DRAINAGE STRATEGY

INCORPORATING AN ASSESSMENT OF FLOOD RISK

for

COARS FARM LIMITED

PROPOSED HOLIDAY ACCOMMODATION

AND ASSOCIATED BUILDINGS

at

COARS FARM

WRIGGLESWORTH, SKIPTON

DECEMBER 2020

REFORD

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1. INTRODUCTION

1.1 This surface water and foul water drainage strategy, incorporating an assessment of flood risk, has been produced on behalf of Coars Farm Limited in support of a planning application for a proposed development comprising 30 holiday units, a 10 bed holiday converted house and barn, a restaurant / café, admin / storage building at Coars Farm, Wrigglesworth, Skipton. A location plan is included within Appendix A.

1.2 This report describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing sewers and includes a proposed strategy for the provision of new drainage to serve the proposed development.

2. BASE INFORMATION

Existing site

2.1 The proposal relates to land (approx. 2.7 hectares) at Coars Farm, Wrigglesworth, Skipton.

2.2 The site lies to the south of Wrigglesworth on the western side of Forest Becks Brow, the road linking Wrigglesworth to Sawley.

2.3 The majority of the existing site comprises rough shrubland. In the north eastern corner of the site lies the established garden centre and café. The existing farmhouse lies in the north western corner of the site.

2.4 The site has a general fall from the northern, western and southern boundaries to the centre of the eastern boundary.

2.5 Access to the site is available from Forest Becks Brow.

Proposed development

2.6 The proposed development will comprise 30 holiday units, a 10 bed holiday converted house and barn, a restaurant / café, admin / storage building. The masterplan is shown on drawing *COA01 / Dwg 08* accompanying the planning application.

Site geology

2.7 The online Soilscapes viewer has identified that the geology encountered will be slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage. It is expected that the underlying cohesive deposits are unlikely to offer the necessary permeability to make soakaway drainage a viable option.

Understanding of existing drainage within and local to the site

2.8 A watercourse lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck approx. 340m from the site's eastern boundary.

2.9 A watercourse in culvert crosses the site from its north western corner to discharge into the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck.

2.10 Within the site are separate surface water and foul water drainage systems serving the existing development. Surface water is discharged into the watercourse. Foul water from the café and farmhouse is treated by a treatment plant that is located within the roundabout at the northern end of the site.

2.11 There are no public sewers within the area.

Flood risk

2.12 The flood map for planning identifies the site lying within Flood zone 1, the lowest risk.

2.13 The Long Term Flood Risk map on the GOV.uk website shows the majority of the site is at a very low risk of surface water flooding. A very low risk means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%). A low risk of surface water flooding is shown along the line of the culverted watercourse crossing the site. A high risk is shown within the low part of the site where water can accumulate prior to discharging under the road to the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow. To mitigate against the risk of surface water flooding:

- The culverted watercourse flowing through the site is to be diverted and improved through the site to enable development to occur.
- A positive surface water drainage system is to be installed within the site with attenuation storage.
- The floor level of the holiday units are to be set a minimum 300mm above existing ground levels.

2.14 There are no canals or artificial sources local to the development site.

2.15 There are no sewers local to the development site.

2.16 The Environment Agency risk of flooding from reservoirs map identifies the site is not at risk.

2.17 The Environment Agency does not consider groundwater flooding to be a significant flood risk factor in the Ribble Valley area.

2.18 Surface water runoff from the development will be controlled to the Greenfield runoff rate, Qbar, and attenuation provided. As such there will be no change to the flood risk upstream or downstream of this location.

3. PROPOSED DRAINAGE STRATEGY

3.1 The proposed drainage layout is included within Appendix B.

Surface Water Drainage

3.2 In accordance with the National Standards for Sustainable Drainage, the drainage strategy should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):

(i) a controlled discharge to a local waterbody or watercourse, or
(ii) a controlled discharge into the public sewer network (depending on availability and capacity).

3.3 The rate and volume of discharge should be restricted to the pre-development values as far as practicable.

Surface water drainage discharges from the developed site

3.4 The online Soilscapes viewer has identified that the geology encountered will be slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage. It is expected that the underlying cohesive deposits are unlikely to offer the necessary permeability to make soakaway drainage a viable option.

3.5 In line with common practice, surface water runoff from the proposed development should mimic those from the existing site. It is therefore intended that surface water runoff from the developed site will be attenuated and discharged into the culverted watercourse that flows through the site and discharges into the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck.

3.6 Surface water runoff from the development will be controlled to the Greenfield runoff rate, Qbar. Attenuation will be provided allowing surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 30% on stored volumes to

discharge into the watercourse. The additional 30% is to allow for climate change and has been included in the surface water volume.

3.7 To determine the restricted surface water discharge rate from the developed site, the Greenfield runoff rate has been calculated using the 'Causeway Flow' programme for a site area of 2.7ha and gives a figure of 26.6 l/s.

3.8 A surface water drainage design has been carried out for the proposed site development for all events up to the 100 year critical rain storm plus 30% for climate change on stored volumes. Attenuation is provided using underground storage within landscaping and car parking areas.

3.9 The surface water drainage design is included within Appendix C.

Foul Water Drainage

3.10 Foul water discharges from the site will be treated by a new sewage treatment plant and the effluent discharged into the culverted watercourse that flows through the site and discharges into the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck. The existing treatment plant is to be removed.

3.11 A typical plant is the Marsh Industries Ultra Polylok 190PE Sewage Treatment Plant. The initial sizing of the plant has been based on 30 two bed holiday units, a 10 bed holiday converted house and a café to cater for a total of 80 people.

3.12 Due to the size of the sewage treatment plant required, a licence will be required from the Environment Agency to make an effluent discharge into the watercourse.

4. SUMMARY AND CONCLUSIONS

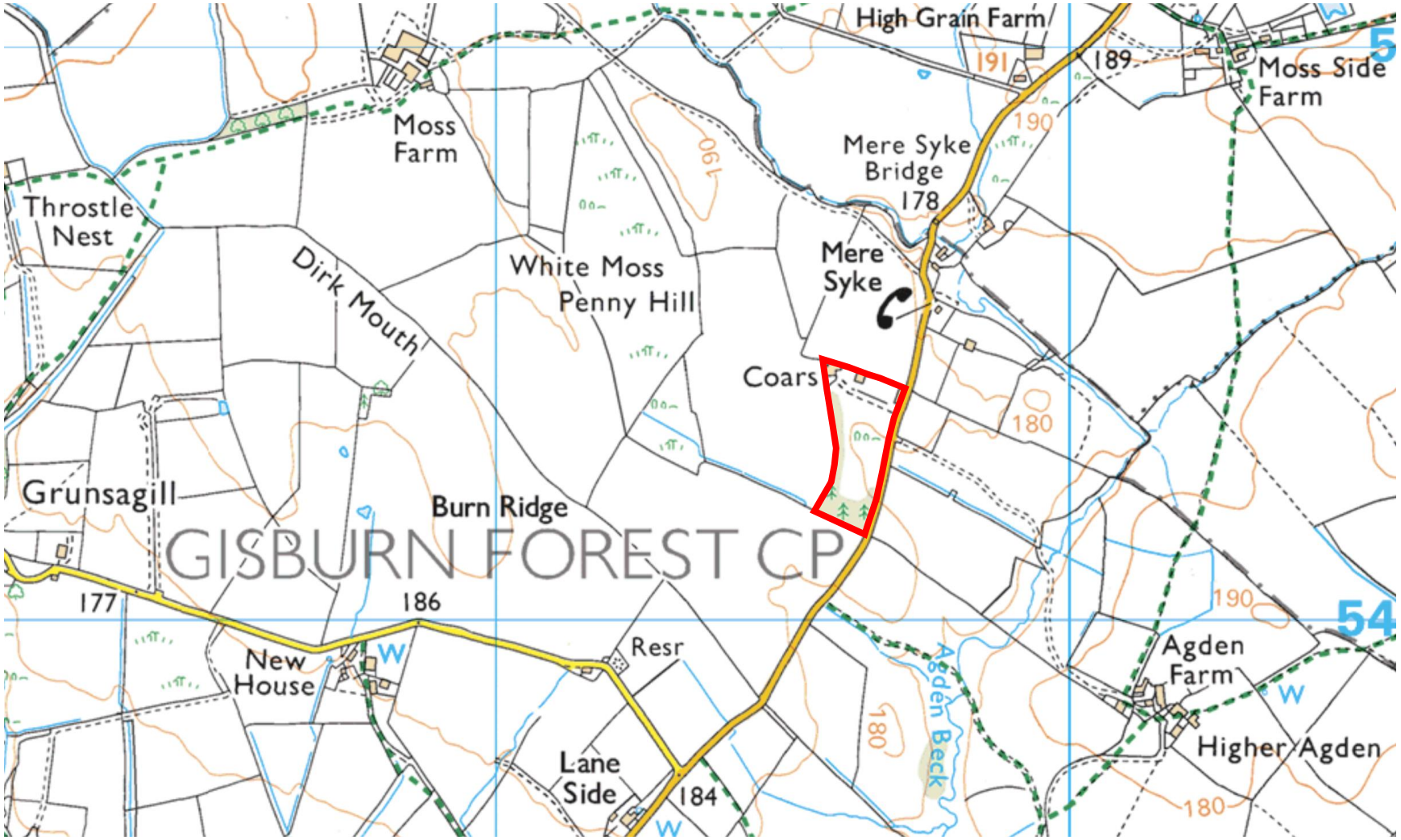
4.1 This surface water and foul water drainage strategy, incorporating an assessment of flood risk, has been produced on behalf of Coars Farm Limited in support of a planning application for a proposed development comprising 30 holiday units, a 10 bed holiday converted house and barn, a restaurant / café, admin / storage building at Coars Farm, Wrigglesworth, Skipton.

4.2 The nature of the local geology means that infiltration of surface water runoff back into the ground is not feasible on this site.

4.3 Surface water runoff from the developed site will be attenuated to the Greenfield runoff rate, Qbar, and discharged into the culverted watercourse that flows through the site and discharges into the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck. Attenuation is provided using underground storage within landscaping and car parking areas.

4.4 Foul water discharges from the site will be treated by a new sewage treatment plant and the effluent discharged into the culverted watercourse that flows through the site and discharges into the watercourse that lies immediately opposite the site on the eastern side of Forest Becks Brow and flows to the east to discharge into the Agden Beck.

APPENDIX A



LOCATION PLAN

APPENDIX B

kitchens
restaurant
patio
bar
bar lounge
Plant sales area
Farm shop
car parking area
Holiday barn
Car parking for holiday home
Reception building
Vision splay
Existing blocked up and new boundary hedge planted
Waste/recycling
New entrance
Vision splay
Holiday Units
Access Road
Attenuation area
Attenuation area
Hydrobrake manhole 20
To watercourse 22
21 Existing manhole
14 Hydrobrake manhole
Proposed STP
1
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DRAINAGE LAYOUT

APPENDIX C

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.800	Minimum Backdrop Height (m)	2.000
Ratio-R	0.260	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.061	5.00	183.000	1200	1.425
2	0.030	5.00	182.500	1200	1.425
3	0.044	5.00	183.000	1200	1.425
4	0.130	5.00	182.200	1200	1.425
5	0.030	5.00	181.000	1200	1.425
6	0.064	5.00	182.000	1200	2.677
7	0.025	5.00	183.800	1200	1.350
8	0.011	5.00	182.500	1200	1.350
9	0.049	5.00	182.500	1200	1.450
10	0.017	5.00	181.500	1200	1.425
11	0.011	5.00	181.000	1200	1.882
12	0.110	5.00	182.300	1200	1.425
13	0.038	5.00	181.000	1200	1.425
14	0.032	5.00	180.500	1200	1.500
15	0.076	5.00	180.100	1200	1.500
16	0.109	5.00	179.500	1200	1.450
17	0.112	5.00	182.500	1200	1.425
18	0.166	5.00	180.800	1200	1.425
19	0.144	5.00	179.000	1200	1.093
20			179.000	1800	1.241
21			179.000	1200	1.300

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	30.000	0.600	181.575	181.075	0.500	60.0	225	5.30	49.0
1.001	2	4	20.000	0.600	181.075	180.775	0.300	66.7	225	5.50	48.4
2.000	3	4	25.000	0.600	181.575	180.775	0.800	31.3	225	5.18	49.5
1.002	4	6	10.000	0.600	180.775	179.398	1.377	7.3	225	5.54	48.2
3.000	5	6	30.000	0.600	179.575	179.398	0.177	169.5	225	5.50	48.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.691	67.2	8.1	1.200	1.200	0.061	0.0
1.001	1.604	63.8	11.9	1.200	1.200	0.091	0.0
2.000	2.348	93.4	5.9	1.200	1.200	0.044	0.0
1.002	4.886	194.3	34.6	1.200	2.377	0.265	0.0
3.000	1.001	39.8	3.9	1.200	2.377	0.030	0.0

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)
1.003	6	11	50.000	0.600	179.323	179.118	0.205	243.9	300	6.37	45.7
4.000	7	8	20.000	0.600	182.450	181.150	1.300	15.4	150	5.13	49.6
4.001	8	9	10.000	0.600	181.150	181.050	0.100	100.0	150	5.30	49.0
4.002	9	10	10.000	0.600	181.050	180.150	0.900	11.1	150	5.35	48.9
4.003	10	11	30.000	0.600	180.075	179.193	0.882	34.0	225	5.57	48.1
1.004	11	14	20.000	0.600	179.118	179.000	0.118	169.5	300	6.65	44.9
5.000	12	13	40.000	0.600	180.875	179.575	1.300	30.8	225	5.28	49.1
5.001	13	14	15.000	0.600	179.575	179.075	0.500	30.0	225	5.39	48.7
1.005	14	15	25.000	0.600	179.000	178.600	0.400	62.5	300	6.86	44.4
1.006	15	16	40.000	0.600	178.600	178.050	0.550	72.7	300	7.22	43.4
1.007	16	19	35.000	0.600	178.050	177.907	0.143	244.8	300	7.80	42.0
6.000	17	18	40.000	0.600	181.075	179.375	1.700	23.5	225	5.25	49.2
6.001	18	19	40.000	0.600	179.375	177.907	1.468	27.2	225	5.51	48.3
1.008	19	20	25.000	0.600	177.907	177.759	0.148	168.9	300	8.14	41.3
1.009	20	21	10.000	0.600	177.759	177.700	0.059	169.5	300	8.28	40.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.003	1.002	70.8	44.5	2.377	1.582	0.359	0.0
4.000	2.581	45.6	3.4	1.200	1.200	0.025	0.0
4.001	1.005	17.8	4.8	1.200	1.300	0.036	0.0
4.002	3.039	53.7	11.3	1.300	1.200	0.085	0.0
4.003	2.250	89.5	13.3	1.200	1.582	0.102	0.0
1.004	1.205	85.1	57.5	1.582	1.200	0.472	0.0
5.000	2.367	94.1	14.6	1.200	1.200	0.110	0.0
5.001	2.397	95.3	19.6	1.200	1.200	0.148	0.0
1.005	1.992	140.8	78.4	1.200	1.200	0.652	0.0
1.006	1.845	130.4	85.7	1.200	1.150	0.728	0.0
1.007	1.000	70.7	95.3	1.150	0.793	0.837	0.0
6.000	2.708	107.7	14.9	1.200	1.200	0.112	0.0
6.001	2.516	100.0	36.4	1.200	0.868	0.278	0.0
1.008	1.207	85.3	140.8	0.793	0.941	1.259	0.0
1.009	1.205	85.1	139.7	0.941	1.000	1.259	0.0

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	30.000	60.0	225	Circular	183.000	181.575	1.200	182.500	181.075	1.200
1.001	20.000	66.7	225	Circular	182.500	181.075	1.200	182.200	180.775	1.200
2.000	25.000	31.3	225	Circular	183.000	181.575	1.200	182.200	180.775	1.200
1.002	10.000	7.3	225	Circular	182.200	180.775	1.200	182.000	179.398	2.377
3.000	30.000	169.5	225	Circular	181.000	179.575	1.200	182.000	179.398	2.377
1.003	50.000	243.9	300	Circular	182.000	179.323	2.377	181.000	179.118	1.582

Link
1.000
1.001
2.000
1.002
3.000
1.003

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)
4.000	20.000	15.4	150	Circular	183.800	182.450	1.200	182.500	181.150	1.200
4.001	10.000	100.0	150	Circular	182.500	181.150	1.200	182.500	181.050	1.300
4.002	10.000	11.1	150	Circular	182.500	181.050	1.300	181.500	180.150	1.200
4.003	30.000	34.0	225	Circular	181.500	180.075	1.200	181.000	179.193	1.582
1.004	20.000	169.5	300	Circular	181.000	179.118	1.582	180.500	179.000	1.200
5.000	40.000	30.8	225	Circular	182.300	180.875	1.200	181.000	179.575	1.200
5.001	15.000	30.0	225	Circular	181.000	179.575	1.200	180.500	179.075	1.200
1.005	25.000	62.5	300	Circular	180.500	179.000	1.200	180.100	178.600	1.200
1.006	40.000	72.7	300	Circular	180.100	178.600	1.200	179.500	178.050	1.150
1.007	35.000	244.8	300	Circular	179.500	178.050	1.150	179.000	177.907	0.793
6.000	40.000	23.5	225	Circular	182.500	181.075	1.200	180.800	179.375	1.200
6.001	40.000	27.2	225	Circular	180.800	179.375	1.200	179.000	177.907	0.868
1.008	25.000	168.9	300	Circular	179.000	177.907	0.793	179.000	177.759	0.941
1.009	10.000	169.5	300	Circular	179.000	177.759	0.941	179.000	177.700	1.000

Link
4.000
4.001
4.002
4.003
1.004
5.000
5.001
1.005
1.006
1.007
6.000
6.001
1.008
1.009

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.800	Drain Down Time (mins)	240
Ratio-R	0.260	Additional Storage (m³/ha)	20.0
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 %)
1	0	0	0
30	0	0	0
100	0	0	0
100	30	0	0

Node 14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	179.000	Product Number	CTL-SHE-0098-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 20 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	177.759	Product Number	CTL-SHE-0222-2660-1240-2660
Design Depth (m)	1.240	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	26.6	Min Node Diameter (mm)	1800

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	179.323
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.90	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	360.0	0.0	1.200	360.0	0.0	1.201	0.0	0.0

Node 16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	178.050
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	120

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	225.0	0.0	0.800	225.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.622	0.047	6.6	0.0934	0.0000	OK
15 minute winter	2	10	181.135	0.060	9.8	0.0934	0.0000	OK
15 minute winter	3	10	181.609	0.034	4.8	0.0601	0.0000	OK
15 minute winter	4	10	180.837	0.062	28.3	0.1822	0.0000	OK
15 minute winter	5	11	179.618	0.043	3.3	0.0671	0.0000	OK
360 minute winter	6	264	179.494	0.171	10.3	55.6719	0.0000	OK
15 minute winter	7	10	182.475	0.025	2.7	0.0371	0.0000	OK
15 minute winter	8	10	181.199	0.049	3.9	0.0639	0.0000	OK
15 minute winter	9	10	181.094	0.043	9.1	0.0786	0.0000	OK
15 minute winter	10	10	180.127	0.052	10.8	0.0715	0.0000	OK
360 minute winter	11	264	179.494	0.376	5.4	0.4689	0.0000	SURCHARGED
15 minute winter	12	10	180.929	0.053	11.9	0.1430	0.0000	OK
15 minute winter	13	10	179.636	0.061	15.8	0.1020	0.0000	OK
360 minute winter	14	264	179.493	0.493	5.6	0.7688	0.0000	SURCHARGED
15 minute winter	15	10	178.675	0.075	13.0	0.1603	0.0000	OK
120 minute summer	16	72	178.134	0.084	16.7	18.2515	0.0000	OK
15 minute winter	17	10	181.126	0.051	12.2	0.1368	0.0000	OK
15 minute winter	18	10	179.458	0.083	30.0	0.2880	0.0000	OK
15 minute winter	19	12	178.160	0.253	45.0	0.9531	0.0000	OK
15 minute winter	20	12	178.147	0.388	27.8	0.9873	0.0000	SURCHARGED
15 minute winter	21	12	177.812	0.112	25.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	6.5	0.897	0.096	0.2176	
15 minute winter	2	1.001	4	9.6	1.113	0.150	0.1731	
15 minute winter	3	2.000	4	4.7	0.766	0.051	0.1577	
15 minute winter	4	1.002	6	28.0	3.340	0.144	0.0839	
15 minute winter	5	3.000	6	3.2	0.601	0.080	0.1580	
360 minute winter	6	1.003	11	4.8	0.427	0.067	2.7972	
15 minute winter	7	4.000	8	2.7	0.800	0.059	0.0694	
15 minute winter	8	4.001	9	3.8	0.823	0.213	0.0464	
15 minute winter	9	4.002	10	9.0	2.191	0.167	0.0410	
15 minute winter	10	4.003	11	10.6	1.329	0.119	0.7010	
360 minute winter	11	1.004	14	4.8	0.168	0.057	1.4084	
15 minute winter	12	5.000	13	11.7	1.472	0.125	0.3189	
15 minute winter	13	5.001	14	15.6	1.084	0.164	0.3638	
360 minute winter	14	1.005	15	4.9	0.915	0.035	0.1491	
15 minute winter	15	1.006	16	13.3	1.775	0.102	0.3631	
120 minute summer	16	1.007	19	12.3	0.638	0.173	1.2645	
15 minute winter	17	6.000	18	12.0	1.217	0.112	0.3998	
15 minute winter	18	6.001	19	29.4	1.338	0.294	1.0593	
15 minute winter	19	1.008	20	27.8	0.658	0.327	1.6729	
15 minute winter	20	1.009	21	25.9	1.013	0.304	0.2555	54.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.649	0.074	16.1	0.1472	0.0000	OK
15 minute winter	2	10	181.173	0.098	23.8	0.1527	0.0000	OK
15 minute winter	3	10	181.628	0.053	11.6	0.0929	0.0000	OK
15 minute winter	4	10	180.879	0.103	69.2	0.3058	0.0000	OK
480 minute winter	5	456	179.897	0.322	1.3	0.4991	0.0000	SURCHARGED
480 minute winter	6	456	179.897	0.574	21.9	186.7546	0.0000	SURCHARGED
15 minute winter	7	10	182.489	0.038	6.6	0.0577	0.0000	OK
15 minute winter	8	10	181.232	0.082	9.4	0.1066	0.0000	OK
15 minute winter	9	10	181.122	0.072	22.1	0.1308	0.0000	OK
15 minute winter	10	10	180.158	0.083	26.5	0.1138	0.0000	OK
480 minute winter	11	456	179.896	0.778	7.2	0.9714	0.0000	SURCHARGED
15 minute winter	12	10	180.960	0.085	29.1	0.2272	0.0000	OK
480 minute winter	13	456	179.896	0.321	6.2	0.5345	0.0000	SURCHARGED
480 minute winter	14	456	179.896	0.896	7.5	1.3962	0.0000	SURCHARGED
15 minute summer	15	9	178.696	0.096	23.8	0.2050	0.0000	OK
120 minute winter	16	88	178.398	0.348	39.6	75.3363	0.0000	SURCHARGED
15 minute winter	17	10	181.155	0.080	29.6	0.2158	0.0000	OK
15 minute winter	18	10	179.524	0.149	73.1	0.5172	0.0000	OK
15 minute winter	19	11	178.492	0.584	108.6	2.2011	0.0000	SURCHARGED
15 minute winter	20	11	178.476	0.717	34.3	1.8248	0.0000	SURCHARGED
30 minute summer	21	16	177.814	0.114	26.6	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)
15 minute winter	1	1.000	2	15.9	1.137	0.237	0.4208	
15 minute winter	2	1.001	4	23.4	1.370	0.367	0.3449	
15 minute winter	3	2.000	4	11.5	0.936	0.123	0.3118	
15 minute winter	4	1.002	6	68.5	4.155	0.353	0.1650	
480 minute winter	5	3.000	6	1.3	0.397	0.032	1.1931	
480 minute winter	6	1.003	11	-7.0	0.378	-0.098	3.5210	
15 minute winter	7	4.000	8	6.5	0.986	0.143	0.1347	
15 minute winter	8	4.001	9	9.2	1.016	0.520	0.0916	
15 minute winter	9	4.002	10	22.0	2.746	0.409	0.0800	
15 minute winter	10	4.003	11	26.2	1.367	0.293	0.7960	
480 minute winter	11	1.004	14	4.6	0.131	0.054	1.4084	
15 minute winter	12	5.000	13	28.8	1.758	0.306	1.0696	
480 minute winter	13	5.001	14	6.2	0.744	0.065	0.5966	
480 minute winter	14	1.005	15	4.9	0.904	0.035	0.1607	
15 minute summer	15	1.006	16	24.6	1.898	0.189	1.1032	
120 minute winter	16	1.007	19	25.5	0.733	0.361	2.4647	
15 minute winter	17	6.000	18	29.3	1.494	0.272	0.8118	
15 minute winter	18	6.001	19	70.9	1.912	0.709	1.3552	
15 minute winter	19	1.008	20	34.3	0.748	0.402	1.7605	
15 minute winter	20	1.009	21	26.6	1.021	0.313	0.2610	132.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.660	0.085	20.7	0.1682	0.0000	OK
15 minute winter	2	10	181.190	0.115	30.7	0.1780	0.0000	OK
15 minute winter	3	10	181.635	0.060	14.9	0.1055	0.0000	OK
15 minute winter	4	10	180.897	0.122	89.0	0.3601	0.0000	OK
600 minute winter	5	570	180.147	0.572	1.4	0.8875	0.0000	SURCHARGED
600 minute winter	6	570	180.147	0.824	24.0	268.2484	0.0000	SURCHARGED
15 minute winter	7	10	182.494	0.044	8.5	0.0657	0.0000	OK
15 minute winter	8	10	181.247	0.097	12.1	0.1259	0.0000	OK
15 minute winter	9	10	181.135	0.085	28.5	0.1538	0.0000	OK
15 minute winter	10	10	180.170	0.095	34.1	0.1307	0.0000	OK
600 minute winter	11	570	180.147	1.029	8.1	1.2837	0.0000	SURCHARGED
15 minute winter	12	10	180.972	0.097	37.3	0.2606	0.0000	OK
600 minute winter	13	570	180.147	0.571	6.7	0.9509	0.0000	SURCHARGED
600 minute winter	14	570	180.146	1.146	7.7	1.7860	0.0000	SURCHARGED
15 minute summer	15	9	178.703	0.103	28.8	0.2208	0.0000	OK
120 minute winter	16	94	178.593	0.543	58.9	117.5299	0.0000	SURCHARGED
15 minute winter	17	10	181.166	0.091	38.0	0.2471	0.0000	OK
15 minute winter	18	11	179.775	0.400	93.9	1.3829	0.0000	SURCHARGED
15 minute winter	19	10	178.622	0.715	128.1	2.6941	0.0000	SURCHARGED
15 minute winter	20	10	178.611	0.852	34.4	2.1683	0.0000	SURCHARGED
30 minute winter	21	14	177.814	0.114	26.6	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)
15 minute winter	1	1.000	2	20.5	1.207	0.304	0.5096	
15 minute winter	2	1.001	4	30.1	1.439	0.473	0.4226	
15 minute winter	3	2.000	4	14.8	0.982	0.158	0.3808	
15 minute winter	4	1.002	6	88.2	4.385	0.454	0.2026	
600 minute winter	5	3.000	6	1.2	0.383	0.030	1.1931	
600 minute winter	6	1.003	11	-7.9	0.368	-0.112	3.5210	
15 minute winter	7	4.000	8	8.4	1.037	0.185	0.1636	
15 minute winter	8	4.001	9	11.9	1.071	0.670	0.1120	
15 minute winter	9	4.002	10	28.3	2.905	0.526	0.0973	
15 minute winter	10	4.003	11	33.8	1.325	0.378	0.8367	
600 minute winter	11	1.004	14	4.2	0.123	0.050	1.4084	
15 minute winter	12	5.000	13	36.9	1.728	0.393	1.1245	
600 minute winter	13	5.001	14	6.2	0.721	0.065	0.5966	
600 minute winter	14	1.005	15	4.9	0.881	0.035	0.1609	
15 minute summer	15	1.006	16	29.8	1.910	0.229	1.4802	
120 minute winter	16	1.007	19	-28.9	0.725	-0.409	2.4647	
15 minute winter	17	6.000	18	37.7	1.523	0.350	1.0980	
15 minute winter	18	6.001	19	83.2	2.093	0.832	1.5908	
15 minute winter	19	1.008	20	34.4	0.794	0.403	1.7605	
15 minute winter	20	1.009	21	26.6	1.021	0.313	0.2611	153.9

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 98.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	181.673	0.098	26.9	0.1942	0.0000	OK
15 minute winter	2	10	181.211	0.136	39.8	0.2114	0.0000	OK
15 minute winter	3	10	181.644	0.069	19.4	0.1208	0.0000	OK
15 minute winter	4	10	180.922	0.147	115.7	0.4338	0.0000	OK
720 minute winter	5	690	180.494	0.919	1.6	1.4268	0.0000	SURCHARGED
720 minute winter	6	690	180.494	1.171	29.3	381.3956	0.0000	SURCHARGED
15 minute winter	7	10	182.500	0.050	11.0	0.0752	0.0000	OK
15 minute winter	8	10	181.269	0.119	15.8	0.1541	0.0000	OK
15 minute winter	9	10	181.153	0.103	37.1	0.1856	0.0000	OK
720 minute winter	10	690	180.494	0.419	5.4	0.5741	0.0000	SURCHARGED
720 minute winter	11	690	180.494	1.376	10.9	1.7172	0.0000	SURCHARGED
15 minute winter	12	11	180.998	0.123	48.5	0.3283	0.0000	OK
720 minute winter	13	690	180.494	0.919	7.7	1.5288	0.0000	SURCHARGED
720 minute winter	14	690	180.494	1.494	9.1	2.3271	0.0000	FLOOD RISK
180 minute winter	15	140	178.999	0.399	14.7	0.8554	0.0000	SURCHARGED
180 minute winter	16	140	178.997	0.947	58.6	173.6011	0.0000	SURCHARGED
15 minute winter	17	11	181.190	0.115	49.4	0.3098	0.0000	OK
15 minute winter	18	12	180.531	1.156	121.3	3.9996	0.0000	FLOOD RISK
180 minute winter	19	140	178.993	1.086	57.4	4.0888	0.0000	FLOOD RISK
180 minute winter	20	140	178.976	1.217	27.3	3.0982	0.0000	FLOOD RISK
15 minute winter	21	7	177.814	0.114	26.6	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)
15 minute winter	1	1.000	2	26.6	1.277	0.396	0.6249	
15 minute winter	2	1.001	4	39.1	1.545	0.614	0.5255	
15 minute winter	3	2.000	4	19.3	1.028	0.206	0.4717	
15 minute winter	4	1.002	6	114.6	4.607	0.590	0.2622	
720 minute winter	5	3.000	6	1.5	0.365	0.037	1.1931	
720 minute winter	6	1.003	11	-10.7	0.323	-0.151	3.5210	
15 minute winter	7	4.000	8	10.9	1.082	0.240	0.2015	
15 minute winter	8	4.001	9	15.5	1.130	0.872	0.1393	
15 minute winter	9	4.002	10	36.8	3.055	0.685	0.1223	
720 minute winter	10	4.003	11	5.4	0.748	0.060	1.1931	
720 minute winter	11	1.004	14	-4.9	0.118	-0.058	1.4084	
15 minute winter	12	5.000	13	46.8	1.822	0.498	1.2381	
720 minute winter	13	5.001	14	7.4	0.713	0.077	0.5966	
720 minute winter	14	1.005	15	4.9	0.915	0.035	0.1610	
180 minute winter	15	1.006	16	14.7	1.448	0.112	2.8168	
180 minute winter	16	1.007	19	-29.4	0.733	-0.415	2.4647	
15 minute winter	17	6.000	18	48.1	1.515	0.447	1.2016	
15 minute winter	18	6.001	19	100.3	2.522	1.002	1.5908	
180 minute winter	19	1.008	20	27.3	0.549	0.320	1.7605	
180 minute winter	20	1.009	21	26.6	1.021	0.313	0.2611	455.5