

Surface Water Drainage Calculations

For a site referred to as

Our Lady's RC School

Undertaken on behalf of

Pozzoni

Job No: 9670

Document No: 9670-WML-ZZ-XX-CA-C-1001

Date: February 2021

Project No. & Name:	9670 – Our Lady’s RC High School, Manchester	Prepared by:	Rev:	Date:
Document Ref:	9670-WML-ZZ-XX-CA-C-1001	Daniel Baker	P01	February 2021

WML Consulting Ltd

Page 2

No. 8 Oak Green
Stanley Green Business Park
Earl Rd, Cheadle Hulme, SK8 6QL

Date 26/02/2021 11:48
File 9670 - SURFACE WATER - ...

Innovyze

Designed by DBaker
Checked by

Network 2014.1.1

Micro
Drainage

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.005	5.602	0.500	11.2	0.000	0.00	0.0	0.600	o	150	

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)
S1.005	42.33	6.26	100.200	0.144	0.0	0.0	0.0	3.03	53.5	17.0

©1982-2014 XP Solutions

WML Consulting Ltd		Page 3
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2014.1.1

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)
S1	102.270	0.900	Open Manhole	450	S1.000	101.370	150				
S2	102.270	1.140	Open Manhole	450	S1.001	101.130	150	S1.000	101.130	150	
S-RE	102.700	1.330	Open Manhole	450	S2.000	101.370	150				
S3	102.100	0.820	Open Manhole	450	S3.000	101.280	150				
S4	102.270	1.110	Open Manhole	450	S2.001	101.160	150	S2.000	101.160	150	
								S3.000	101.160	150	
S5	102.270	1.160	Open Manhole	450	S2.002	101.110	150	S2.001	101.110	150	
S6	102.270	1.505	Open Manhole	600	S1.002	100.765	225	S1.001	100.840	150	
								S2.002	100.840	150	
S7	102.400	2.160	Open Manhole		S1.003	100.240	300	S1.002	100.740	225	423
S-TANK	102.500	2.280	Junction	0	S1.004	100.220	300	S1.003	100.220	300	
S8	102.500	2.300	Open Manhole	1200	S1.005	100.200	150	S1.004	100.200	300	
S	102.500	2.800	Open Manhole	0		OUTFALL		S1.005	99.700	150	

WML Consulting Ltd		Page 4
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2014.1.1

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)
S1.000	o	150	S1	102.270	101.370	0.750	Open Manhole	450
S1.001	o	150	S2	102.270	101.130	0.990	Open Manhole	450
S2.000	o	150	S-RE	102.700	101.370	1.180	Open Manhole	450
S3.000	o	150	S3	102.100	101.280	0.670	Open Manhole	450
S2.001	o	150	S4	102.270	101.160	0.960	Open Manhole	450
S2.002	o	150	S5	102.270	101.110	1.010	Open Manhole	450
S1.002	o	225	S6	102.270	100.765	1.280	Open Manhole	600
S1.003	o	300	S7	102.400	100.240	1.860	Open Manhole	1200
S1.004	o	300	S-TANK	102.500	100.220	1.980	Junction	
S1.005	o	150	S8	102.500	100.200	2.150	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)
S1.000	24.000	100.0	S2	102.270	101.130	0.990	Open Manhole	450
S1.001	29.000	100.0	S6	102.270	100.840	1.280	Open Manhole	600
S2.000	13.000	61.9	S4	102.270	101.160	0.960	Open Manhole	450
S3.000	12.000	100.0	S4	102.270	101.160	0.960	Open Manhole	450
S2.001	5.000	100.0	S5	102.270	101.110	1.010	Open Manhole	450
S2.002	27.000	100.0	S6	102.270	100.840	1.280	Open Manhole	600
S1.002	2.500	100.0	S7	102.400	100.740	1.435	Open Manhole	1200
S1.003	7.690	384.5	S-TANK	102.500	100.220	1.980	Junction	
S1.004	7.690	384.5	S8	102.500	100.200	2.000	Open Manhole	1200
S1.005	5.602	11.2	S	102.500	99.700	2.650	Open Manhole	0

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)
S1.005	S	102.500	99.700	0.000	0	0

WML Consulting Ltd		Page 5
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48 File 9670 - SURFACE WATER - ...		
Designed by DBaker Checked by		
Innovyze		Network 2014.1.1
<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coefficient 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 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 1 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 18.000 Storm Duration (mins) 30 Ratio R 0.359		
©1982-2014 XP Solutions		

WML Consulting Ltd		Page 6
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48 File 9670 - SURFACE WATER - ...	Designed by DBaker Checked by	
Innovyze	Network 2014.1.1	

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S8, DS/PN: S1.005, Volume (m³): 3.1

Unit Reference	MD-SCU-0035-8000-0300-8000
Design Head (m)	0.300
Design Flow (l/s)	0.8
Flush-Flo™	Calculated
Objective	Linear discharge profile
Diameter (mm)	35
Invert Level (m)	100.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.300	0.8
Flush-Flo™	0.053	0.4
Kick-Flo®	0.053	0.4
Mean Flow over Head Range	-	0.5

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	0.5	1.200	1.5	3.000	2.3	7.000	3.5
0.200	0.7	1.400	1.6	3.500	2.4	7.500	3.6
0.300	0.8	1.600	1.7	4.000	2.6	8.000	3.7
0.400	0.9	1.800	1.8	4.500	2.8	8.500	3.8
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.9
0.600	1.1	2.200	2.0	5.500	3.1	9.500	4.0
0.800	1.2	2.400	2.0	6.000	3.2		
1.000	1.4	2.600	2.1	6.500	3.3		

WML Consulting Ltd		Page 7
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48 File 9670 - SURFACE WATER - ...		
Designed by DBaker Checked by		
Innovyze		Network 2014.1.1

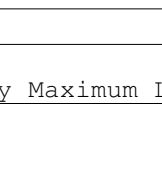
Storage Structures for Storm

Cellular Storage Manhole: S-TANK, DS/PN: S1.004

Invert Level (m) 100.220 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	65.0	65.0	2.600	0.0	106.9
0.200	65.0	71.4	2.800	0.0	106.9
0.400	65.0	77.9	3.000	0.0	106.9
0.600	65.0	84.3	3.200	0.0	106.9
0.800	65.0	90.8	3.400	0.0	106.9
1.000	65.0	97.2	3.600	0.0	106.9
1.200	65.0	103.7	3.800	0.0	106.9
1.400	0.0	106.9	4.000	0.0	106.9
1.600	0.0	106.9	4.200	0.0	106.9
1.800	0.0	106.9	4.400	0.0	106.9
2.000	0.0	106.9	4.600	0.0	106.9
2.200	0.0	106.9	4.800	0.0	106.9
2.400	0.0	106.9	5.000	0.0	106.9

©1982-2014 XP Solutions

WML Consulting Ltd		Page 8	
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL			
Date 26/02/2021 11:48 File 9670 - SURFACE WATER - ...			
Designed by DBaker Checked by			
Innovyze		Network 2014.1.1	

1 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 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 0.359
Region England and Wales Cv (Summer)	0.750	
M5-60 (mm)	18.000 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	1	0%	100/15 Summer	100/15 Winter			1
S1.001	15 Winter	1	0%	30/15 Summer				
S2.000	15 Winter	1	0%	100/15 Summer				
S3.000	15 Winter	1	0%	100/15 Summer				
S2.001	15 Winter	1	0%	100/15 Summer				
S2.002	15 Winter	1	0%	100/15 Summer				
S1.002	15 Winter	1	0%	30/15 Summer				
S1.003	360 Winter	1	0%	30/30 Summer				
S1.004	360 Winter	1	0%	30/30 Summer				
S1.005	360 Winter	1	0%	1/30 Summer				

PN	US/MH Name	Water	Flooded		Pipe			Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	
S1.000	S1	101.426	-0.094	0.000	0.30	0.0	5.0	OK
S1.001	S2	101.198	-0.082	0.000	0.42	0.0	7.1	OK
S2.000	S-RE	101.394	-0.126	0.000	0.06	0.0	1.3	OK
S3.000	S3	101.323	-0.107	0.000	0.18	0.0	2.9	OK
S2.001	S4	101.216	-0.094	0.000	0.29	0.0	4.1	OK

©1982-2014 XP Solutions

WML Consulting Ltd		Page 9
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2014.1.1

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

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Flow (l/s)	
S2.002	S5	101.167	-0.093	0.000	0.31	0.0	5.2	OK
S1.002	S6	100.882	-0.108	0.000	0.53	0.0	15.9	OK
S1.003	S7	100.443	-0.097	0.000	0.08	0.0	2.9	OK
S1.004	S-TANK	100.443	-0.077	0.000	0.04	0.0	1.9	OK*
S1.005	S8	100.451	0.101	0.000	0.02	0.0	0.7	SURCHARGED

WML Consulting Ltd

Page 10

No. 8 Oak Green
Stanley Green Business Park
Earl Rd, Cheadle Hulme, SK8 6QL

Date 26/02/2021 11:48
File 9670 - SURFACE WATER - ...

Innovyze

Designed by DBaker
Checked by

Network 2014.1.1



30 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 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 0.359

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30	0%	100/15 Summer	100/15 Winter			1
S1.001	15 Winter	30	0%	30/15 Summer				
S2.000	15 Winter	30	0%	100/15 Summer				
S3.000	15 Winter	30	0%	100/15 Summer				
S2.001	15 Winter	30	0%	100/15 Summer				
S2.002	15 Winter	30	0%	100/15 Summer				
S1.002	15 Winter	30	0%	30/15 Summer				
S1.003	360 Winter	30	0%	30/30 Summer				
S1.004	360 Winter	30	0%	30/30 Summer				
S1.005	360 Winter	30	0%	1/30 Summer				

Water

Flooded

Pipe

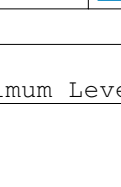
PN	US/MH Name	Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	101.468	-0.052	0.000	0.72	0.0	12.1	OK
S1.001	S2	101.346	-0.066	0.000	1.02	0.0	17.4	SURCHARGED
S2.000	S-RE	101.409	-0.111	0.000	0.15	0.0	3.1	OK
S3.000	S3	101.350	-0.080	0.000	0.44	0.0	7.0	OK
S2.001	S4	101.256	-0.054	0.000	0.71	0.0	10.0	OK

©1982-2014 XP Solutions

WML Consulting Ltd		Page 11
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2014.1.1

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

PN	US/MH Name	Water	Surch'd Depth (m)	Flooded	Flow / Cap.	O'flow (l/s)	Pipe	Status
		Level (m)		Volume (m ³)			Flow (l/s)	
S2.002	S5	101.212	-0.048	0.000	0.77	0.0	13.1	OK
S1.002	S6	101.038	0.048	0.000	1.35	0.0	40.4	SURCHARGED
S1.003	S7	100.818	0.278	0.000	0.17	0.0	6.4	SURCHARGED
S1.004	S-TANK	100.817	0.297	0.000	0.10	0.0	4.8	SURCHARGED*
S1.005	S8	100.846	0.496	0.000	0.02	0.0	1.1	SURCHARGED

WML Consulting Ltd		Page 12
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48 File 9670 - SURFACE WATER - ...		
Designed by DBaker Checked by		
Innovyze		Network 2014.1.1

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 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	0.359
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+40%	100/15 Summer	100/15 Winter			1
S1.001	15 Winter	100	+40%	30/15 Summer				
S2.000	15 Winter	100	+40%	100/15 Summer				
S3.000	15 Winter	100	+40%	100/15 Summer				
S2.001	15 Winter	100	+40%	100/15 Summer				
S2.002	15 Winter	100	+40%	100/15 Summer				
S1.002	480 Winter	100	+40%	30/15 Summer				
S1.003	480 Winter	100	+40%	30/30 Summer				
S1.004	480 Winter	100	+40%	30/30 Summer				
S1.005	480 Winter	100	+40%	1/30 Summer				

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	102.270	0.750	0.060	1.15	0.0	19.4	FLOOD
S1.001	S2	101.983	0.703	0.000	1.64	0.0	27.9	FLOOD RISK
S2.000	S-RE	101.684	0.164	0.000	0.24	0.0	5.0	SURCHARGED
S3.000	S3	101.726	0.296	0.000	0.70	0.0	11.3	SURCHARGED
S2.001	S4	101.664	0.354	0.000	1.18	0.0	16.5	SURCHARGED

©1982-2014 XP Solutions

WML Consulting Ltd		Page 13
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/02/2021 11:48	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2014.1.1

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

PN	US/MH Name	Water	Surch'd Depth (m)	Flooded	Flow / Cap.	O'flow (1/s)	Pipe	Status
		Level (m)		Volume (m ³)			Flow (1/s)	
S2.002	S5	101.595	0.335	0.000	1.23	0.0	20.9	SURCHARGED
S1.002	S6	101.393	0.403	0.000	0.31	0.0	9.3	SURCHARGED
S1.003	S7	101.393	0.853	0.000	0.25	0.0	9.1	SURCHARGED
S1.004	S-TANK	101.392	0.872	0.000	0.10	0.0	5.0	SURCHARGED*
S1.005	S8	101.419	1.069	0.000	0.03	0.0	1.5	SURCHARGED