

PFA Consulting		Page 1
Stratton Park House Wanborough Road Swindon SN3 4HG		E216: Helios Renewable Energy Project Newtork Design for Pond 2
Date 01/06/2023		Designed by IS
File E216-Site 3D-Network Pon...		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	50.214	0.100	502.1	0.029	5.00	0.0	0.600	o	225	Pipe/Conduit		
S2.001	27.477	0.055	499.6	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit		
S3.000	59.039	0.120	492.0	0.089	5.00	0.0	0.600	o	225	Pipe/Conduit		
S3.001	34.970	0.070	499.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S2.002	11.430#	0.060	190.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S2.003	5.957	0.015	397.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S2.004	19.523	0.040	488.1	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	157.59	6.45	3.741	0.029	0.0	0.0	0.0	0.58	22.9	12.4
S2.001	150.07	7.24	3.641	0.058	0.0	0.0	0.0	0.58	23.0<<	23.6
S3.000	155.26	6.69	3.770	0.089	0.0	0.0	0.0	0.58	23.2<<	37.4
S3.001	146.08	7.70	3.650	0.089	0.0	0.0	0.0	0.58	23.0<<	37.4
S2.002	144.38	7.90	3.586	0.147	0.0	0.0	0.0	0.94	37.5<<	57.5
S2.003	143.12	8.05	3.526	0.147	0.0	0.0	0.0	0.65	25.8<<	57.5
S2.004	138.72	8.61	3.511	0.147	0.0	0.0	0.0	0.59	23.3<<	57.5

PFA Consulting		Page 2
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
Date 01/06/2023	Designed by IS	
File E216-Site 3D-Network Pon...	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	4.636	3.741	0.670	Open Manhole	1200
S2.001	o	225	S2	4.176	3.641	0.310	Open Manhole	1200
S3.000	o	225	S3	4.683	3.770	0.688	Open Manhole	1200
S3.001	o	225	S4	4.467	3.650	0.592	Open Manhole	1200
S2.002	o	225	S5	4.234	3.586	0.423	Open Manhole	1200
S2.003	o	225	S6 - SuDS	4.326	3.526	0.575	Open Manhole	1200
S2.004	o	225	S7	4.196	3.511	0.460	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	50.214	502.1	S2	4.176	3.641	0.310	Open Manhole	1200
S2.001	27.477	499.6	S5	4.234	3.586	0.423	Open Manhole	1200
S3.000	59.039	492.0	S4	4.467	3.650	0.592	Open Manhole	1200
S3.001	34.970	499.6	S5	4.234	3.580	0.429	Open Manhole	1200
S2.002	11.430#	190.5	S6 - SuDS	4.326	3.526	0.575	Open Manhole	1200
S2.003	5.957	397.1	S7	4.196	3.511	0.460	Open Manhole	1200
S2.004	19.523	488.1	S	4.250	3.471	0.554	Open Manhole	0


PFA Consulting		Page 3
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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	0.029	0.029	0.029
2.001	-	-	100	0.029	0.029	0.029
3.000	-	-	100	0.089	0.089	0.089
3.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
2.003	-	-	100	0.000	0.000	0.000
2.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.147	0.147	0.147

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)
S2.004	S	4.250	3.471	3.150	0	0

PFA Consulting		Page 4
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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: S2.004, Volume (m³): 1.0

Unit Reference	MD-SHE-0054-1000-0500-1000
Design Head (m)	0.500
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	54
Invert Level (m)	3.511
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)	0.500	1.0	Kick-Flo®	0.332	0.8
Flush-Flo™	0.151	1.0	Mean Flow over Head Range	-	0.9

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	1.0	1.200	1.5	3.000	2.2	7.000	3.4
0.200	1.0	1.400	1.6	3.500	2.4	7.500	3.5
0.300	0.9	1.600	1.7	4.000	2.6	8.000	3.6
0.400	0.9	1.800	1.8	4.500	2.7	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.8	9.000	3.8
0.600	1.1	2.200	1.9	5.500	3.0	9.500	3.9
0.800	1.2	2.400	2.0	6.000	3.1		
1.000	1.4	2.600	2.1	6.500	3.2		

PFA Consulting		Page 5
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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) 50.2
Safety Factor 2.0	Slope (1:X) 500.0
Porosity 0.30	Cap Volume Depth (m) 0.000
Invert Level (m) 3.641	Cap Infiltration Depth (m) 0.000

Trench Soakaway Manhole: S2, DS/PN: S2.001

Infiltration Coefficient Base (m/hr) 0.00000	Trench Width (m) 0.2
Infiltration Coefficient Side (m/hr) 0.00000	Trench Length (m) 27.5
Safety Factor 2.0	Slope (1:X) 500.0
Porosity 0.30	Cap Volume Depth (m) 0.000
Invert Level (m) 3.541	Cap Infiltration Depth (m) 0.000


Trench Soakaway Manhole: S3, 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) 59.0
Safety Factor 2.0	Slope (1:X) 500.0
Porosity 0.30	Cap Volume Depth (m) 0.000
Invert Level (m) 3.700	Cap Infiltration Depth (m) 0.000

Tank or Pond Manhole: S6 - SuDS, DS/PN: S2.003

Invert Level (m) 3.526

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	109.9	0.300	163.3	0.600	221.7
0.100	127.1	0.400	182.2	0.700	242.3
0.200	144.9	0.500	201.7	0.800	263.5

PFA Consulting		Page 6
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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

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 4 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)	Flooded			
S2.000	S1	15 minute 2 year Winter I+0%	4.636	3.798	-0.168	0.000	0.13		
S2.001	S2	15 minute 2 year Winter I+0%	4.176	3.726	-0.140	0.000	0.24		
S3.000	S3	15 minute 2 year Winter I+0%	4.683	3.889	-0.106	0.000	0.50		
S3.001	S4	15 minute 2 year Winter I+0%	4.467	3.762	-0.113	0.000	0.49		
S2.002	S5	15 minute 2 year Winter I+0%	4.234	3.696	-0.115	0.000	0.48		
S2.003	S6 - SuDS	360 minute 2 year Winter I+0%	4.326	3.659	-0.092	0.000	0.04		
S2.004	S7	360 minute 2 year Winter I+0%	4.196	3.658	-0.078	0.000	0.05		

PFA Consulting		Page 7
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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	0.980	1.445	2.9	OK
S2.001	S2	0.000	0.745	3.105	5.2	OK
S3.000	S3	0.000	1.355	5.725	11.1	OK
S3.001	S4		0.550	5.725	10.6	OK
S2.002	S5		0.855	8.796	15.4	OK
S2.003	S6 - SuDS		16.482	26.581	0.9	OK
S2.004	S7		0.262	26.542	0.9	OK

PFA Consulting		Page 8
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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 4 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			Flow / Cap.
				Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	
S2.000	S1	360 minute 100 year Winter I+30%	4.636	3.984	0.018	0.000	0.09
S2.001	S2	360 minute 100 year Winter I+30%	4.176	3.983	0.117	0.000	0.17
S3.000	S3	15 minute 100 year Winter I+30%	4.683	4.332	0.337	0.000	1.62
S3.001	S4	15 minute 100 year Winter I+30%	4.467	4.067	0.192	0.000	1.55
S2.002	S5	360 minute 100 year Winter I+30%	4.234	3.982	0.171	0.000	0.30
S2.003	S6 - SuDS	360 minute 100 year Winter I+30%	4.326	3.980	0.229	0.000	0.05
S2.004	S7	360 minute 100 year Winter I+30%	4.196	3.981	0.245	0.000	0.05

PFA Consulting		Page 9
Stratton Park House Wanborough Road Swindon SN3 4HG	E216: Helios Renewable Energy Project Newtork Design for Pond 2	
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

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	2.584	17.932	2.0	SURCHARGED
S2.001	S2		0.000	3.120	34.887	3.6	FLOOD RISK
S3.000	S3		0.000	5.781	24.708	36.2	SURCHARGED
S3.001	S4			2.766	24.029	33.7	SURCHARGED
S2.002	S5			2.836	89.386	9.5	FLOOD RISK
S2.003	S6 - SuDS			69.172	36.771	1.1	SURCHARGED
S2.004	S7			0.715	36.140	1.0	FLOOD RISK