	0.103	2.9884	
360 minute winter	SW02	1.002	SW03	14.3	0.408	0.210	0.6453	
360 minute winter	H01	2.000	H02	0.3	0.299	0.008	0.8319	
360 minute winter	H02	2.001	SW05	-0.9	0.078	-0.021	0.6193	
360 minute winter	SW05	2.002	SW03	5.4	0.488	0.131	0.5393	
360 minute winter	SW03	1.003	SW04	22.3	0.350	0.319	0.6140	
360 minute winter	TANK 1	3.000	SW04	-20.6	-0.292	-0.291	0.8643	
360 minute winter	SW04	Hydro-Brake®	HW01	5.0				157.4

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FEH MODEL – 1 IN 100 Year + 10% + 40% - No Flooding

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