









PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method


Network Design Table for Storm

- Indicates pipe length does not match coordinates
 « - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	147.915	0.296	499.7	0.089	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	48.724	0.100	487.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	11.983	0.025	479.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	73.777	0.254	290.0	0.104	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	13.000#	0.030	433.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.004	7.079	0.015	471.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.005	35.704	0.075	476.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	133.89	9.26	3.803	0.089	0.0	0.0	0.0	0.58	23.0«	32.3
S2.001	124.83	10.65	3.507	0.089	0.0	0.0	0.0	0.59	23.3«	32.3
S2.002	122.82	10.99	3.407	0.089	0.0	0.0	0.0	0.59	23.5«	32.3
S3.000	156.00	6.61	3.661	0.104	0.0	0.0	0.0	0.76	30.3«	43.9
S2.003	120.83	11.34	3.382	0.193	0.0	0.0	0.0	0.62	24.7«	63.2
S2.004	119.73	11.53	3.352	0.193	0.0	0.0	0.0	0.60	23.7«	63.2
S2.005	114.49	12.54	3.337	0.193	0.0	0.0	0.0	0.59	23.6«	63.2

PFA Consulting		Page 2
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway		Network 2020.1.3

PIPELINE SCHEDULES for Storm


Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2.000	o	225	S1	4.733	3.803	0.705	Open Manhole	1200
S2.001	o	225	S2	4.872	3.507	1.140	Open Manhole	1200
S2.002	o	225	S3	4.712	3.407	1.080	Open Manhole	1200
S3.000	o	225	S4	4.717	3.661	0.831	Open Manhole	1200
S2.003	o	225	S5	4.612	3.382	1.005	Open Manhole	1200
S2.004	o	225	S6 - SuDS	4.452	3.352	0.875	Open Manhole	1200
S2.005	o	225	S7	4.515	3.337	0.953	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)
S2.000	147.915	499.7	S2	4.872	3.507	1.140	Open Manhole	1200
S2.001	48.724	487.2	S3	4.712	3.407	1.080	Open Manhole	1200
S2.002	11.983	479.3	S5	4.612	3.382	1.005	Open Manhole	1200
S3.000	73.777	290.0	S5	4.612	3.407	0.981	Open Manhole	1200
S2.003	13.000#	433.3	S6 - SuDS	4.452	3.352	0.875	Open Manhole	1200
S2.004	7.079	471.9	S7	4.515	3.337	0.953	Open Manhole	1200
S2.005	35.704	476.1	S	4.250	3.262	0.763	Open Manhole	0


PFA Consulting		Page 3
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023	Designed by IS	
File E216-SITE 3D-NETWORK PON...	Checked by BF	
Causeway		Network 2020.1.3

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	-	-	100	0.089	0.089	0.089
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.104	0.104	0.104
2.003	-	-	100	0.000	0.000	0.000
2.004	-	-	100	0.000	0.000	0.000
2.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.193	0.193	0.193

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S2.005	S	4.250	3.262	2.300	0	0

PFA Consulting		Page 4
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway		Network 2020.1.3

Online Controls for Storm


Hydro-Brake® Optimum Manhole: S7, DS/PN: S2.005, Volume (m³): 1.6

Unit Reference	MD-SHE-0048-1000-0900-1000
Design Head (m)	0.900
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	48
Invert Level (m)	3.337
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	1.0	Kick-Flo®	0.428	0.7
Flush-Flo™	0.212	0.9	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	1.200	1.1	3.000	1.7	7.000	2.5
0.200	0.9	1.400	1.2	3.500	1.8	7.500	2.6
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.7
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.8
0.500	0.8	2.000	1.4	5.000	2.2	9.000	2.9
0.600	0.8	2.200	1.5	5.500	2.3	9.500	2.9
0.800	0.9	2.400	1.6	6.000	2.4		
1.000	1.0	2.600	1.6	6.500	2.5		

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway		Network 2020.1.3

Storage Structures for Storm

Trench Soakaway Manhole: S1, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.5
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	147.9
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	3.703	Cap Infiltration Depth (m)	0.000


Trench Soakaway Manhole: S4, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	0.5
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	73.8
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	0.30	Cap Volume Depth (m)	0.000
Invert Level (m)	3.561	Cap Infiltration Depth (m)	0.000

Tank or Pond Manhole: S6 - SuDS, DS/PN: S2.004

Invert Level (m) 3.352

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	218.5	0.300	303.6	0.600	393.8	0.900	489.0
0.100	246.3	0.400	333.1	0.700	424.9	1.000	521.9
0.200	274.7	0.500	363.1	0.800	456.7	1.100	555.3

PFA Consulting		Page 6
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023	Designed by IS	
File E216-SITE 3D-NETWORK PON...	Checked by BF	
Causeway	Network 2020.1.3	

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 * 10m³/ha Storage 2.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 463451 426329 SE 63451 26329
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
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, 100
Climate Change (%) 0, 30

PN	US/MH Name	Event	US/CL (m)	Water			Volume (m ³)	Flow / Cap.	Overflow (l/s)
				Level (m)	Depth (m)	Surcharged			
S2.000	S1	15 minute 2 year Winter I+0%	4.733	3.914	-0.114	0.000	0.40		
S2.001	S2	15 minute 2 year Winter I+0%	4.872	3.606	-0.126	0.000	0.38		
S2.002	S3	15 minute 2 year Winter I+0%	4.712	3.559	-0.073	0.000	0.53		
S3.000	S4	15 minute 2 year Winter I+0%	4.717	3.772	-0.114	0.000	0.43		
S2.003	S5	30 minute 2 year Winter I+0%	4.612	3.544	-0.063	0.000	0.87		
S2.004	S6 - SuDS	480 minute 2 year Winter I+0%	4.452	3.466	-0.111	0.000	0.04		
S2.005	S7	480 minute 2 year Winter I+0%	4.515	3.465	-0.097	0.000	0.04		

PFA Consulting		Page 7
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway	Network 2020.1.3	

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

PN	US/MH Name	Infil. Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Pipe Flow (l/s)	Status
S2.000	S1	0.000	1.908	5.437	9.1	OK
S2.001	S2		0.441	5.434	8.4	OK
S2.002	S3		0.975	5.420	8.4	OK
S3.000	S4	0.000	1.748	6.467	12.7	OK
S2.003	S5		0.918	15.337	15.5	OK
S2.004	S6 - SuDS		26.878	34.300	0.8	OK
S2.005	S7		0.239	34.215	0.8	OK

PFA Consulting		Page 8
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023 File E216-SITE 3D-NETWORK PON...	Designed by IS Checked by BF	
Causeway		Network 2020.1.3

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 2.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 463451 426329 SE 63451 26329
Data Type Point
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
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, 100
Climate Change (%) 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Surcharged			Flooded Volume (m ³)	Flow / Cap.
				Level (m)	Depth (m)	Flow		
S2.000	S1	15 minute 100 year Winter I+30%	4.733	4.238	0.210	0.000	1.15	
S2.001	S2	30 minute 100 year Winter I+30%	4.872	3.878	0.146	0.000	1.08	
S2.002	S3	30 minute 100 year Winter I+30%	4.712	3.777	0.145	0.000	1.58	
S3.000	S4	15 minute 100 year Winter I+30%	4.717	4.227	0.341	0.000	1.39	
S2.003	S5	480 minute 100 year Winter I+30%	4.612	3.748	0.141	0.000	0.63	
S2.004	S6 - SuDS	480 minute 100 year Winter I+30%	4.452	3.747	0.170	0.000	0.05	
S2.005	S7	480 minute 100 year Winter I+30%	4.515	3.747	0.185	0.000	0.04	

PFA Consulting		Page 9
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 1	
Date 01/06/2023	Designed by IS	
File E216-SITE 3D-NETWORK PON...	Checked by BF	
Causeway	Network 2020.1.3	

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

PN	US/MH Name	Overflow (1/s)	Infil. Vol (m ³)	Maximum Vol (m ³)	Discharge Vol (m ³)	Pipe Flow (1/s)	Status
S2.000	S1		0.000	9.195	24.474	26.0	SURCHARGED
S2.001	S2			5.158	31.753	24.0	SURCHARGED
S2.002	S3			2.299	30.312	25.2	SURCHARGED
S3.000	S4		0.000	7.305	28.722	41.1	SURCHARGED
S2.003	S5			3.182	131.441	11.2	SURCHARGED
S2.004	S6 - SuDS			109.126	41.881	1.0	SURCHARGED
S2.005	S7			0.692	41.222	0.9	SURCHARGED