

Project name	Ocado, Bicester Plot B		
Design note title	Drainage Strategy Technical Note		
Document reference	Drainage Strategy Technical Note		
Author	James Welch		
Revision	P02		
Date	16.11.2020	Approved	✓

Hydrock Consultants have been commissioned to complete the detailed design of the foul and storm water drainage to accommodate the extension of the external yard and parking for Plot B at Symmetry Park, Bicester. The proposed works included additional parking area, out buildings, vehicle wash down, refuelling and storage zones.

This technical note is to be read in accordance with Hydrock drawings C-13482-HYD-00-ZZ-DR-7000 and 7001 - Drainage Strategy Sheets 1 and 2 respectively.

1. EXISTING STORM DRAINAGE

The existing storm water system for Plot B has been designed and installed to accommodate a 1in100yr+20% climate change storm event. The existing network has a pumped outfall with a pump rate of 5.5(l/s) for storms up to and including a 1in1yr event and 12.5(l/s) for all storms exceeding this event. The existing as built system when modelled for a 1in100yr+20%CC storm event has 17.3m³ of flooding in total (See Appendix A for MicroDrainage Results). When modelled for the 1in100yr+40%CC event as required to comply with current legislation the existing system floods to a volume of 360.7m³ (See Appendix B for MicroDrainage Results). Regardless of any planned extension or development this flooding would be the case for such a storm event.

2. PROPOSED STORM WATER STRATEGY

It is proposed to limit any impact on the existing as built drainage as a result of the proposed works. With the exception of minor diversion to avoid proposed out buildings the existing network is to remain unchanged. This approach includes the existing pumping station and rising main that will remain as per the previously approved discharge rates and not increasing as a result of the increased impermeable area.

The proposed system primarily consists of a network of drainage channel with the surface levels graded to ensure car parking and yard areas fall towards the above-mentioned channels. Any rainwater pipes are connected via a traditional manhole and piped gravity system. The point of connection to the existing storm system is downstream of the existing petrol interceptor (to avoid overloading the existing interceptor) but upstream of the existing attenuation tank. The proposed system drains to the existing pump via the existing network with the existing pump acting as the flow control device for the complete site (existing and proposed); there is therefore no requirement for a flow control device on the proposed network.

With the existing discharge rate not increasing but additional impermeable area draining to the system there is a need for additional attenuation to control flooding. Attenuation is provided in the form of an offline tank located on the proposed system. The required attenuation volume is 570m³ to ensure the extent of flooding on the proposed system is controlled and that the flooding on the existing system does not increase.

When modelling for a 1in100yr+40%CC event the proposed system does not discharge at an increased rate from existing and has 13.1m³ of flooding. This flooding can be accommodated within the natural valley/low point of the proposed car park above ground. The existing system has 355.9m³ of flooding which is a 4.8m³ improvement from the existing situation (See Appendix C for MicroDrainage Results).

There is no flooding during for any event up to and including the 1in30yr return period storm.

There is therefore no increase in discharge rate and no increase in flooding from the plot B site as a result of the increase in impermeable area.

3. POLLUTION CONTROL AND SUDS FEATURES

Due to the nature of the development (primarily external yard and parking) the proposed works are to drain via a suitably sized full retention petrol interceptor. The wash down facility is to drain via a washdown/silt trap unit that will discharge to the storm system - this is necessary due to the foul drainage being a water treatment system and the impact any potential pollution could have on the treatment facility operating efficiently. The refuelling area is to drain via a class 1 forecourt interceptor. All interceptor and washdown units are to be alarmed.

Attenuation is primarily provided within a below ground storage crate due to the limited space available on site and the need for all external areas to be treated. There is a swale to collect runoff from the footpath area as an additional SUDs item.

4. FOUL DRAINAGE SYSTEM

Additional foul connections have been provided to proposed buildings that will require foul outlets. All connections can drain via gravity to the existing system.

At the time of writing this report the exact staff number is unknown. Subject to confirmation of this number the existing foul treatment facility may need to be upgraded.

Appendix A

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Symmetry Park

Bicester

Zone 2

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Network 2018.1.1

Micro Drainage

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 0.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

FSR

Ratio R 0.403

Region England and Wales

Cv (Summer) 0.750

M5-60 (mm)

20.000

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)

300.0

Analysis Timestep 2.5 Second

Increment (Extended)

DTS Status

ON

DVD Status

OFF

Inertia Status

OFF

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years)

100

Climate Change (%)

20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	100	+20%	100/15 Summer	100/15 Summer		
1.001	2	15 Winter	100	+20%	100/15 Summer	100/15 Winter		
1.002	3	15 Winter	100	+20%	100/15 Summer			
1.003	4	960 Winter	100	+20%	100/15 Summer			
1.004	5	960 Winter	100	+20%	100/15 Summer			
1.005	5A	960 Winter	100	+20%	100/15 Summer			
1.006	6	960 Winter	100	+20%	100/15 Summer			
2.000	7	960 Winter	100	+20%	100/15 Summer			
1.007	7	960 Winter	100	+20%	100/15 Summer			
1.008	8	960 Winter	100	+20%	100/15 Summer			
1.009	9	960 Winter	100	+20%	100/15 Summer			
1.010	10	960 Winter	100	+20%	100/15 Summer			
3.000	11	15 Winter	100	+20%	100/15 Summer			
3.001	12	15 Winter	100	+20%	100/15 Summer	100/15 Summer		
3.002	13	15 Winter	100	+20%	100/15 Summer			
3.003	14	15 Winter	100	+20%	100/15 Summer			
3.004	14A	960 Winter	100	+20%	100/15 Summer			
3.005	15	960 Winter	100	+20%	100/15 Summer			
3.006	16	960 Winter	100	+20%	100/15 Summer			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

US/MH		Return Climate	First (X)	First (Y)	First (Z)	Overflow	Water Level
PN	Name						
	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
1.011	11 960 Winter	100	+20%	100/15 Summer			65.252
4.000	17 960 Winter	100	+20%	100/15 Summer			65.220
4.001	22 960 Winter	100	+20%	100/480 Winter			65.220
4.002	23 960 Winter	100	+20%	100/15 Summer			65.218
1.012	13 960 Winter	100	+20%	100/15 Summer			65.216

Surcharged Flooded		Pipe		Level	
US/MH	Depth	Volume	Flow / Overflow	Flow	Level
PN	Name	(m)	(m³)	Cap. (l/s)	Exceeded
1.011	11	3.202	0.000	1.17	16.4 SURCHARGED
4.000	17	0.565	0.000	0.08	2.8 SURCHARGED
4.001	22	0.965	0.000	0.07	3.9 SURCHARGED
4.002	23	1.613	0.000	0.05	5.6 SURCHARGED
1.012	13	3.336	0.000	0.79	12.5 SURCHARGED

Appendix B

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Micro Drainage

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 0.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.403

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 100

Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	960 Winter	100	+40%	100/15 Summer	100/15 Summer		
1.001	2	960 Winter	100	+40%	100/15 Summer	100/15 Summer		
1.002	3	960 Winter	100	+40%	100/15 Summer			
1.003	4	960 Winter	100	+40%	100/15 Summer			
1.004	5	960 Winter	100	+40%	100/15 Summer			
1.005	5A	960 Winter	100	+40%	100/15 Summer	100/480 Winter		
1.006	6	960 Winter	100	+40%	100/15 Summer			
2.000	7	960 Winter	100	+40%	100/15 Summer	100/240 Winter		
1.007	7	960 Winter	100	+40%	100/15 Summer	100/240 Winter		
1.008	8	960 Winter	100	+40%	100/15 Summer			
1.009	9	960 Winter	100	+40%	100/15 Summer			
1.010	10	960 Winter	100	+40%	100/15 Summer			
3.000	11	15 Winter	100	+40%	100/15 Summer			
3.001	12	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
3.002	13	15 Winter	100	+40%	100/15 Summer			
3.003	14	960 Winter	100	+40%	100/15 Summer			
3.004	14A	960 Winter	100	+40%	100/15 Summer			
3.005	15	960 Winter	100	+40%	100/15 Summer			
3.006	16	960 Winter	100	+40%	100/15 Summer			

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)
1.011	11	960 Winter	100	+40%	100/15 Summer				65.630
4.000	17	960 Winter	100	+40%	100/15 Summer				65.540
4.001	22	960 Winter	100	+40%	100/15 Summer				65.551
4.002	23	960 Winter	100	+40%	100/15 Summer				65.557
1.012	13	960 Winter	100	+40%	100/15 Summer				65.562

		Surcharged Flooded			Pipe		
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Level Exceeded
1.011	11	3.580	0.000	1.30		18.2	SURCHARGED
4.000	17	0.885	0.000	0.09		3.3	SURCHARGED
4.001	22	1.296	0.000	0.08		4.6	SURCHARGED
4.002	23	1.952	0.000	0.05		6.5	SURCHARGED
1.012	13	3.682	0.000	0.79		12.5	SURCHARGED

Appendix C

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Date 18/09/2019 16:40 File Zone 2 Proposed.MDX										Designed by Alex Badek Checked by John Hayden	
Innovyze										Network 2018.1.1	
<u>Existing Network Details for Storm</u>											
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type		
1.000	45.400	0.305	148.9	0.101	4.00	0.600	o	225	Pipe/Conduit		
1.001	48.040	0.240	200.0	0.122	0.00	0.600	o	300	Pipe/Conduit		
1.002	18.000	0.090	200.0	0.052	0.00	0.600	o	300	Pipe/Conduit		
1.003	86.800	0.460	188.7	0.000	0.00	0.600	o	300	Pipe/Conduit		
1.004	11.000	0.050	220.0	0.000	0.00	0.600	o	300	Pipe/Conduit		
1.005	19.900	0.095	209.5	0.000	0.00	0.600	o	300	Pipe/Conduit		
1.006	56.170	0.119	472.0	0.228	0.00	0.600	o	525	Pipe/Conduit		
2.000	49.800	1.194	41.7	0.205	4.00	0.600	o	300	Pipe/Conduit		
1.007	18.600	0.050	372.0	0.350	0.00	0.600	o	525	Pipe/Conduit		
1.008	5.250	0.050	105.0	0.000	0.00	0.600	o	525	Pipe/Conduit		
1.009	5.250	0.050	105.0	0.000	0.00	0.600	o	525	Pipe/Conduit		
3.000	85.700	0.355	241.4	0.229	4.00	0.600	o	300	Pipe/Conduit		
4.000	57.300	0.355	161.4	0.373	4.00	0.600	o	300	Pipe/Conduit		
3.001	21.900	1.814	12.1	0.000	0.00	0.600	o	300	Pipe/Conduit		
5.000	24.100	0.340	70.9	0.035	4.00	0.600	o	150	Pipe/Conduit		
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)		
1.000	1	65.470	64.240	1.005	65.480	63.935	1.320		1200		
1.001	2	65.480	63.860	1.320	65.700	63.620	1.780		1200		
1.002	3	65.700	63.620	1.780	65.830	63.530	2.000		1200		
1.003	4	65.830	63.530	2.000	65.850	63.070	2.480		1200		
1.004	5	65.850	63.070	2.480	65.505	63.020	2.185		1200		
1.005	5A	65.505	63.020	2.185	65.860	62.925	2.635		1200		
1.006	6	65.860	62.700	2.635	65.390	62.581	2.284		1500		
2.000	7	65.390	64.000	1.090	65.390	62.806	2.284		1200		
1.007	7	65.390	62.581	2.284	65.770	62.531	2.714		1500		
1.008	8	65.770	62.531	2.714	65.770	62.481	2.764		1500		
1.009	9	65.770	62.231	3.014	65.780	62.181	3.074		1500		
3.000	N1	66.205	64.705	1.200	66.205	64.350	1.555		1200		
4.000	N2	66.205	64.705	1.200	66.205	64.350	1.555		1200		
3.001	N3	66.205	64.350	1.555	66.065	62.536	3.229		1200		
5.000	N4	66.065	64.715	1.200	66.065	64.375	1.540		1200		
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Date 18/09/2019 16:40 File Zone 2 Proposed.MDX								Designed by Alex Badek Checked by John Hayden	
Innovyze								Network 2018.1.1	
<u>Existing Network Details for Storm</u>									
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
5.001	21.300	1.789	11.9	0.017	0.00	0.600	o	150	Pipe/Conduit
3.002	12.100	0.030	403.3	0.000	0.00	0.600	o	525	Pipe/Conduit
1.010	5.250	0.050	105.0	0.000	0.00	0.600	o	525	Pipe/Conduit
6.000	28.180	0.080	352.3	0.237	4.00	0.600	o	600	Pipe/Conduit
6.001	27.910	0.080	348.9	0.484	0.00	0.600	o	600	Pipe/Conduit
6.002	28.300	0.070	404.3	0.484	0.00	0.600	o	600	Pipe/Conduit
6.003	19.700	0.100	197.0	0.245	0.00	0.600	o	600	Pipe/Conduit
6.004	12.600	0.060	210.0	0.000	0.00	0.600	o	600	Pipe/Conduit
6.005	19.430	0.890	21.8	0.063	0.00	0.600	o	600	Pipe/Conduit
6.006	6.000	0.050	120.0	0.000	0.00	0.600	o	600	Pipe/Conduit
1.011	4.670	0.050	93.4	0.000	0.00	0.600	o	150	Pipe/Conduit
7.000	80.030	0.400	200.1	0.083	4.00	0.600	o	225	Pipe/Conduit
7.001	47.300	0.650	72.8	0.033	0.00	0.600	o	225	Pipe/Conduit
7.002	25.000	1.650	15.2	0.050	0.00	0.600	o	225	Pipe/Conduit
1.012	10.000	0.100	100.0	0.000	0.00	0.600	o	150	Pipe/Conduit
PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
5.001	N5	66.065	64.375	1.540	66.065	62.586	3.329		1200
3.002	N6	66.065	62.211	3.329	65.780	62.181	3.074		1500
1.010	10	65.780	62.181	3.074	66.040	62.131	3.384		1500
6.000	11	65.970	64.330	1.040	65.840	64.250	0.990		1500
6.001	12	65.840	64.250	0.990	65.900	64.170	1.130		1500
6.002	13	65.900	64.170	1.130	65.960	64.100	1.260		1500
6.003	14	65.960	64.100	1.260	65.950	64.000	1.350		1500
6.004	14A	65.950	64.000	1.350	65.810	63.940	1.270		1500
6.005	15	65.810	63.940	1.270	65.900	63.050	2.250		1500
6.006	16	65.900	63.050	2.250	66.040	63.000	2.440		1500
1.011	11	66.040	61.900	3.990	66.110	61.850	4.110		1500
7.000	17	65.930	64.430	1.275	66.190	64.030	1.935		1200
7.001	22	66.190	64.030	1.935	65.860	63.380	2.255		1200
7.002	23	65.860	63.380	2.255	66.110	61.730	4.155		1200
1.012	13	66.110	61.730	4.230	65.030	61.630	3.250	Complex	1200
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Manhole Schedules for Storm											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	65.470	1.230	Open Manhole	1200	1.000	64.240	225				
2	65.480	1.620	Open Manhole	1200	1.001	63.860	300	1.000	63.935	225	
3	65.700	2.080	Open Manhole	1200	1.002	63.620	300	1.001	63.620	300	
4	65.830	2.300	Open Manhole	1200	1.003	63.530	300	1.002	63.530	300	
5	65.850	2.780	Open Manhole	1200	1.004	63.070	300	1.003	63.070	300	
5A	65.505	2.485	Open Manhole	1200	1.005	63.020	300	1.004	63.020	300	
6	65.860	3.160	Open Manhole	1500	1.006	62.700	525	1.005	62.925	300	
7	65.390	1.390	Open Manhole	1200	2.000	64.000	300				
7	65.390	2.809	Open Manhole	1500	1.007	62.581	525	1.006	62.581	525	
								2.000	62.806	300	
8	65.770	3.239	Open Manhole	1500	1.008	62.531	525	1.007	62.531	525	
9	65.770	3.539	Open Manhole	1500	1.009	62.231	525	1.008	62.481	525	250
N1	66.205	1.500	Open Manhole	1200	3.000	64.705	300				
N2	66.205	1.500	Open Manhole	1200	4.000	64.705	300				
N3	66.205	1.855	Open Manhole	1200	3.001	64.350	300	3.000	64.350	300	
								4.000	64.350	300	
N4	66.065	1.350	Open Manhole	1200	5.000	64.715	150				
N5	66.065	1.690	Open Manhole	1200	5.001	64.375	150	5.000	64.375	150	
N6	66.065	3.854	Open Manhole	1500	3.002	62.211	525	3.001	62.536	300	100
								5.001	62.586	150	
10	65.780	3.599	Open Manhole	1500	1.010	62.181	525	1.009	62.181	525	
								3.002	62.181	525	
11	65.970	1.640	Open Manhole	1500	6.000	64.330	600				
12	65.840	1.590	Open Manhole	1500	6.001	64.250	600	6.000	64.250	600	
13	65.900	1.730	Open Manhole	1500	6.002	64.170	600	6.001	64.170	600	
14	65.960	1.860	Open Manhole	1500	6.003	64.100	600	6.002	64.100	600	
14A	65.950	1.950	Open Manhole	1500	6.004	64.000	600	6.003	64.000	600	
15	65.810	1.870	Open Manhole	1500	6.005	63.940	600	6.004	63.940	600	
16	65.900	2.850	Open Manhole	1500	6.006	63.050	600	6.005	63.050	600	
11	66.040	4.140	Open Manhole	1500	1.011	61.900	150	1.010	62.131	525	606
								6.006	63.000	600	1550
17	65.930	1.500	Open Manhole	1200	7.000	64.430	225				
22	66.190	2.160	Open Manhole	1200	7.001	64.030	225	7.000	64.030	225	
23	65.860	2.480	Open Manhole	1200	7.002	63.380	225	7.001	63.380	225	
13	66.110	4.380	Open Manhole	1200	1.012	61.730	150	1.011	61.850	150	120
								7.002	61.730	225	
	65.030	3.400	Open Manhole	0		OUTFALL		1.012	61.630	150	
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	65.470	64.240	1.005	Open Manhole	1200
1.001	o	300	2	65.480	63.860	1.320	Open Manhole	1200
1.002	o	300	3	65.700	63.620	1.780	Open Manhole	1200
1.003	o	300	4	65.830	63.530	2.000	Open Manhole	1200
1.004	o	300	5	65.850	63.070	2.480	Open Manhole	1200
1.005	o	300	5A	65.505	63.020	2.185	Open Manhole	1200
1.006	o	525	6	65.860	62.700	2.635	Open Manhole	1500
2.000	o	300	7	65.390	64.000	1.090	Open Manhole	1200
1.007	o	525	7	65.390	62.581	2.284	Open Manhole	1500
1.008	o	525	8	65.770	62.531	2.714	Open Manhole	1500
1.009	o	525	9	65.770	62.231	3.014	Open Manhole	1500
3.000	o	300	N1	66.205	64.705	1.200	Open Manhole	1200
4.000	o	300	N2	66.205	64.705	1.200	Open Manhole	1200
3.001	o	300	N3	66.205	64.350	1.555	Open Manhole	1200
5.000	o	150	N4	66.065	64.715	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	45.400	148.9	2	65.480	63.935	1.320	Open Manhole	1200
1.001	48.040	200.0	3	65.700	63.620	1.780	Open Manhole	1200
1.002	18.000	200.0	4	65.830	63.530	2.000	Open Manhole	1200
1.003	86.800	188.7	5	65.850	63.070	2.480	Open Manhole	1200
1.004	11.000	220.0	5A	65.505	63.020	2.185	Open Manhole	1200
1.005	19.900	209.5	6	65.860	62.925	2.635	Open Manhole	1500
1.006	56.170	472.0	7	65.390	62.581	2.284	Open Manhole	1500
2.000	49.800	41.7	7	65.390	62.806	2.284	Open Manhole	1500
1.007	18.600	372.0	8	65.770	62.531	2.714	Open Manhole	1500
1.008	5.250	105.0	9	65.770	62.481	2.764	Open Manhole	1500
1.009	5.250	105.0	10	65.780	62.181	3.074	Open Manhole	1500
3.000	85.700	241.4	N3	66.205	64.350	1.555	Open Manhole	1200
4.000	57.300	161.4	N3	66.205	64.350	1.555	Open Manhole	1200
3.001	21.900	12.1	N6	66.065	62.536	3.229	Open Manhole	1500
5.000	24.100	70.9	N5	66.065	64.375	1.540	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

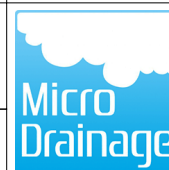
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.001	o	150	N5	66.065	64.375	1.540	Open Manhole	1200
3.002	o	525	N6	66.065	62.211	3.329	Open Manhole	1500
1.010	o	525	10	65.780	62.181	3.074	Open Manhole	1500
6.000	o	600	11	65.970	64.330	1.040	Open Manhole	1500
6.001	o	600	12	65.840	64.250	0.990	Open Manhole	1500
6.002	o	600	13	65.900	64.170	1.130	Open Manhole	1500
6.003	o	600	14	65.960	64.100	1.260	Open Manhole	1500
6.004	o	600	14A	65.950	64.000	1.350	Open Manhole	1500
6.005	o	600	15	65.810	63.940	1.270	Open Manhole	1500
6.006	o	600	16	65.900	63.050	2.250	Open Manhole	1500
1.011	o	150	11	66.040	61.900	3.990	Open Manhole	1500
7.000	o	225	17	65.930	64.430	1.275	Open Manhole	1200
7.001	o	225	22	66.190	64.030	1.935	Open Manhole	1200
7.002	o	225	23	65.860	63.380	2.255	Open Manhole	1200
1.012	o	150	13	66.110	61.730	4.230	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.001	21.300	11.9	N6	66.065	62.586	3.329	Open Manhole	1500
3.002	12.100	403.3	10	65.780	62.181	3.074	Open Manhole	1500
1.010	5.250	105.0	11	66.040	62.131	3.384	Open Manhole	1500
6.000	28.180	352.3	12	65.840	64.250	0.990	Open Manhole	1500
6.001	27.910	348.9	13	65.900	64.170	1.130	Open Manhole	1500
6.002	28.300	404.3	14	65.960	64.100	1.260	Open Manhole	1500
6.003	19.700	197.0	14A	65.950	64.000	1.350	Open Manhole	1500
6.004	12.600	210.0	15	65.810	63.940	1.270	Open Manhole	1500
6.005	19.430	21.8	16	65.900	63.050	2.250	Open Manhole	1500
6.006	6.000	120.0	11	66.040	63.000	2.440	Open Manhole	1500
1.011	4.670	93.4	13	66.110	61.850	4.110	Open Manhole	1200
7.000	80.030	200.1	22	66.190	64.030	1.935	Open Manhole	1200
7.001	47.300	72.8	23	65.860	63.380	2.255	Open Manhole	1200
7.002	25.000	15.2	13	66.110	61.730	4.155	Open Manhole	1200
1.012	10.000	100.0		65.030	61.630	3.250	Open Manhole	0

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Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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1.012	65.030	61.630	0.000	0	0
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Volumetric Runoff Coeff	0.900	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

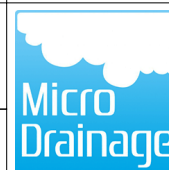
Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.900
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.403		

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Online Controls for Storm Complex Manhole: 13, DS/PN: 1.012, Volume (m³): 6.0 Pump Invert Level (m) 61.730 <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.001</td><td>5.5000</td><td>1.040</td><td>5.5000</td><td>1.041</td><td>12.5000</td><td>3.560</td><td>12.5000</td></tr></table> Weir Discharge Coef 0.544 Width (m) 1.500 Invert Level (m) 66.110			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.001	5.5000	1.040	5.5000	1.041	12.5000	3.560	12.5000
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)											
0.001	5.5000	1.040	5.5000	1.041	12.5000	3.560	12.5000											
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Storage Structures for Storm Cellular Storage Manhole: N6, DS/PN: 3.002 Invert Level (m) 62.211 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>300.0</td><td>0.0</td><td>2.001</td><td>0.0</td><td>0.0</td></tr><tr><td>2.000</td><td>300.0</td><td>0.0</td><td></td><td></td><td></td></tr></table> Cellular Storage Manhole: 11, DS/PN: 1.011 Invert Level (m) 61.900 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>758.0</td><td>0.0</td><td>2.010</td><td>0.0</td><td>0.0</td></tr><tr><td>2.000</td><td>758.0</td><td>0.0</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	300.0	0.0	2.001	0.0	0.0	2.000	300.0	0.0				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	758.0	0.0	2.010	0.0	0.0	2.000	758.0	0.0			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																	
0.000	300.0	0.0	2.001	0.0	0.0																																	
2.000	300.0	0.0																																				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																	
0.000	758.0	0.0	2.010	0.0	0.0																																	
2.000	758.0	0.0																																				
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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.403
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH		Storm	Return Climate		First (X)		First (Y)		First (Z)	Overflow
	Name			Period	Change	Surcharge		Flood		Overflow	Act.
1.000	1	15	Winter	2	+0%	100/15	Summer	100/15	Summer		
1.001	2	15	Winter	2	+0%	30/15	Summer	100/15	Summer		
1.002	3	15	Winter	2	+0%	30/15	Summer				
1.003	4	15	Winter	2	+0%	30/15	Summer				
1.004	5	15	Winter	2	+0%	30/15	Summer				
1.005	5A	15	Winter	2	+0%	30/15	Summer	100/960	Winter		
1.006	6	15	Winter	2	+0%	30/15	Summer				
2.000	7	15	Winter	2	+0%	100/15	Summer	100/360	Winter		
1.007	7	15	Winter	2	+0%	30/15	Summer	100/360	Winter		
1.008	8	15	Winter	2	+0%	30/15	Summer				
1.009	9	960	Winter	2	+0%	30/15	Summer				
3.000	N1	15	Winter	2	+0%	30/15	Summer	100/15	Summer		
4.000	N2	15	Winter	2	+0%	30/15	Summer	100/15	Summer		
3.001	N3	15	Winter	2	+0%	100/15	Summer				
5.000	N4	15	Winter	2	+0%	100/15	Summer				
5.001	N5	15	Winter	2	+0%	100/240	Winter				
3.002	N6	960	Winter	2	+0%	30/60	Winter				
1.010	10	960	Winter	2	+0%	30/60	Summer				
6.000	11	15	Winter	2	+0%	30/15	Summer				

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<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	
6.001	12	15 Winter	2	+0%	30/15 Summer	100/15 Summer			
6.002	13	15 Winter	2	+0%	30/15 Summer				
6.003	14	15 Winter	2	+0%	30/15 Summer				
6.004	14A	15 Winter	2	+0%	30/15 Summer				
6.005	15	15 Winter	2	+0%	100/15 Summer				
6.006	16	15 Winter	2	+0%	30/15 Summer				
1.011	11	960 Winter	2	+0%	2/15 Summer				
7.000	17	15 Winter	2	+0%	100/15 Summer				
7.001	22	15 Winter	2	+0%	100/15 Summer				
7.002	23	15 Winter	2	+0%	100/15 Summer				
1.012	13	960 Winter	2	+0%	2/15 Summer				
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	12	64.576	-0.274	0.000	0.38		113.7	OK	4
6.002	13	64.536	-0.234	0.000	0.66		180.7	OK	
6.003	14	64.446	-0.254	0.000	0.62		216.6	OK	
6.004	14A	64.362	-0.238	0.000	0.68		215.9	OK	
6.005	15	64.138	-0.402	0.000	0.24		223.3	OK	
6.006	16	63.413	-0.237	0.000	0.67		223.9	OK	
1.011	11	62.675	0.625	0.000	0.62		8.7	SURCHARGED	
7.000	17	64.536	-0.119	0.000	0.41		14.5	OK	
7.001	22	64.119	-0.136	0.000	0.33		19.1	OK	
7.002	23	63.451	-0.154	0.000	0.21		26.5	OK	
1.012	13	62.683	0.803	0.000	0.40		6.3	SURCHARGED	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

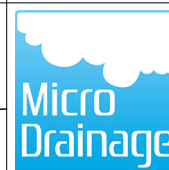
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH		Return Climate		First (X)		First (Y)		First (Z)		Overflow Act.
	Name	Storm	Period	Change	Surcharge		Flood		Overflow		
1.000	1	15 Winter	30	+0%	100/15	Summer	100/15	Summer			
1.001	2	15 Winter	30	+0%	30/15	Summer	100/15	Summer			
1.002	3	15 Winter	30	+0%	30/15	Summer					
1.003	4	15 Winter	30	+0%	30/15	Summer					
1.004	5	15 Winter	30	+0%	30/15	Summer					
1.005	5A	15 Winter	30	+0%	30/15	Summer	100/960	Winter			
1.006	6	15 Winter	30	+0%	30/15	Summer					
2.000	7	15 Winter	30	+0%	100/15	Summer	100/360	Winter			
1.007	7	15 Winter	30	+0%	30/15	Summer	100/360	Winter			
1.008	8	960 Winter	30	+0%	30/15	Summer					
1.009	9	960 Winter	30	+0%	30/15	Summer					
3.000	N1	15 Winter	30	+0%	30/15	Summer	100/15	Summer			
4.000	N2	15 Winter	30	+0%	30/15	Summer	100/15	Summer			
3.001	N3	15 Winter	30	+0%	100/15	Summer					
5.000	N4	15 Winter	30	+0%	100/15	Summer					
5.001	N5	15 Winter	30	+0%	100/240	Winter					
3.002	N6	960 Winter	30	+0%	30/60	Winter					
1.010	10	960 Winter	30	+0%	30/60	Summer					
6.000	11	15 Winter	30	+0%	30/15	Summer					

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Symmetry Park
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100 year Return Period Summary of Critical Results by Maximum Level (Rank
1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.403
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

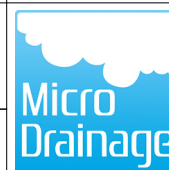
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep 2.5 Second Increment (Extended)	
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

US/MH				Return	Climate	First (X)		First (Y)		First (Z)	Overflow
PN	Name	Storm	Period	Change		Surcharge		Flood		Overflow	Act.
1.000	1	1440	Winter	100	+40%	100/15	Summer	100/15	Summer		
1.001	2	1440	Winter	100	+40%	30/15	Summer	100/15	Summer		
1.002	3	1440	Winter	100	+40%	30/15	Summer				
1.003	4	1440	Winter	100	+40%	30/15	Summer				
1.004	5	960	Winter	100	+40%	30/15	Summer				
1.005	5A	960	Winter	100	+40%	30/15	Summer	100/960	Winter		
1.006	6	960	Winter	100	+40%	30/15	Summer				
2.000	7	960	Winter	100	+40%	100/15	Summer	100/360	Winter		
1.007	7	960	Winter	100	+40%	30/15	Summer	100/360	Winter		
1.008	8	960	Winter	100	+40%	30/15	Summer				
1.009	9	960	Winter	100	+40%	30/15	Summer				
3.000	N1	15	Winter	100	+40%	30/15	Summer	100/15	Summer		
4.000	N2	15	Winter	100	+40%	30/15	Summer	100/15	Summer		
3.001	N3	960	Winter	100	+40%	100/15	Summer				
5.000	N4	960	Winter	100	+40%	100/15	Summer				
5.001	N5	1440	Winter	100	+40%	100/240	Winter				
3.002	N6	960	Winter	100	+40%	30/60	Winter				
1.010	10	960	Winter	100	+40%	30/60	Summer				
6.000	11	15	Winter	100	+40%	30/15	Summer				

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100 year Return Period Summary of Critical Results by Maximum Level (Rank
1) for Storm

PN	US/MH Name	Water		Surcharged	Flooded	Flow / Overflow Cap. (l/s)	Pipe	Status	Level
		Level (m)	Depth (m)	Volume (m³)	Flow		Flow (l/s)		Exceeded
1.000	1	65.503	1.038	33.441	0.10		4.2	FLOOD	7
1.001	2	65.505	1.345	25.032	0.09		6.3	FLOOD	6
1.002	3	65.507	1.587	0.000	0.12		7.8	FLOOD RISK	
1.003	4	65.507	1.677	0.000	0.10		7.8	SURCHARGED	
1.004	5	65.512	2.142	0.000	0.17		10.4	SURCHARGED	
1.005	5A	65.514	2.194	8.816	0.15		10.2	FLOOD	2
1.006	6	65.518	2.293	0.000	0.09		18.4	SURCHARGED	
2.000	7	65.518	1.218	127.941	0.08		12.3	FLOOD	4
1.007	7	65.519	2.413	129.318	0.20		39.4	FLOOD	4
1.008	8	65.567	2.511	0.000	0.16		39.2	FLOOD RISK	
1.009	9	65.581	2.825	0.000	0.16		38.9	FLOOD RISK	
3.000	N1	66.206	1.201	0.588	1.95		134.2	FLOOD	2
4.000	N2	66.218	1.213	12.667	2.10		173.7	FLOOD	4
3.001	N3	65.573	0.923	0.000	0.08		23.7	SURCHARGED	
5.000	N4	65.542	0.677	0.000	0.07		1.4	SURCHARGED	
5.001	N5	65.552	1.027	0.000	0.03		1.5	SURCHARGED	
3.002	N6	65.580	2.844	0.000	0.12		16.8	SURCHARGED	
1.010	10	65.583	2.877	0.000	0.13		31.1	FLOOD RISK	
6.000	11	65.909	0.979	0.000	0.53		155.3	FLOOD RISK	

