



Richborough Energy Park 1 & 2

Revised Drainage Calculations in Support of Condition 6 – As Built Scheme



Rev	Date	Reason for Issue	Produced by	Checked by	Checked by	Comments
01	30.10.23	First Issue	M. Boor Drainage Engineer	M. Mason Lead Engineer	D. Finn Project Manger	
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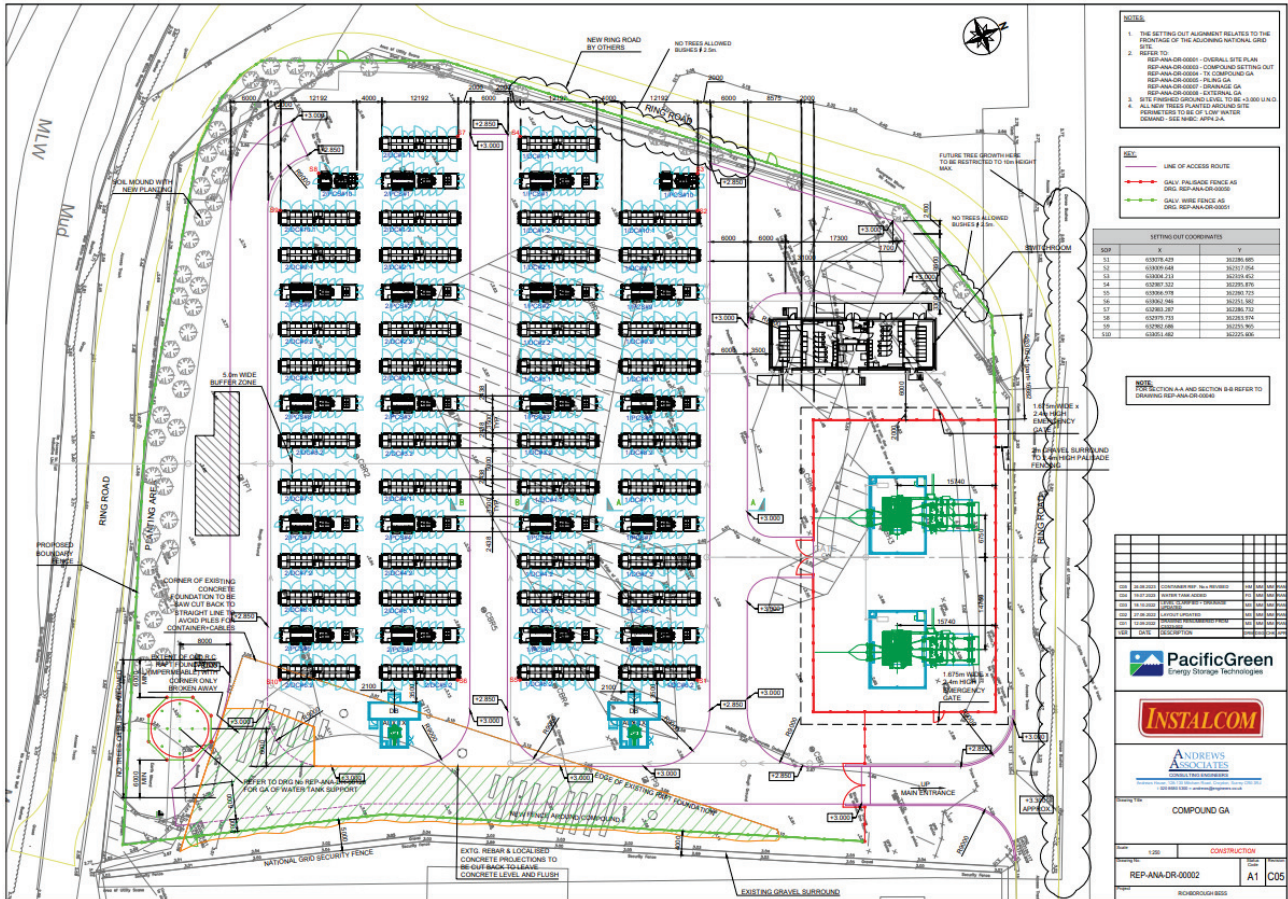
RICHBOROUGH ENERGY PARK



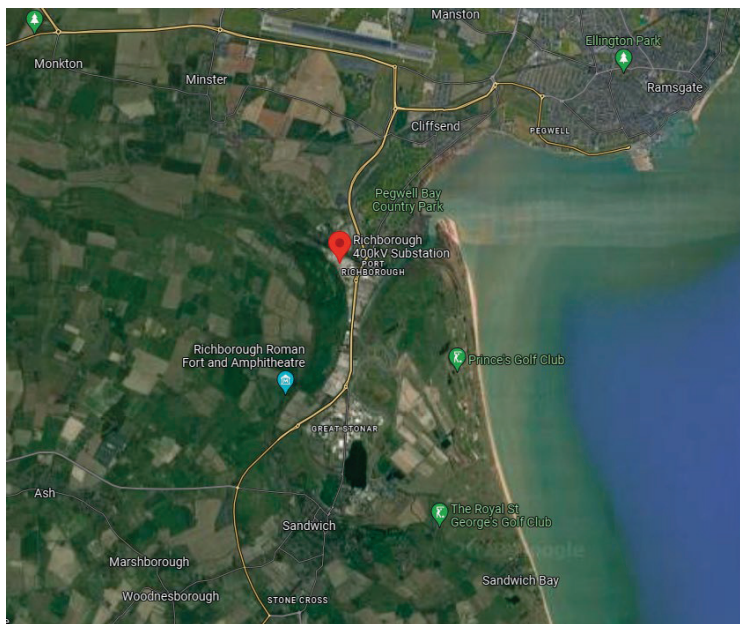
REVISED DRAINAGE CALCULATIONS IN SUPPORT OF CONDITION 6 – AS BUILT SCHEME

1. Introduction

The Project is formed of two 49.99 MW 1-hr duration battery energy storage system (BESS) facilities named Richborough Energy Park 1 (REP1) and Richborough Energy Park 2 (REP2). The project is constructed adjacent to the National Grid 400kV substation at Richborough Energy Park.



Site Plan



Site Location: Richborough Energy Park, Sandwich CT13 9NL

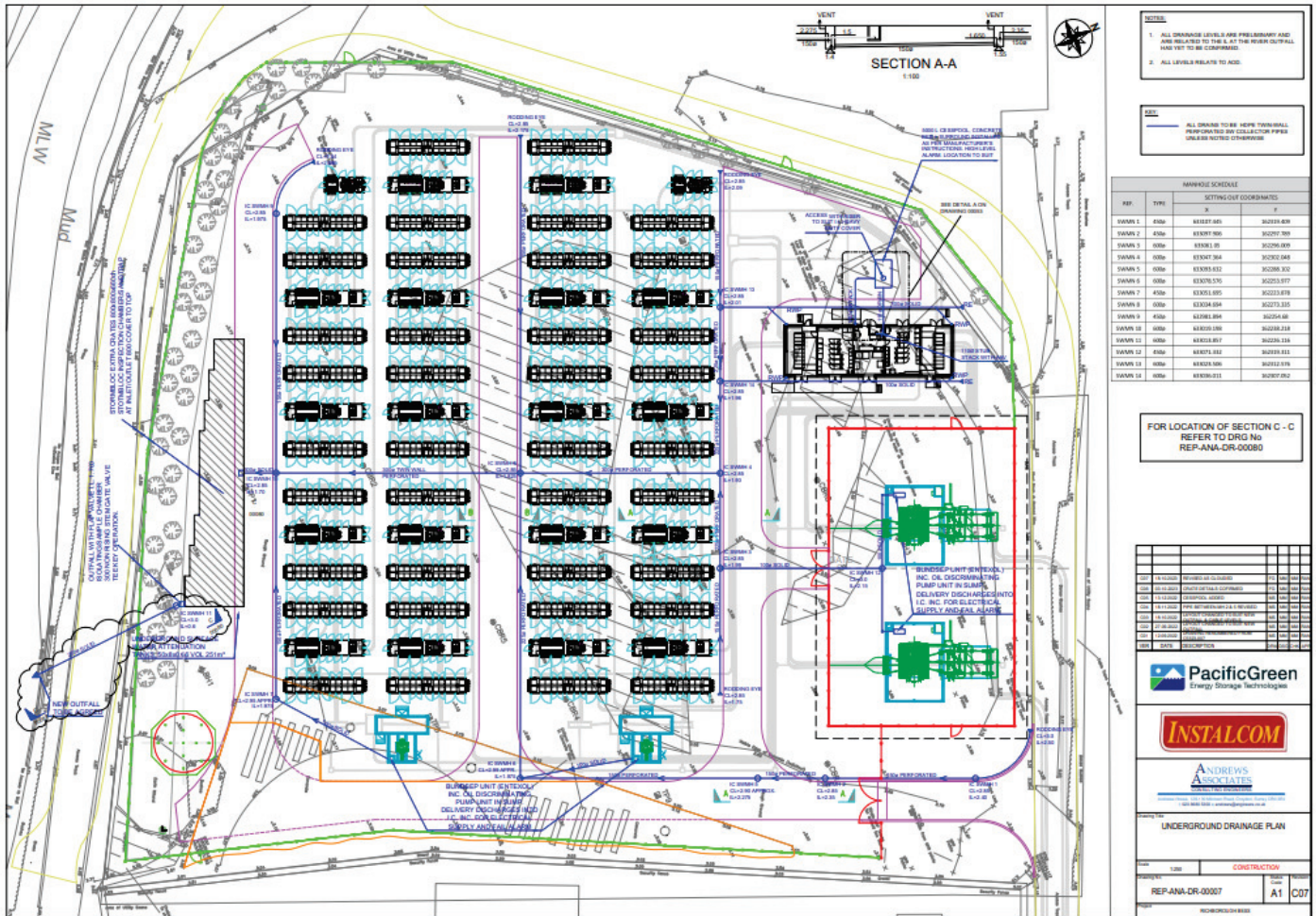


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REVISED DRAINAGE CALCULATIONS IN SUPPORT OF CONDITION 6 – AS BUILT SCHEME

2. Drainage Plan





3. Drainage Strategy

The underlying SUDS drainage scheme for the site remains unchanged, i.e. the surface water generated by the development up to and including a 100 year adjusted storm event can be accommodated and disposed of within the curtilage of the site via an outfall to the tidal River Stour.

There is no increased risk of on site or off-site flooding, and no additional water will flow into the SSI to the north. Any silt and pollutants resulting from the site will be managed to ensure there is no pollution risk to receiving waters.

Any foul water generated by messing facilities will be collected in a contained system, with a level alarm and be tankered off site.

All open-air plant containing oils will be housed in fully bunded areas drained via pumps and an oil discriminating system.

All non-evaporated or non-permeated surface water run-off will be discharged into the river Stour via an outfall. It was proposed that an existing outfall serving the old site would be used, but this could not be found and is to be replaced by a 250 dia outfall, compliant with all current standards under an FRA12 application

The ground levels of the whole site are approximately 3.10 to the north falling to 2.70 to the south in the soft landscaped area between the site fence line and river Stour.

The developed area of the site has been raised to a general level of 3.00 flat, in areas where the units are sited falling to 2.850 at road low spots.

Construction requirements have meant that type 1 MOT has been used across the raised area. For run off calculation purposes this is deemed to be impermeable and hence the SUDS system has been revised to allow for greater run off volumes.

To accommodate the greater volumes of run off a crate attenuation tank is to be installed to accommodate the runoff during tide locking and extreme storm events. The attached calculations are based on a tank of 252 cu.m. volume. The tank has been sized to deal with storm events up to 30 years return. Additional storage is required for events more extreme than this, and during a 100 +CC this additional volume equates to 138 cu.m. The delivery network has been sized to retard flow at higher levels of run off which will result in surcharging of the network where the excess volume will be held. Some shallow surface ponding will occur at surface low points (2.850). A soil bund (which is to be landscaped) has been constructed around most of the perimeter of the site, within the fence line which will retain any ponding until it is drained by the underground network. Any surcharged drainage which might flow at ground level will drain to the existing soft landscaping at the southern low point of the site 2.70 (varies) and permeate into the ground, which in reality is how the predevelopment site, much of which was hard landscaping drained pre this development.

Silt traps are placed at the inlet and outlets of the crates, with an additional isolating/sampling chamber, isolating valve on inlet, flap valve on outfall. The isolating valve can be closed to protect the river from any discharge from an unforeseen event.



RICHBOROUGH ENERGY PARK



REVISED DRAINAGE CALCULATIONS IN SUPPORT OF CONDITION 6 – AS BUILT SCHEME

4. SUDS Design Report

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	10	Connection Type	Level Inverts
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.900
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.010	4.00	3.000	600	633157.861	162166.581	0.750
2	0.015	4.00	2.850	600	633149.276	162159.309	0.690
3	0.008	4.00	2.850	600	633125.646	162159.308	0.850
4	0.047	4.00	2.900	600	633115.058	162159.308	0.975
5	0.117	4.00	2.990	600	633077.759	162159.306	1.365
6	0.016	4.00	2.850	600	633146.936	162233.346	1.050
7	0.086	4.00	2.850	600	633109.138	162254.467	1.110
8	0.026	4.00	2.850	600	633109.138	162233.346	1.190
9	0.017	4.00	2.850	600	633146.936	162221.712	1.050
10	0.009	4.00	2.850	600	633109.138	162221.712	1.230
11	0.020	4.00	3.000	600	633134.608	162203.825	1.050
12	0.020	4.00	3.000	600	633134.608	162182.387	1.050
13			3.000	600	633134.608	162192.309	1.200
14	0.071	4.00	2.850	600	633109.138	162172.806	1.100
15	0.013	4.00	2.850	600	633109.138	162192.309	1.210
16			2.850	600	633109.138	162207.268	1.270
17	0.096	4.00	2.850	600	633077.754	162260.010	1.025
18	0.092	4.00	2.850	600	633077.756	162207.266	1.375
19		4.00	2.950	600	633056.867	162162.385	1.000
20	0.126	4.00	2.950	600	633039.370	162171.747	1.325
21		4.00	2.840	600	633045.044	162256.059	1.125
22	0.100	4.00	2.850	600	633039.370	162248.043	1.225
23	0.113	4.00	2.850	600	633039.370	162207.268	1.500
24			3.000		633026.141	162207.268	2.400
24_OUT			3.680	600	633004.267	162207.268	3.090

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	1	2	12.233	0.600	2.250	2.160	0.090	135.9	150	4.24	50.0
1.001	2	3	23.630	0.600	2.160	2.000	0.160	147.7	150	4.71	50.0
1.002	3	4	10.588	0.600	2.000	1.925	0.075	141.2	150	4.92	50.0
1.003	4	5	37.299	0.600	1.925	1.625	0.300	124.3	150	5.61	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)
1.000	0.860	15.2	1.4	0.600	0.540	0.010	0.0	30	0.531
1.001	0.824	14.6	3.4	0.540	0.700	0.025	0.0	49	0.671
1.002	0.844	14.9	4.4	0.700	0.825	0.033	0.0	56	0.736
1.003	0.900	15.9	10.8	0.825	1.215	0.080	0.0	91	0.967

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)
1.004	5	18	47.960	0.600	1.625	1.475	0.150	319.7	225	6.72	50.0
2.000	6	8	37.798	0.600	1.800	1.660	0.140	270.0	100	5.36	50.0
3.000	7	8	21.121	0.600	1.740	1.660	0.080	264.0	150	4.57	50.0
2.001	8	10	11.634	0.600	1.660	1.620	0.040	290.8	225	5.61	50.0
4.000	9	10	37.798	0.600	1.800	1.620	0.180	210.0	100	5.20	50.0
2.002	10	16	14.444	0.600	1.620	1.580	0.040	361.1	225	5.97	50.0
5.000	11	13	11.516	0.600	1.950	1.800	0.150	76.8	100	4.22	50.0
6.000	12	13	9.922	0.600	1.950	1.800	0.150	66.1	100	4.17	50.0
5.001	13	15	25.470	0.600	1.800	1.640	0.160	159.2	150	4.75	50.0
7.000	14	15	19.503	0.600	1.750	1.640	0.110	177.3	150	4.43	50.0
5.002	15	16	14.959	0.600	1.640	1.580	0.060	249.3	225	5.06	50.0
2.003	16	18	31.382	0.600	1.580	1.475	0.105	298.9	300	6.55	50.0
8.000	17	18	52.744	0.600	1.825	1.475	0.350	150.7	150	5.08	50.0
1.005	18	23	38.386	0.600	1.475	1.350	0.125	307.1	300	7.43	50.0
9.000	19	20	19.844	0.600	1.950	1.625	0.325	61.1	100	4.34	50.0
9.001	20	23	35.521	0.600	1.625	1.350	0.275	129.2	150	5.01	50.0
10.000	21	22	10.471	0.600	1.715	1.625	0.090	116.3	100	4.25	50.0
10.001	22	23	40.775	0.600	1.625	1.350	0.275	148.3	150	5.07	50.0
1.006	23	24	13.229	0.600	1.350	0.600	0.750	17.6	300	7.49	50.0
1.007	24	24_OUT	5.000	0.600	0.600	0.590	0.010	500.0	300	7.61	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)
1.004	0.726	28.9	26.7	1.140	1.150	0.197	0.0	172	0.821
2.000	0.463	3.6	2.2	0.950	1.090	0.016	0.0	56	0.484
3.000	0.614	10.8	11.7	0.960	1.040	0.086	0.0	150	0.625
2.001	0.761	30.3	17.3	0.965	1.005	0.128	0.0	122	0.786
4.000	0.527	4.1	2.3	0.950	1.130	0.017	0.0	54	0.542
2.002	0.682	27.1	20.9	1.005	1.045	0.154	0.0	148	0.750
5.000	0.879	6.9	2.7	0.950	1.100	0.020	0.0	43	0.825
6.000	0.948	7.4	2.7	0.950	1.100	0.020	0.0	42	0.874
5.001	0.794	14.0	5.4	1.050	1.060	0.040	0.0	64	0.740
7.000	0.751	13.3	9.6	0.950	1.060	0.071	0.0	95	0.818
5.002	0.823	32.7	16.8	0.985	1.045	0.124	0.0	114	0.827
2.003	0.904	63.9	37.6	0.970	1.075	0.278	0.0	166	0.939
8.000	0.816	14.4	13.0	0.875	1.225	0.096	0.0	112	0.922
1.005	0.892	63.0	89.9	1.075	1.200	0.663	0.0	300	0.903
9.000	0.987	7.8	0.0	0.900	1.225	0.000	0.0	0	0.000
9.001	0.882	15.6	17.1	1.175	1.350	0.126	0.0	150	0.899
10.000	0.712	5.6	0.0	1.025	1.125	0.000	0.0	0	0.000
10.001	0.823	14.5	13.5	1.075	1.350	0.100	0.0	115	0.932
1.006	3.761	265.8	135.7	1.200	2.100	1.002	0.0	152	3.781
1.007	0.696	49.2	135.7	2.100	2.790	1.002	0.0	300	0.705

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	12.233	135.9	150	Circular	3.000	2.250	0.600	2.850	2.160	0.540
1.001	23.630	147.7	150	Circular	2.850	2.160	0.540	2.850	2.000	0.700
1.002	10.588	141.2	150	Circular	2.850	2.000	0.700	2.900	1.925	0.825
1.003	37.299	124.3	150	Circular	2.900	1.925	0.825	2.990	1.625	1.215
1.004	47.960	319.7	225	Circular	2.990	1.625	1.140	2.850	1.475	1.150
2.000	37.798	270.0	100	Circular	2.850	1.800	0.950	2.850	1.660	1.090
3.000	21.121	264.0	150	Circular	2.850	1.740	0.960	2.850	1.660	1.040
2.001	11.634	290.8	225	Circular	2.850	1.660	0.965	2.850	1.620	1.005
4.000	37.798	210.0	100	Circular	2.850	1.800	0.950	2.850	1.620	1.130
2.002	14.444	361.1	225	Circular	2.850	1.620	1.005	2.850	1.580	1.045
5.000	11.516	76.8	100	Circular	3.000	1.950	0.950	3.000	1.800	1.100
6.000	9.922	66.1	100	Circular	3.000	1.950	0.950	3.000	1.800	1.100
5.001	25.470	159.2	150	Circular	3.000	1.800	1.050	2.850	1.640	1.060
7.000	19.503	177.3	150	Circular	2.850	1.750	0.950	2.850	1.640	1.060
5.002	14.959	249.3	225	Circular	2.850	1.640	0.985	2.850	1.580	1.045
2.003	31.382	298.9	300	Circular	2.850	1.580	0.970	2.850	1.475	1.075
8.000	52.744	150.7	150	Circular	2.850	1.825	0.875	2.850	1.475	1.225
1.005	38.386	307.1	300	Circular	2.850	1.475	1.075	2.850	1.350	1.200
9.000	19.844	61.1	100	Circular	2.950	1.950	0.900	2.950	1.625	1.225
9.001	35.521	129.2	150	Circular	2.950	1.625	1.175	2.850	1.350	1.350
10.000	10.471	116.3	100	Circular	2.840	1.715	1.025	2.850	1.625	1.125
10.001	40.775	148.3	150	Circular	2.850	1.625	1.075	2.850	1.350	1.350
1.006	13.229	17.6	300	Circular	2.850	1.350	1.200	3.000	0.600	2.100
1.007	5.000	500.0	300	Circular	3.000	0.600	2.100	3.680	0.590	2.790

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	5	600	Manhole	Adoptable
1.004	5	600	Manhole	Adoptable	18	600	Manhole	Adoptable
2.000	6	600	Manhole	Adoptable	8	600	Manhole	Adoptable
3.000	7	600	Manhole	Adoptable	8	600	Manhole	Adoptable
2.001	8	600	Manhole	Adoptable	10	600	Manhole	Adoptable
4.000	9	600	Manhole	Adoptable	10	600	Manhole	Adoptable
2.002	10	600	Manhole	Adoptable	16	600	Manhole	Adoptable
5.000	11	600	Manhole	Adoptable	13	600	Manhole	Adoptable
6.000	12	600	Manhole	Adoptable	13	600	Manhole	Adoptable
5.001	13	600	Manhole	Adoptable	15	600	Manhole	Adoptable
7.000	14	600	Manhole	Adoptable	15	600	Manhole	Adoptable
5.002	15	600	Manhole	Adoptable	16	600	Manhole	Adoptable
2.003	16	600	Manhole	Adoptable	18	600	Manhole	Adoptable
8.000	17	600	Manhole	Adoptable	18	600	Manhole	Adoptable
1.005	18	600	Manhole	Adoptable	23	600	Manhole	Adoptable
9.000	19	600	Manhole	Adoptable	20	600	Manhole	Adoptable
9.001	20	600	Manhole	Adoptable	23	600	Manhole	Adoptable
10.000	21	600	Manhole	Adoptable	22	600	Manhole	Adoptable
10.001	22	600	Manhole	Adoptable	23	600	Manhole	Adoptable
1.006	23	600	Manhole	Adoptable	24		Junction	
1.007	24		Junction		24_OUT	600	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Node 24_OUT Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m ²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	2.040	300	0.040	600	0.790	900	1.540	1200	-0.460
60	2.290	360	-0.460	660	1.540	960	0.790	1260	0.040
120	2.040	420	-0.710	720	2.040	1020	0.040	1320	0.790
180	1.540	480	-0.460	780	2.290	1080	-0.460	1380	1.540
240	0.790	540	0.040	840	2.040	1140	-0.710	1440	2.040

Node 24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	209

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	200.0	0.0	1.320	200.0	0.0	1.321	0.0	0.0

Node 3 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.000	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	10	Diameter (mm)	450

Node 4 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.925	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	14	Diameter (mm)	450

Node 5 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.625	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	15	Diameter (mm)	450

Node 18 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.004
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.475	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	600

Node 23 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.005
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.350	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	600

Node 8 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	3.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.660	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	450

Node 10 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.620	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	150	Diameter (mm)	525

Node 16 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.580	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	600

Node 15 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	7.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.640	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	525

Node 16 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	5.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.580	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	525

Node 18 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.475	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	150	Diameter (mm)	600

Node 18 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	8.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.475	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	525

Node 23 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	10.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.350	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	525

Node 23 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	9.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.350	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)	180	Diameter (mm)	525

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	10	2.281	0.031	1.4	0.0168	0.0000	OK
15 minute summer	2	10	2.210	0.050	3.5	0.0360	0.0000	OK
15 minute winter	3	10	2.056	0.056	4.6	0.0500	0.0000	OK
15 minute winter	4	10	2.015	0.090	11.2	0.1694	0.0000	OK
15 minute winter	5	11	1.818	0.193	27.5	0.6357	0.0000	OK
15 minute winter	6	10	1.856	0.056	2.3	0.0330	0.0000	OK
15 minute winter	7	11	1.895	0.155	12.3	0.2846	0.0000	SURCHARGED
15 minute winter	8	11	1.806	0.146	17.6	0.3269	0.0000	OK
15 minute winter	9	10	1.854	0.054	2.4	0.0326	0.0000	OK
15 minute winter	10	11	1.789	0.169	20.5	0.2479	0.0000	OK
15 minute summer	11	10	1.994	0.044	2.8	0.0291	0.0000	OK
15 minute summer	12	10	1.993	0.043	2.8	0.0282	0.0000	OK
15 minute winter	13	10	1.865	0.065	5.6	0.0184	0.0000	OK
15 minute summer	14	10	1.851	0.101	10.1	0.1585	0.0000	OK
15 minute winter	15	11	1.778	0.138	17.6	0.2658	0.0000	OK
15 minute winter	16	12	1.767	0.187	35.3	0.5882	0.0000	OK
15 minute winter	17	11	1.950	0.125	13.7	0.2700	0.0000	OK
15 minute winter	18	12	1.739	0.264	78.8	3.0653	0.0000	OK
15 minute summer	19	1	1.950	0.000	0.0	0.0000	0.0000	OK
15 minute winter	20	11	1.815	0.190	17.9	0.4156	0.0000	SURCHARGED
15 minute summer	21	10	1.742	0.027	0.6	0.0077	0.0000	OK
15 minute winter	22	10	1.741	0.116	14.2	0.2205	0.0000	OK
240 minute winter	23	228	1.522	0.172	32.0	1.2968	0.0000	OK
240 minute winter	24	228	1.524	0.924	32.0	175.4836	0.0000	SURCHARGED
600 minute summer	24_OUT	780	2.880	2.290	50.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	1.4	0.366	0.092	0.0473	
15 minute summer	2	1.001	3	3.5	0.624	0.239	0.1318	
15 minute winter	3	1.002	4	4.5	0.523	0.300	0.0905	
15 minute winter	4	1.003	5	10.8	0.678	0.681	0.5353	
15 minute winter	5	1.004	18	23.2	0.667	0.806	1.8237	
15 minute winter	6	2.000	8	2.2	0.321	0.613	0.2334	
15 minute winter	7	3.000	8	11.7	0.681	1.076	0.3704	
15 minute winter	8	2.001	10	16.8	0.617	0.556	0.3442	
15 minute winter	9	4.000	10	2.4	0.343	0.569	0.2289	
15 minute winter	10	2.002	16	19.1	0.655	0.704	0.4852	
15 minute summer	11	5.000	13	2.8	0.648	0.406	0.0503	
15 minute summer	12	6.000	13	2.8	0.669	0.376	0.0425	
15 minute winter	13	5.001	15	5.5	0.467	0.395	0.3054	
15 minute summer	14	7.000	15	10.1	0.730	0.764	0.2753	
15 minute winter	15	5.002	16	16.2	0.645	0.495	0.4530	
15 minute winter	16	2.003	18	32.5	0.613	0.509	1.7554	
15 minute winter	17	8.000	18	12.5	0.743	0.870	0.8786	
15 minute winter	18	1.005	23	75.4	1.544	1.196	1.9271	
15 minute summer	19	9.000	20	0.0	0.000	0.000	0.0776	
15 minute winter	20	9.001	23	16.0	0.955	1.024	0.6252	
15 minute summer	21	10.000	22	-0.6	-0.117	-0.102	0.0500	
15 minute winter	22	10.001	23	13.8	0.839	0.948	0.6556	
240 minute winter	23	1.006	24	32.0	2.199	0.120	0.7413	
240 minute winter	24	1.007	24_OUT	48.4	0.851	0.983	0.3521	181.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	13	2.608	0.358	7.4	0.1967	0.0000	SURCHARGED
15 minute winter	2	13	2.603	0.443	8.9	0.3180	0.0000	FLOOD RISK
15 minute winter	3	13	2.593	0.593	9.5	1.7875	0.0000	FLOOD RISK
15 minute winter	4	13	2.579	0.654	17.0	1.6425	0.0000	SURCHARGED
1440 minute summer	5	870	2.407	0.782	4.9	4.5514	0.0000	SURCHARGED
15 minute winter	6	12	2.469	0.669	5.8	0.3936	0.0000	SURCHARGED
15 minute winter	7	11	2.784	1.044	31.0	1.9129	0.0000	FLOOD RISK
1440 minute summer	8	870	2.406	0.746	3.1	2.4386	0.0000	SURCHARGED
15 minute winter	9	12	2.436	0.636	6.1	0.3863	0.0000	SURCHARGED
1440 minute summer	10	870	2.406	0.786	3.7	1.6008	0.0000	SURCHARGED
1440 minute summer	11	870	2.407	0.457	0.5	0.2997	0.0000	SURCHARGED
1440 minute summer	12	870	2.407	0.457	0.5	0.3033	0.0000	SURCHARGED
1440 minute summer	13	870	2.406	0.606	1.0	0.1716	0.0000	SURCHARGED
15 minute winter	14	11	2.529	0.779	25.6	1.2259	0.0000	SURCHARGED
1440 minute summer	15	870	2.405	0.765	3.0	2.4599	0.0000	SURCHARGED
1440 minute summer	16	870	2.405	0.825	7.3	3.8449	0.0000	SURCHARGED
15 minute winter	17	10	2.850	1.025	34.6	2.2099	1.3917	FLOOD
1440 minute summer	18	870	2.403	0.928	16.1	18.5562	0.0000	SURCHARGED
15 minute winter	19	12	2.948	0.998	5.6	0.2826	0.0000	FLOOD RISK
15 minute winter	20	11	2.950	1.325	45.4	2.8951	0.1613	FLOOD
15 minute winter	21	11	2.649	0.934	4.5	0.2644	0.0000	FLOOD RISK
15 minute winter	22	11	2.651	1.026	35.8	1.9559	0.0000	FLOOD RISK
1440 minute summer	23	870	2.392	1.042	23.8	18.2852	0.0000	SURCHARGED
1440 minute summer	24	870	2.385	1.785	37.3	250.8950	0.0000	SURCHARGED
60 minute winter	24_OUT	60	2.880	2.290	59.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	-3.8	0.450	-0.250	0.2154	
15 minute winter	2	1.001	3	7.0	0.680	0.482	0.4160	
15 minute winter	3	1.002	4	9.9	0.562	0.663	0.1864	
15 minute winter	4	1.003	5	13.5	0.801	0.850	0.6566	
1440 minute summer	5	1.004	18	4.9	0.366	0.170	1.9074	
15 minute winter	6	2.000	8	3.3	0.419	0.900	0.2957	
15 minute winter	7	3.000	8	25.0	1.419	2.304	0.3718	
1440 minute summer	8	2.001	10	3.1	0.440	0.103	0.4627	
15 minute winter	9	4.000	10	3.7	0.467	0.884	0.2957	
1440 minute summer	10	2.002	16	4.5	0.427	0.165	0.5745	
1440 minute summer	11	5.000	13	0.5	0.377	0.072	0.0901	
1440 minute summer	12	6.000	13	0.5	0.385	0.067	0.0776	
1440 minute summer	13	5.001	15	1.0	0.304	0.071	0.4484	
15 minute winter	14	7.000	15	21.5	1.223	1.622	0.3433	
1440 minute summer	15	5.002	16	3.0	0.398	0.092	0.5949	
1440 minute summer	16	2.003	18	9.1	0.409	0.143	2.2099	
15 minute winter	17	8.000	18	21.7	1.235	1.508	0.9285	
1440 minute summer	18	1.005	23	18.9	0.952	0.299	2.7031	
15 minute winter	19	9.000	20	-5.6	-0.718	-0.725	0.1553	
15 minute winter	20	9.001	23	32.7	1.859	2.098	0.6253	
15 minute winter	21	10.000	22	-4.5	-0.580	-0.811	0.0819	
15 minute winter	22	10.001	23	27.1	1.540	1.865	0.7178	
1440 minute summer	23	1.006	24	37.3	1.322	0.140	0.9316	
1440 minute summer	24	1.007	24_OUT	65.0	0.923	1.321	0.3521	548.7

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	11	2.874	0.624	5.0	0.3425	0.0000	FLOOD RISK
15 minute winter	2	11	2.850	0.690	10.8	0.4954	1.2216	FLOOD
15 minute winter	3	11	2.850	0.850	14.0	2.7262	1.4473	FLOOD
15 minute winter	4	11	2.868	0.943	23.7	2.4156	0.0000	FLOOD RISK
120 minute winter	5	86	2.851	1.226	27.5	7.6729	0.0000	FLOOD RISK
120 minute winter	6	86	2.850	1.050	2.5	0.6174	0.0570	FLOOD
15 minute winter	7	9	2.850	1.110	43.3	2.0335	3.5995	FLOOD
120 minute winter	8	86	2.846	1.186	18.2	4.0096	0.0000	FLOOD RISK
120 minute winter	9	86	2.850	1.050	2.6	0.6374	0.0473	FLOOD
120 minute winter	10	86	2.846	1.226	20.3	2.5948	0.0000	FLOOD RISK
120 minute winter	11	86	2.856	0.906	3.0	0.5945	0.0000	FLOOD RISK
120 minute winter	12	86	2.855	0.905	3.1	0.6011	0.0000	FLOOD RISK
120 minute winter	13	86	2.850	1.050	6.1	0.2972	0.0000	FLOOD RISK
15 minute winter	14	10	2.850	1.100	35.8	1.7314	1.0384	FLOOD
120 minute winter	15	86	2.845	1.205	17.1	4.0320	0.0000	FLOOD RISK
120 minute winter	16	86	2.844	1.264	34.3	6.1450	0.0000	FLOOD RISK
15 minute winter	17	9	2.850	1.025	48.4	2.2099	5.7033	FLOOD
120 minute winter	18	86	2.841	1.366	84.9	29.1694	0.0000	FLOOD RISK
15 minute winter	19	10	2.950	1.000	6.7	0.2830	0.1355	FLOOD
15 minute winter	20	9	2.950	1.325	63.5	2.8951	4.9625	FLOOD
30 minute winter	21	18	2.840	1.125	3.8	0.3184	0.3156	FLOOD
15 minute winter	22	10	2.850	1.225	50.1	2.3361	1.8978	FLOOD
120 minute winter	23	86	2.814	1.464	124.3	27.0196	0.0000	FLOOD RISK
120 minute winter	24	84	2.787	2.187	118.2	250.8950	0.0000	FLOOD RISK
180 minute winter	24_OUT	60	2.880	2.290	66.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	4.3	0.459	0.284	0.2154	
15 minute winter	2	1.001	3	6.7	0.705	0.458	0.4160	
15 minute winter	3	1.002	4	10.5	0.598	0.706	0.1864	
15 minute winter	4	1.003	5	14.5	0.822	0.910	0.6566	
120 minute winter	5	1.004	18	25.4	0.640	0.882	1.9074	
120 minute winter	6	2.000	8	2.1	0.301	0.567	0.2957	
15 minute winter	7	3.000	8	27.9	1.583	2.570	0.3718	
120 minute winter	8	2.001	10	16.8	0.563	0.553	0.4627	
120 minute winter	9	4.000	10	2.2	0.321	0.524	0.2957	
120 minute winter	10	2.002	16	19.2	0.590	0.710	0.5745	
120 minute winter	11	5.000	13	3.0	0.643	0.433	0.0901	
120 minute winter	12	6.000	13	3.1	0.659	0.413	0.0776	
120 minute winter	13	5.001	15	5.7	0.422	0.407	0.4484	
15 minute winter	14	7.000	15	26.7	1.515	2.008	0.3433	
120 minute winter	15	5.002	16	15.3	0.556	0.466	0.5949	
120 minute winter	16	2.003	18	32.0	0.564	0.501	2.2099	
15 minute winter	17	8.000	18	21.5	1.220	1.489	0.9285	
120 minute winter	18	1.005	23	78.7	1.380	1.249	2.7031	
15 minute winter	19	9.000	20	-6.7	-0.862	-0.870	0.1553	
15 minute winter	20	9.001	23	32.6	1.851	2.089	0.6253	
30 minute winter	21	10.000	22	-3.8	-0.483	-0.676	0.0819	
15 minute winter	22	10.001	23	29.2	1.659	2.009	0.7178	
120 minute winter	23	1.006	24	118.2	3.260	0.445	0.9316	
120 minute winter	24	1.007	24_OUT	60.7	0.870	1.234	0.3521	441.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.35%

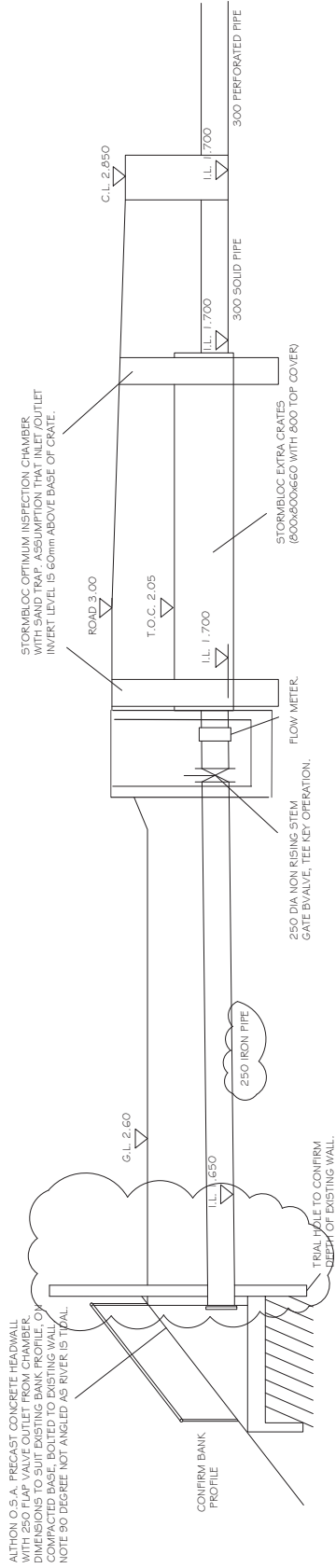
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	12	2.855	0.605	7.8	0.3323	0.0000	FLOOD RISK
1440 minute summer	2	780	2.850	0.690	1.2	0.4954	1.5346	FLOOD
1440 minute summer	3	780	2.850	0.850	2.2	2.7262	3.6289	FLOOD
1440 minute summer	4	780	2.850	0.925	3.0	2.3675	0.0000	FLOOD RISK
1440 minute summer	5	780	2.848	1.223	7.3	7.6548	0.0000	FLOOD RISK
1440 minute summer	6	780	2.850	1.050	0.6	0.6174	0.7203	FLOOD
1440 minute summer	7	780	2.850	1.110	3.2	2.0335	3.4211	FLOOD
1440 minute summer	8	780	2.850	1.190	4.3	4.0220	0.6542	FLOOD
1440 minute summer	9	780	2.850	1.050	0.6	0.6374	0.7154	FLOOD
1440 minute summer	10	780	2.850	1.230	4.7	2.6037	0.8640	FLOOD
1440 minute summer	11	780	2.850	0.900	0.7	0.5907	0.0000	FLOOD RISK
1440 minute summer	12	780	2.850	0.900	0.7	0.5979	0.0000	FLOOD RISK
1440 minute summer	13	780	2.850	1.050	1.4	0.2971	0.0000	FLOOD RISK
1440 minute summer	14	780	2.850	1.100	2.6	1.7314	2.7603	FLOOD
1440 minute summer	15	780	2.850	1.210	4.1	4.0497	2.2981	FLOOD
1440 minute summer	16	780	2.850	1.270	8.7	6.1727	1.8397	FLOOD
15 minute winter	17	9	2.850	1.025	43.3	2.2099	4.2694	FLOOD
1440 minute summer	18	780	2.850	1.375	20.0	29.3752	14.7178	FLOOD
30 minute winter	19	18	2.950	1.000	4.7	0.2830	0.1453	FLOOD
15 minute winter	20	10	2.950	1.325	56.7	2.8951	2.3594	FLOOD
1440 minute summer	21	780	2.840	1.125	1.7	0.3184	3.0347	FLOOD
1440 minute summer	22	780	2.850	1.225	3.7	2.3361	1.1560	FLOOD
1440 minute summer	23	780	2.850	1.500	30.7	27.7714	12.7121	FLOOD
1440 minute summer	24	780	2.850	2.250	32.2	250.8950	0.0000	FLOOD RISK
180 minute summer	24_OUT	60	2.880	2.290	60.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	4.0	0.479	0.263	0.2154	
1440 minute summer	2	1.001	3	1.0	0.436	0.068	0.4160	
1440 minute summer	3	1.002	4	-1.9	0.385	-0.126	0.1864	
1440 minute summer	4	1.003	5	3.0	0.419	0.187	0.6566	
1440 minute summer	5	1.004	18	6.3	0.394	0.217	1.9074	
1440 minute summer	6	2.000	8	0.6	0.169	0.178	0.2957	
1440 minute summer	7	3.000	8	2.8	0.471	0.254	0.3718	
1440 minute summer	8	2.001	10	3.9	0.456	0.128	0.4627	
1440 minute summer	9	4.000	10	0.7	0.154	0.165	0.2957	
1440 minute summer	10	2.002	16	5.2	0.455	0.193	0.5745	
1440 minute summer	11	5.000	13	0.7	0.418	0.101	0.0901	
1440 minute summer	12	6.000	13	0.7	0.427	0.094	0.0776	
1440 minute summer	13	5.001	15	1.4	0.313	0.099	0.4484	
1440 minute summer	14	7.000	15	2.2	0.478	0.165	0.3433	
1440 minute summer	15	5.002	16	3.8	0.426	0.115	0.5949	
1440 minute summer	16	2.003	18	10.2	0.449	0.160	2.2099	
15 minute winter	17	8.000	18	22.0	1.247	1.522	0.9285	
1440 minute summer	18	1.005	23	21.7	1.010	0.344	2.7031	
30 minute winter	19	9.000	20	-4.7	-0.615	-0.602	0.1553	
15 minute winter	20	9.001	23	32.5	1.848	2.086	0.6253	
1440 minute summer	21	10.000	22	-1.7	-0.215	-0.302	0.0819	
1440 minute summer	22	10.001	23	3.3	0.462	0.225	0.7178	
1440 minute summer	23	1.006	24	32.2	1.316	0.121	0.9316	
1440 minute summer	24	1.007	24_OUT	68.3	0.970	1.387	0.3521	752.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.35%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	1	10	2.882	0.632	8.3	0.3472	0.0000	FLOOD RISK
60 minute winter	2	34	2.850	0.690	8.3	0.4954	4.0620	FLOOD
120 minute winter	3	72	2.850	0.850	10.6	2.7262	8.4223	FLOOD
15 minute winter	4	10	2.900	0.975	30.6	2.5014	2.8462	FLOOD
15 minute winter	5	11	2.982	1.357	81.9	8.5959	0.0000	FLOOD RISK
120 minute winter	6	72	2.850	1.050	3.1	0.6174	1.6723	FLOOD
120 minute winter	7	72	2.850	1.110	16.7	2.0335	9.4077	FLOOD
120 minute winter	8	72	2.850	1.190	22.4	4.0220	1.8042	FLOOD
120 minute winter	9	72	2.850	1.050	3.3	0.6374	1.7417	FLOOD
60 minute winter	10	46	2.850	1.230	36.1	2.6037	0.8073	FLOOD
15 minute winter	11	11	3.000	1.050	12.4	0.6888	0.2432	FLOOD
15 minute winter	12	11	3.000	1.050	12.6	0.6972	0.2094	FLOOD
120 minute winter	13	72	2.883	1.083	6.5	0.3065	0.0000	FLOOD RISK
120 minute winter	14	72	2.850	1.100	13.8	1.7314	7.3699	FLOOD
60 minute winter	15	46	2.850	1.210	32.0	4.0497	4.2370	FLOOD
60 minute winter	16	46	2.850	1.270	59.8	6.1727	2.3233	FLOOD
60 minute winter	17	29	2.850	1.025	30.0	2.2099	13.2531	FLOOD
1440 minute summer	18	780	2.850	1.375	29.9	29.3752	13.7083	FLOOD
60 minute winter	19	32	2.950	1.000	2.7	0.2830	0.1939	FLOOD
15 minute winter	20	8	2.950	1.325	79.5	2.8951	10.6218	FLOOD
1440 minute summer	21	780	2.840	1.125	1.7	0.3184	3.0347	FLOOD
120 minute winter	22	70	2.850	1.225	19.3	2.3361	6.7143	FLOOD
1440 minute summer	23	780	2.850	1.500	45.8	27.7714	22.6326	FLOOD
60 minute winter	24	54	2.853	2.253	180.5	250.8950	0.0000	FLOOD RISK
1440 minute summer	24_OUT	780	2.880	2.290	72.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute winter	1	1.000	2	7.5	0.484	0.492	0.2154	
60 minute winter	2	1.001	3	5.6	0.663	0.381	0.4160	
120 minute winter	3	1.002	4	-9.0	0.521	-0.606	0.1864	
15 minute winter	4	1.003	5	13.6	0.772	0.854	0.6566	
15 minute winter	5	1.004	18	54.6	1.372	1.891	1.9074	
120 minute winter	6	2.000	8	2.3	0.299	0.643	0.2957	
120 minute winter	7	3.000	8	15.1	0.859	1.394	0.3718	
120 minute winter	8	2.001	10	19.7	0.565	0.651	0.4627	
120 minute winter	9	4.000	10	2.5	0.337	0.596	0.2957	
60 minute winter	10	2.002	16	33.0	0.830	1.217	0.5745	
15 minute winter	11	5.000	13	8.1	1.030	1.167	0.0901	
15 minute winter	12	6.000	13	8.3	1.067	1.121	0.0776	
120 minute winter	13	5.001	15	5.9	0.426	0.424	0.4484	
120 minute winter	14	7.000	15	12.5	0.710	0.941	0.3433	
60 minute winter	15	5.002	16	28.0	0.705	0.856	0.5949	
60 minute winter	16	2.003	18	53.3	0.757	0.835	2.2099	
60 minute winter	17	8.000	18	21.2	1.205	1.471	0.9285	
1440 minute summer	18	1.005	23	28.8	1.056	0.456	2.7031	
60 minute winter	19	9.000	20	-2.7	-0.410	-0.354	0.1553	
15 minute winter	20	9.001	23	32.6	1.850	2.088	0.6253	
1440 minute summer	21	10.000	22	-1.7	-0.215	-0.302	0.0819	
120 minute winter	22	10.001	23	16.9	0.963	1.165	0.7178	
1440 minute summer	23	1.006	24	44.4	1.256	0.167	0.9316	
60 minute winter	24	1.007	24_OUT	60.7	0.900	1.234	0.3521	388.8



SECTION C - C

SCALE 1:50

FOR LOCATION REFER TO DRG No REP-ANA-DR-00007

NO.	REV.	DATE	DESCRIPTION	BY	CHK	APP
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DRAINAGE
SECTION C - C

SCALE	AS SHOWN	CONSTRUCTION	PROVISION
DRAWING NO.	REP-ANA-DR-00007	CODE	A
PROJECT	RICHBOROUGH BESS		