



Surface Water Drainage Calculations

For a site referred to as

**113-117 North Road,
Manchester**

Undertaken on Behalf of

Brindle & Yam Solicitors.

Client Name:	Brindle & Yam Solicitors
Site Address:	113-117 North Road, Manchester
Date:	24.05.23
Document Title :	Surface Water Drainage Calculations
Document ref	23282-0002
Revision:	P01

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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. 23282-1001 – Proposed Drainage GA
 - b. 23282-0001 – Drainage Strategy Document

Summary of Results

3. As noted within the drainage strategy document, due to the difficulties restricting proposed flows from the new development to the below Greenfield Runoff Rates it has been considered that a maximum forward flow of 1 l/s should be used for all storm durations up to and including the critical 100-year event + 40% climate change allowance subject to approval by United Utilities.
4. The below summary table demonstrates that the above maximum design flow of 1 l/s is achievable based on the drainage design shown on drawing 23282-1001.

Greenfield Runoff Rate* (l/s)	Proposed Site Runoff Rate – Manhole S5 (l/s)
Q1: 0.1	1:1: 0.8
Q30: 0.1	1:30: 0.9
Q100: 0.2	1:100 + 40%: 1.0



Greenfield Runoff Calculation

		Page 1
		
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Innovyze	Source Control 2020.1.3	
ICP SUDS Mean Annual Flood Input Return Period (years)100Soil0.450 Area (ha)0.015Urban0.000 SAAR (mm)860Region NumberRegion 10 Results 1/s QBAR Rural0.1 QBAR Urban0.1 Q100 years0.2 Q1 year0.1 Q30 years0.1 Q100 years0.2		
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Surface Water Network Calculation

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Design Criteria for Storm

FSR Rainfall Model - England and Wales				
Return Period (years)	1		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

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	9.756	0.100	97.6	0.007	5.00	0.0	0.600	o	100	Pipe/Conduit	
S1.001	3.139	0.000	0.0	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit	
S2.000	10.861	0.500	21.7	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit	
S1.002	4.155	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	4.075	0.050	81.5	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	46.00	5.21	76.450	0.007	0.0	0.0	0.0	0.78	6.1	0.9
S1.001	43.35	5.96	76.350	0.009	0.0	0.0	0.0	0.07	0.5«	1.1
S2.000	46.38	5.11	76.850	0.005	0.0	0.0	0.0	1.66	13.1	0.6
S1.002	40.34	6.96	75.800	0.014	0.0	0.0	0.0	0.07	0.5«	1.6
S1.003	40.12	7.04	75.800	0.014	0.0	0.0	0.0	0.85	6.7	1.6



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PIPELINE SCHEDULES for StormUpstream 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	100	S1	77.100	76.450	0.550	Open Manhole	315
S1.001	o	100	S2	77.000	76.350	0.550	Open Manhole	315
S2.000	o	100	S3	77.500	76.850	0.550	Open Manhole	315
S1.002	o	100	S3	77.200	75.800	1.300	Junction	
S1.003	o	100	S4	77.000	75.800	1.100	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	9.756	97.6	S2	77.000	76.350	0.550	Open Manhole	315
S1.001	3.139	0.0	S3	77.200	76.350	0.750	Junction	
S2.000	10.861	21.7	S3	77.200	76.350	0.750	Junction	
S1.002	4.155	0.0	S4	77.000	75.800	1.100	Open Manhole	1200
S1.003	4.075	81.5	S	76.850	75.750	1.000	Open Manhole	0



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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.007	0.007	0.007
1.001	User	-	100	0.002	0.002	0.002
2.000	User	-	100	0.005	0.005	0.005
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.014	0.014	0.014

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)
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S1.003	S	76.850	75.750	0.000	0	0
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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	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	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	0.360		



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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.002, Volume (m³): 0.1

Unit Reference	MD-SHE-0049-1000-0800-1000
Design Head (m)	0.800
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	75.800
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	1.0
Flush-Flo™	0.215	0.9
Kick-Flo®	0.437	0.8
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	1.2	3.000	1.8	7.000	2.7
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.8
0.300	0.9	1.600	1.4	4.000	2.1	8.000	2.9
0.400	0.8	1.800	1.4	4.500	2.2	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.3	9.000	3.0
0.600	0.9	2.200	1.6	5.500	2.4	9.500	3.1
0.800	1.0	2.400	1.6	6.000	2.5		
1.000	1.1	2.600	1.7	6.500	2.6		



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Storage Structures for Storm

Complex Manhole: S3, DS/PN: S1.002

Cellular Storage

Invert Level (m) 75.800 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	2.5	2.5	1.300	0.0	7.7
0.100	2.5	3.1	1.400	0.0	7.7
0.200	2.5	3.8	1.500	0.0	7.7
0.300	2.5	4.4	1.600	0.0	7.7
0.400	2.5	5.0	1.700	0.0	7.7
0.500	2.5	5.7	1.800	0.0	7.7
0.600	2.5	6.3	1.900	0.0	7.7
0.700	2.5	6.9	2.000	0.0	7.7
0.800	1.2	7.5	2.100	0.0	7.7
0.900	0.0	7.7	2.200	0.0	7.7
1.000	0.0	7.7	2.300	0.0	7.7
1.100	0.0	7.7	2.400	0.0	7.7
1.200	0.0	7.7	2.500	0.0	7.7

Infiltration Trench

Infiltration Coefficient Base (m/hr) 0.00000 Trench Width (m) 0.4
 Infiltration Coefficient Side (m/hr) 0.00000 Trench Length (m) 5.8
 Safety Factor 2.0 Slope (1:X) 0.0
 Porosity 0.30 Cap Volume Depth (m) 0.800
 Invert Level (m) 75.800 Cap Infiltration Depth (m) 0.000

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Simulation Criteria

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

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1	15	Winter	1	+0%	100/30	Winter		76.475
S1.001	S2	15	Winter	1	+0%	100/15	Summer		76.386
S2.000	S3	15	Winter	1	+0%				76.864
S1.002	S3	30	Winter	1	+0%	1/15	Summer		75.920
S1.003	S4	30	Winter	1	+0%				75.824

PN	US/MH Name	Surcharged		Flooded	Flow / Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow Cap.		Time (mins)	Flow (l/s)		
S1.000	S1	-0.075	0.000	0.15			0.8		OK
S1.001	S2	-0.064	0.000	0.27			1.1		OK
S2.000	S3	-0.086	0.000	0.05			0.6		OK
S1.002	S3	0.020	0.000	0.20		15	0.8	SURCHARGED*	
S1.003	S4	-0.076	0.000	0.14			0.8		OK

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<u>Simulation Criteria</u>			
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (1/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
<u>Synthetic Rainfall Details</u>			
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			OFF
DVD Status			ON
Inertia Status			ON
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									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1	15 Winter	30	+0%	100/30 Winter				76.491
S1.001	S2	15 Winter	30	+0%	100/15 Summer				76.412
S2.000	S3	15 Winter	30	+0%					76.873
S1.002	S3	30 Winter	30	+0%	1/15 Summer				76.183
S1.003	S4	120 Winter	30	+0%					75.827

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Time (mins)			Flow (l/s)			
S1.000	S1	-0.059	0.000	0.36				2.0		OK
S1.001	S2	-0.038	0.000	0.69				2.7		OK
S2.000	S3	-0.077	0.000	0.12				1.5		OK
S1.002	S3	0.283	0.000	0.23			20	0.9	SURCHARGED*	
S1.003	S4	-0.073	0.000	0.16				0.9		OK

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Simulation Criteria			
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /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

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1	60 Winter	100	+40%	100/30 Winter				76.708
S1.001	S2	60 Winter	100	+40%	100/15 Summer				76.704
S2.000	S3	15 Winter	100	+40%					76.882
S1.002	S3	60 Winter	100	+40%	1/15 Summer				76.701
S1.003	S4	60 Winter	100	+40%					75.829

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
S1.000	S1	0.158	0.000	0.35			2.0	SURCHARGED	
S1.001	S2	0.254	0.000	0.68			2.7	FLOOD RISK	
S2.000	S3	-0.068	0.000	0.23			2.8	OK	
S1.002	S3	0.801	0.000	0.26		46	1.0	SURCHARGED*	
S1.003	S4	-0.071	0.000	0.18			1.0	OK	



Exceedance Flow Route Plan





United Utilities Sewer Records



United Utilities Maps
for SafeDig

Date :	26/04/2023 11:56:29
Centre X:	387992
Centre Y:	398681
Scale :	500
UserName:	NETWRKPLS

Extract from maps of United Utilities'
Underground Assets

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

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