

Surface Water Drainage Calculations

For a site referred to as

Glendene,
Wythenshawe

Undertaken on behalf of

Garden City Design & Build Ltd.

Job No: 9003

Document No: 9003-WML-00-XX-CA-C-0001

Date: April 2022

Project No. & Name:	9003 – Glendene, Wythenshawe	Status:	Prepared by:	Rev:	Date:
Document Ref:	9003-WML-00-XX-CA-C-0001	Preliminary	Daniel Baker	P01	April 2022

General Notes

1. The calculations within this document have been undertaken using MicroDrainage Software version 2020.
2. This document is to be read in conjunction with the following documents;
 - a. 9003-WML-ZZ-XX-DR-C-1001 - 1005 – Proposed Drainage GAs
 - b. 9003-WML-ZZ-XX-RP-C-1001 – Drainage Strategy Document

Summary of Results

3. The following summary demonstrates that the outgoing flow rates for the new development works are less than or equal to those of the pre-development site.
4. The existing site comprises a combination of Greenfield and Brownfield areas as shown within appendix 01 below.
5. Greenfield Areas have been calculated using MicoDrainage Software version 2020 whilst the existing Brownfield flow rate has been calculated using a 50mm/Hr rainfall intensity as noted within the drainage strategy.

Existing		
Greenfield Runoff Rate (l/s)	Brownfield Runoff Rate (l/s)	Proposed Site Runoff Rate - Total (l/s)
Q1: 4.3 Q30: 8.3 Q100: 10.2	72.9 36.4 - Allowable (50% reduction)	4.3 + 36.4 = 40.7

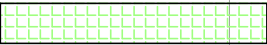
Proposed				
Proposed Site Runoff Rate - South (l/s)	Proposed Site Runoff Rate - North (l/s)	Actual Site Runoff Rate - South (l/s)	Actual Site Runoff Rate - North (l/s)	Actual Site Runoff Rate - Total (l/s)
10.00	30.00	9.8	30.3	<u>40.1</u>

6. It is noted that during the 100 year event plus 40% climate change allowance there is a small volume of flooding, circa 0.26m³. This is considered negligible and will be contained within the site via the proposed gullies and associate pipework.
7. The following calculations are associated with the adoptable drainage only and don't take into account the extensive private drainage network which will provide an additional storage volume and further reduce the risk of flooding.

Existing Site Area Plan



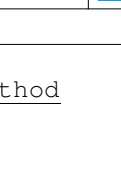
LEGEND

	EXISTING BROWNFIELD AREA: 5,249m ²
	EXISTING GREENFIELD AREA: 8,909m ²

Greenfield Runoff Assessment

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 16:27 File	Designed by DBaker Checked by	
Innovyze		Source Control 2020.1.3
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.450 Area (ha) 0.891 Urban 0.000 SAAR (mm) 849 Region Number Region 10 Results l/s QBAR Rural 4.9 QBAR Urban 4.9 Q100 years 10.2 Q1 year 4.3 Q30 years 8.3 Q100 years 10.2		
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**Proposed Surface Water Network
(South)**

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 14:31 File 9003 - SURFACE WATER - ...		
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Innovyze		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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)	Section Type	Auto Design
S1.000	26.500	0.085	311.8	0.041	5.00	0.0	0.600	o	600	Pipe/Conduit	
S2.000	7.000	0.030	233.3	0.056	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	42.000	0.140	300.0	0.034	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	3.315	0.035	94.7	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	3.156	0.088	35.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

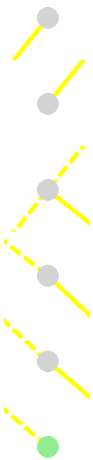
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.32	48.760	0.041	0.0	0.0	0.0	1.37	388.4	5.6
S2.000	50.00	5.07	48.705	0.056	0.0	0.0	0.0	1.59	449.5	7.6
S1.001	50.00	5.82	48.675	0.131	0.0	0.0	0.0	1.40	396.0	17.7
S1.002	50.00	5.86	48.535	0.192	0.0	0.0	0.0	1.62	114.2	26.0
S1.003	50.00	5.88	48.500	0.192	0.0	0.0	0.0	2.63	186.2	26.0

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WML Consulting Ltd		Page 2
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
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File 9003 - SURFACE WATER - ...	Checked by	
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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)
S1	50.710	1.950	Open Manhole	2400	S1.000	48.760	600				
S2	51.920	3.215	Open Manhole	2400	S2.000	48.705	600				
S3	51.830	3.155	Open Manhole	2400	S1.001	48.675	600	S1.000	48.675	600	
								S2.000	48.675	600	
S4	52.250	3.715	Open Manhole	2400	S1.002	48.535	300	S1.001	48.535	600	
S-C1	52.250	3.750	Open Manhole	1350	S1.003	48.500	300	S1.002	48.500	300	
S	52.390	3.978	Open Manhole	0		OUTFALL		S1.003	48.412	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	247.334	-61.660	247.334	-61.660	Required	
S2	226.275	-87.713	226.275	-87.713	Required	
S3	230.682	-82.275	230.682	-82.275	Required	
S4	263.600	-108.359	263.600	-108.359	Required	
S-C1	266.021	-110.624	266.021	-110.624	Required	
S	268.420	-112.675			No Entry	

WML Consulting Ltd		Page 3
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 14:31	Designed by DBaker	
File 9003 - SURFACE WATER - ...	Checked by	
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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)
S1.000	o	600	S1	50.710	48.760	1.350	Open Manhole	2400
S2.000	o	600	S2	51.920	48.705	2.615	Open Manhole	2400
S1.001	o	600	S3	51.830	48.675	2.555	Open Manhole	2400
S1.002	o	300	S4	52.250	48.535	3.415	Open Manhole	2400
S1.003	o	300	S-C1	52.250	48.500	3.450	Open Manhole	1350

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	26.500	311.8	S3	51.830	48.675	2.555	Open Manhole	2400
S2.000	7.000	233.3	S3	51.830	48.675	2.555	Open Manhole	2400
S1.001	42.000	300.0	S4	52.250	48.535	3.115	Open Manhole	2400
S1.002	3.315	94.7	S-C1	52.250	48.500	3.450	Open Manhole	1350
S1.003	3.156	35.9	S	52.390	48.412	3.678	Open Manhole	0

WML Consulting Ltd		Page 4
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 14:31	Designed by DBaker	
File 9003 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2020.1.3

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.041	0.041	0.041
2.000	-	-	100	0.056	0.056	0.056
1.001	-	-	100	0.034	0.034	0.034
1.002	-	-	100	0.061	0.061	0.061
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.192	0.192	0.192

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)
S1.003	S	52.390	48.412	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /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	0
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	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 14:31 File 9003 - SURFACE WATER - ...		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.002, Volume (m³): 28.0

Unit Reference	MD-SHE-0131-1000-2000-1000
Design Head (m)	2.000
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	131
Invert Level (m)	48.535
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0
Flush-Flo™	0.569	9.8
Kick-Flo®	1.167	7.8
Mean Flow over Head Range	-	8.7

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	4.7	1.200	7.9	3.000	12.1	7.000	18.1
0.200	8.3	1.400	8.5	3.500	13.0	7.500	18.7
0.300	9.2	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.6	1.800	9.5	4.500	14.7	8.500	19.9
0.500	9.8	2.000	10.0	5.000	15.4	9.000	20.5
0.600	9.8	2.200	10.5	5.500	16.2	9.500	21.0
0.800	9.6	2.400	10.9	6.000	16.8		
1.000	9.0	2.600	11.3	6.500	17.5		

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Page 6

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

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Micro
Drainage

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 0

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 0.360

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

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Water Level (m)

S1.000

S1 15 Winter

1

+0%

100/15 Summer

48.819

S2.000

S2 30 Winter

1

+0%

100/15 Summer

48.801

S1.001

S3 30 Winter

1

+0%

100/15 Summer

48.801

S1.002

S4 30 Winter

1

+0%

30/15 Summer

48.797

S1.003

S-C1 30 Winter

1

+0%

48.567

PN

US/MH Name

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Half Drain Time (mins)

Pipe Flow (l/s)

Status

Level Exceeded

S1.000

S1

-0.541

0.000

0.01

4.5

OK

S2.000

S2

-0.504

0.000

0.02

4.9

OK

S1.001

S3

-0.474

0.000

0.03

10.0

OK

S1.002

S4

-0.038

0.000

0.14

8.5

OK

S1.003

S-C1

-0.233

0.000

0.11

8.5

OK

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Page 7

No. 8 Oak Green
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Micro
Drainage

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Network 2020.1.3

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 0

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 0.360

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

Water

Level

US/MH

Return Climate

First (X)

First (Y)

First (Z)

Overflow

Water

PN

Name

Storm

Period

Change

Surcharge

Flood

Overflow

Act.

(m)

S1.000

S1 30 Winter

30

+0%

100/15 Summer

49.085

S2.000

S2 30 Winter

30

+0%

100/15 Summer

49.085

S1.001

S3 30 Winter

30

+0%

100/15 Summer

49.085

S1.002

S4 30 Winter

30

+0%

30/15 Summer

49.081

S1.003

S-C1 30 Winter

30

+0%

48.572

Surcharged Flooded

Half Drain Pipe

US/MH

Depth

Volume

Flow / Overflow

Time

Flow

Status

Level

PN

Name

(m)

(m³)

Cap.

(l/s)

(mins)

(l/s)

Exceeded

S1.000

S1

-0.275

0.000

0.02

6.5

OK

S2.000

S2

-0.220

0.000

0.04

10.0

OK

S1.001

S3

-0.190

0.000

0.04

13.1

OK

S1.002

S4

0.246

0.000

0.16

9.8

SURCHARGED

S1.003

S-C1

-0.228

0.000

0.13

9.8

OK

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Page 8

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Earl Rd, Cheadle Hulme, SK8 6QL

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Micro Drainage

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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 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 0

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 0.360

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	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	100	+40%	100/15	Summer			50.403
S2.000	S2	60 Winter	100	+40%	100/15	Summer			50.404
S1.001	S3	60 Winter	100	+40%	100/15	Summer			50.403
S1.002	S4	60 Winter	100	+40%	30/15	Summer			50.402
S1.003	S-C1	60 Winter	100	+40%					48.572

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	1.043	0.000	0.02			7.2	SURCHARGED	
S2.000	S2	1.099	0.000	0.05			11.5	SURCHARGED	
S1.001	S3	1.128	0.000	0.03			11.5	SURCHARGED	
S1.002	S4	1.567	0.000	0.16			9.8	SURCHARGED	
S1.003	S-C1	-0.228	0.000	0.13			9.8	OK	

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**Proposed Surface Water Network
(North)**

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Network 2020.1.3

Page 1



STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)

100

PIMP (%)

100

M5-60 (mm)

18.000

Add Flow / Climate Change (%)

0

Ratio R

0.360

Minimum Backdrop Height (m)

0.200

Maximum Rainfall (mm/hr)

50

Maximum Backdrop Height (m)

1.500

Maximum Time of Concentration (mins)

30

Min Design Depth for Optimisation (m)

1.200

Foul Sewage (l/s/ha)

0.000

Min Vel for Auto Design only (m/s)

1.00

Volumetric Runoff Coeff.

0.750

Min Slope for Optimisation (1:X)

500

Designed with Level Soffits

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)	Section Type	Auto Design
S3.000	14.500	0.150	96.7	0.132	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	12.007	0.130	92.4	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	39.683	0.040	992.1	0.039	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S3.003	21.927	0.020	1096.4	0.142	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S4.000	52.000	1.850	28.1	0.050	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	28.000	0.140	200.0	0.070	0.00	0.0	0.600	o	750	Pipe/Conduit	
S3.004	12.000	0.010	1200.0	0.028	0.00	0.0	0.600	o	1200	Pipe/Conduit	
S3.005	2.940	0.100	29.4	0.048	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.006	3.842	0.040	96.1	0.000	0.00	0.0	0.600	o	300	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)
S3.000	50.00	5.24	48.770	0.132	0.0	0.0	0.0	1.02	18.1	17.9
S3.001	50.00	5.38	47.300	0.174	0.0	0.0	0.0	1.36	54.1	23.6
S3.002	50.00	5.94	45.670	0.213	0.0	0.0	0.0	1.18	1333.8	28.8
S3.003	50.00	6.27	45.630	0.355	0.0	0.0	0.0	1.12	1268.1	48.1
S4.000	50.00	5.35	48.850	0.050	0.0	0.0	0.0	2.48	98.5	6.8
S4.001	50.00	5.59	46.200	0.120	0.0	0.0	0.0	1.98	872.6	16.2
S3.004	50.00	6.46	45.610	0.503	0.0	0.0	0.0	1.07	1211.5	68.1
S3.005	50.00	6.47	45.600	0.551	0.0	0.0	0.0	2.91	205.7	74.6
S3.006	50.00	6.51	45.500	0.551	0.0	0.0	0.0	1.60	113.4	74.6

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WML Consulting Ltd		Page 2
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 15:09	Designed by DBaker	
File 9003 - SURFACE WATER - ...	Checked by	
Innovyze	Network 2020.1.3	

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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S5	50.920	2.150	Open Manhole	1200	S3.000	48.770	150				
S6	50.200	2.900	Open Manhole	1200	S3.001	47.300	225	S3.000	48.620	150	1245
S7	50.000	4.330	Open Manhole	2700	S3.002	45.670	1200	S3.001	47.170	225	525
S8	48.850	3.220	Open Manhole	2700	S3.003	45.630	1200	S3.002	45.630	1200	
S9	50.850	2.000	Open Manhole	1200	S4.000	48.850	225				
S10	48.490	2.290	Open Manhole	2400	S4.001	46.200	750	S4.000	47.000	225	275
S11	47.910	2.300	Open Manhole	2700	S3.004	45.610	1200	S3.003	45.610	1200	
								S4.001	46.060	750	
S12	47.700	2.100	Open Manhole	2700	S3.005	45.600	300	S3.004	45.600	1200	
S-C3	47.700	2.200	Open Manhole	1500	S3.006	45.500	300	S3.005	45.500	300	
S	47.410	1.950	Open Manhole	0		OUTFALL		S3.006	45.460	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	254.597	-27.724	254.597	-27.724	Required	
S6	265.884	-36.826	265.884	-36.826	Required	
S7	277.858	-35.930	277.858	-35.930	Required	
S8	302.765	-5.038	302.765	-5.038	Required	
S9	306.167	-46.186	306.167	-46.186	Required	
S10	338.552	-5.501	338.552	-5.501	Required	
S11	316.645	11.937	316.645	11.937	Required	
S12	320.034	23.448	320.034	23.448	Required	
S-C3	318.954	26.182	318.954	26.182	Required	

WML Consulting Ltd		Page 3
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 15:09 File 9003 - SURFACE WATER - ...		
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Innovyze		Network 2020.1.3

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S	321.156	29.330			No Entry	



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WML Consulting Ltd		Page 4
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 15:09	Designed by DBaker	
File 9003 - SURFACE WATER - ...	Checked by	
Innovyze		Network 2020.1.3

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)
S3.000	o	150	S5	50.920	48.770	2.000	Open Manhole	1200
S3.001	o	225	S6	50.200	47.300	2.675	Open Manhole	1200
S3.002	o	1200	S7	50.000	45.670	3.130	Open Manhole	2700
S3.003	o	1200	S8	48.850	45.630	2.020	Open Manhole	2700
S4.000	o	225	S9	50.850	48.850	1.775	Open Manhole	1200
S4.001	o	750	S10	48.490	46.200	1.540	Open Manhole	2400
S3.004	o	1200	S11	47.910	45.610	1.100	Open Manhole	2700
S3.005	o	300	S12	47.700	45.600	1.800	Open Manhole	2700
S3.006	o	300	S-C3	47.700	45.500	1.900	Open Manhole	1500

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)
S3.000	14.500	96.7	S6	50.200	48.620	1.430	Open Manhole	1200
S3.001	12.007	92.4	S7	50.000	47.170	2.605	Open Manhole	2700
S3.002	39.683	992.1	S8	48.850	45.630	2.020	Open Manhole	2700
S3.003	21.927	1096.4	S11	47.910	45.610	1.100	Open Manhole	2700
S4.000	52.000	28.1	S10	48.490	47.000	1.265	Open Manhole	2400
S4.001	28.000	200.0	S11	47.910	46.060	1.100	Open Manhole	2700
S3.004	12.000	1200.0	S12	47.700	45.600	0.900	Open Manhole	2700
S3.005	2.940	29.4	S-C3	47.700	45.500	1.900	Open Manhole	1500
S3.006	3.842	96.1	S	47.410	45.460	1.650	Open Manhole	0

WML Consulting Ltd				Page 5																																																																																						
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<u>Area Summary for Storm</u> <table><thead><tr><th>Pipe Number</th><th>PIMP Type</th><th>PIMP Name</th><th>PIMP (%)</th><th>Gross Area (ha)</th><th>Imp. Area (ha)</th><th>Pipe Total (ha)</th></tr></thead><tbody><tr><td>3.000</td><td>-</td><td>-</td><td>100</td><td>0.132</td><td>0.132</td><td>0.132</td></tr><tr><td>3.001</td><td>-</td><td>-</td><td>100</td><td>0.042</td><td>0.042</td><td>0.042</td></tr><tr><td>3.002</td><td>-</td><td>-</td><td>100</td><td>0.039</td><td>0.039</td><td>0.039</td></tr><tr><td>3.003</td><td>-</td><td>-</td><td>100</td><td>0.142</td><td>0.142</td><td>0.142</td></tr><tr><td>4.000</td><td>-</td><td>-</td><td>100</td><td>0.050</td><td>0.050</td><td>0.050</td></tr><tr><td>4.001</td><td>-</td><td>-</td><td>100</td><td>0.070</td><td>0.070</td><td>0.070</td></tr><tr><td>3.004</td><td>-</td><td>-</td><td>100</td><td>0.028</td><td>0.028</td><td>0.028</td></tr><tr><td>3.005</td><td>-</td><td>-</td><td>100</td><td>0.048</td><td>0.048</td><td>0.048</td></tr><tr><td>3.006</td><td>-</td><td>-</td><td>100</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td colspan="4"></td><td>Total</td><td>Total</td><td>Total</td></tr><tr><td colspan="4"></td><td>0.551</td><td>0.551</td><td>0.551</td></tr></tbody></table>							Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)	3.000	-	-	100	0.132	0.132	0.132	3.001	-	-	100	0.042	0.042	0.042	3.002	-	-	100	0.039	0.039	0.039	3.003	-	-	100	0.142	0.142	0.142	4.000	-	-	100	0.050	0.050	0.050	4.001	-	-	100	0.070	0.070	0.070	3.004	-	-	100	0.028	0.028	0.028	3.005	-	-	100	0.048	0.048	0.048	3.006	-	-	100	0.000	0.000	0.000					Total	Total	Total					0.551	0.551	0.551
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WML Consulting Ltd		Page 6																																																																								
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL																																																																										
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Online Controls for Storm Hydro-Brake® Optimum Manhole: S12, DS/PN: S3.005, Volume (m³): 22.5 Unit Reference MD-SHE-0223-3000-2000-3000 Design Head (m)2.000 Design Flow (l/s)30.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)223 Invert Level (m)45.600 Minimum Outlet Pipe Diameter (mm)300 Suggested Manhole Diameter (mm)1800 Control Points Head (m)Flow (l/s) Design Point (Calculated)2.00030.0 Flush-Flo™0.58630.0 Kick-Flo®1.26824.1 Mean Flow over Head Range-26.0 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 <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>0.100</td><td>7.5</td><td>1.200</td><td>25.7</td><td>3.000</td><td>36.4</td><td>7.000</td><td>54.9</td></tr><tr><td>0.200</td><td>22.0</td><td>1.400</td><td>25.3</td><td>3.500</td><td>39.2</td><td>7.500</td><td>56.7</td></tr><tr><td>0.300</td><td>27.8</td><td>1.600</td><td>26.9</td><td>4.000</td><td>41.8</td><td>8.000</td><td>58.5</td></tr><tr><td>0.400</td><td>29.2</td><td>1.800</td><td>28.5</td><td>4.500</td><td>44.3</td><td>8.500</td><td>60.3</td></tr><tr><td>0.500</td><td>29.8</td><td>2.000</td><td>30.0</td><td>5.000</td><td>46.6</td><td>9.000</td><td>62.0</td></tr><tr><td>0.600</td><td>30.0</td><td>2.200</td><td>31.4</td><td>5.500</td><td>48.8</td><td>9.500</td><td>63.6</td></tr><tr><td>0.800</td><td>29.5</td><td>2.400</td><td>32.7</td><td>6.000</td><td>50.9</td><td></td><td></td></tr><tr><td>1.000</td><td>28.4</td><td>2.600</td><td>34.0</td><td>6.500</td><td>52.9</td><td></td><td></td></tr></table>			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	7.5	1.200	25.7	3.000	36.4	7.000	54.9	0.200	22.0	1.400	25.3	3.500	39.2	7.500	56.7	0.300	27.8	1.600	26.9	4.000	41.8	8.000	58.5	0.400	29.2	1.800	28.5	4.500	44.3	8.500	60.3	0.500	29.8	2.000	30.0	5.000	46.6	9.000	62.0	0.600	30.0	2.200	31.4	5.500	48.8	9.500	63.6	0.800	29.5	2.400	32.7	6.000	50.9			1.000	28.4	2.600	34.0	6.500	52.9		
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Page 7

No. 8 Oak Green
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Date 06/04/2022 15:09
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Micro
Drainage

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 0

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 0.360

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	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S3.000	S5	15 Winter	1	+0%	30/15 Summer			
S3.001	S6	15 Winter	1	+0%	100/15 Summer			
S3.002	S7	30 Winter	1	+0%	100/30 Summer			
S3.003	S8	30 Winter	1	+0%	100/30 Summer			
S4.000	S9	15 Winter	1	+0%				
S4.001	S10	15 Winter	1	+0%	100/30 Winter			
S3.004	S11	30 Winter	1	+0%	100/30 Summer			
S3.005	S12	30 Winter	1	+0%	1/15 Summer	100/60 Winter		
S3.006	S-C3	30 Winter	1	+0%				

PN	US/MH Name	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S5	48.887	-0.033	0.000	0.95			15.8	OK
S3.001	S6	47.405	-0.120	0.000	0.43			20.0	OK
S3.002	S7	45.940	-0.930	0.000	0.02			17.7	OK

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Page 11

No. 8 Oak Green

Stanley Green Business Park

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File 9003 - SURFACE WATER - ...

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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 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 0

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 0.360

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

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

S3.000S5 15 Winter100+40% 30/15 Summer

S3.001S6 15 Winter100+40% 100/15 Summer

S3.002S7 60 Winter100+40% 100/30 Summer

S3.003S8 60 Winter100+40% 100/30 Summer

S4.000S9 15 Winter100+40%

S4.001S10 60 Winter100+40% 100/30 Winter

S3.004S11 60 Winter100+40% 100/30 Summer

S3.005S12 60 Winter100+40% 1/15 Summer 100/60 Winter

S3.006S-C3 60 Winter100+40%

PN

US/MH Name

Level (m)

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Half Drain Time (mins)

Pipe Flow (l/s)

Status

S3.000S5 50.7671.8470.0003.6260.2 FLOOD RISK

S3.001S6 47.7740.2490.0001.7178.9 SURCHARGED

S3.002S7 47.7020.8320.0000.0653.9 SURCHARGED

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