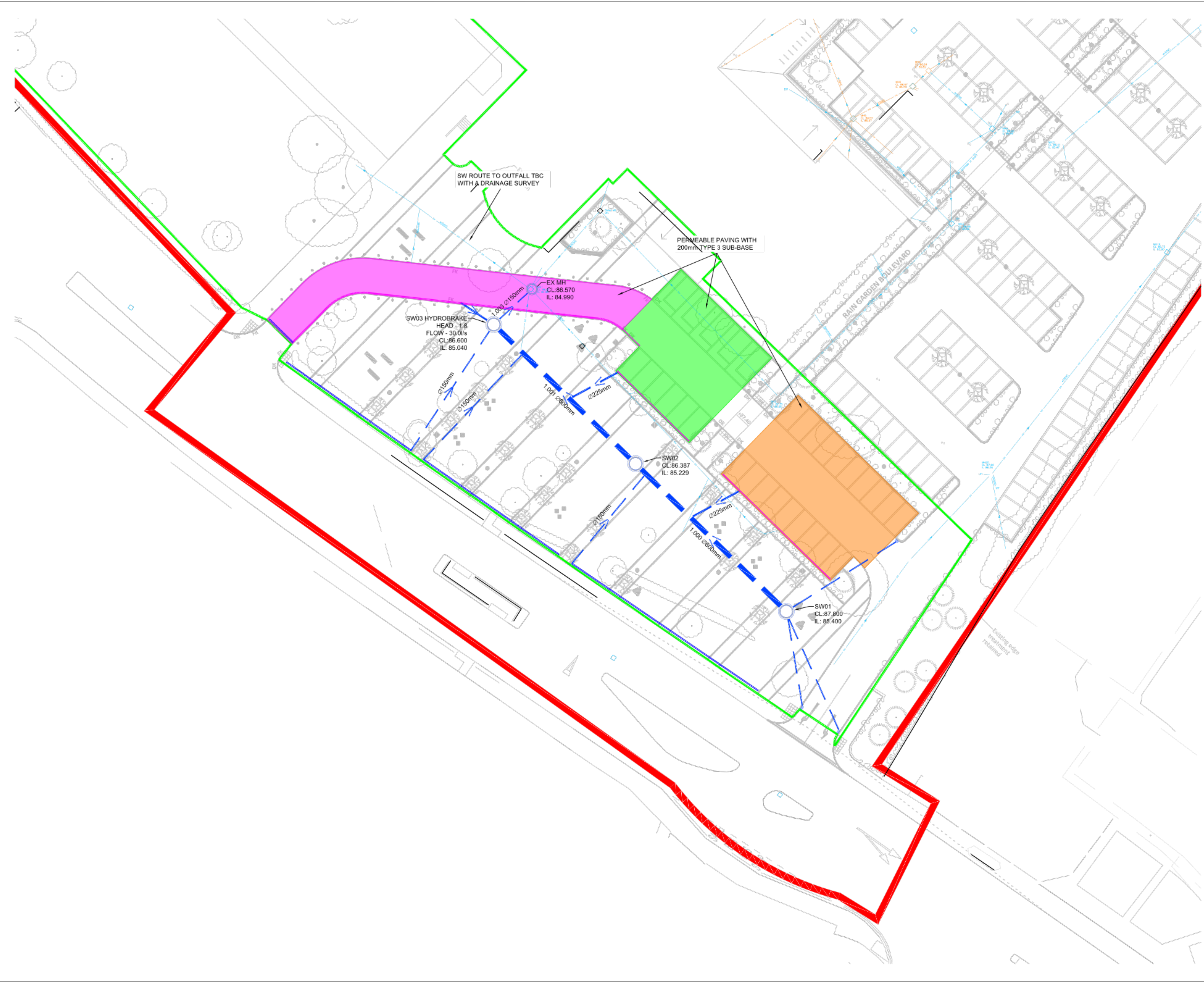




DISCLAIMER NOTES:

- THIS DOCUMENT IS COPYRIGHT OF THE ORIGINATOR AND MUST BE TREATED AS CONFIDENTIAL
- THIS DOCUMENT MUST NOT BE ALTERED, REPRODUCED OR DISTRIBUTED WITHOUT PRIOR WRITTEN CONSENT OF THE ORIGINATOR
- THIS DOCUMENT MUST NOT BE ALTERED - THE ORIGINATOR ACCEPTS NO RESPONSIBILITY FOR ANY DISCREPANCIES ARISING AS A RESULT OF THE ORIGINATOR'S INFORMATION BEING ALTERED BY OTHERS
- ANY DISCREPANCY MUST BE REPORTED TO THE ORIGINATOR
- DO NOT SCALE THIS DOCUMENT - USE FIGURED DIMENSIONS ONLY
- ALL DIMENSIONS MUST BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF ANY RELATED WORKS
- THIS DOCUMENT MUST BE READ IN CONJUNCTION WITH ALL SUPPORTING DOCUMENTS PRODUCED BY THE ORIGINATOR AND OTHER PROJECT DISCIPLINES
- THE ORIGINATOR ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF BACKGROUND INFORMATION PRODUCED BY THIRD PARTIES - THIS MUST BE TREATED AS INDICATIVE ONLY
- USERS OF THIS DOCUMENT ARE RESPONSIBLE FOR CHECKING WHICH REVISION IS CURRENT
- THE DOCUMENT STATUS 'INFORMATION' OR 'PRELIMINARY' INDICATES THAT THIS DRAWING IS FOR REFERENCE PURPOSES ONLY - THE ORIGINATOR WILL ACCEPT NO RESPONSIBILITY FOR THE COMPLETENESS OF INFORMATION UNDER THIS STATUS
- THE DOCUMENT STATUS 'RECORD' OR 'AS BUILT' HAS BEEN PREPARED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, THE ORIGINATOR ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THIS 'RECORD' OR 'AS BUILT' DOCUMENT OR FOR ANY ERRORS OR OMISSIONS THAT MAY HAVE BEEN INCORPORATED INTO IT AS A RESULT OF INCORRECT INFORMATION PROVIDED TO THE ORIGINATOR, THOSE RELYING ON THE 'RECORD' OR 'AS BUILT' DOCUMENT ARE ADVISED TO OBTAIN INDEPENDENT VERIFICATION OF ITS ACCURACY

DRAWING NOTES:

CDM REGULATIONS 2015

SIGNIFICANT OR NON-OBVIOUS RISKS AND RISKS WHICH ARE DIFFICULT TO MANAGE ARE IDENTIFIED ON THIS DRAWING USING THE FOLLOWING SYMBOL IDENTIFIED TO THE RIGHT WITH BRIEF ACCOMPANYING TEXT. FOR FURTHER DETAILS OF THE RISKS IDENTIFIED BY DESIGNERS, REFERENCE SHOULD BE MADE TO CDM HAZARD REGISTER.

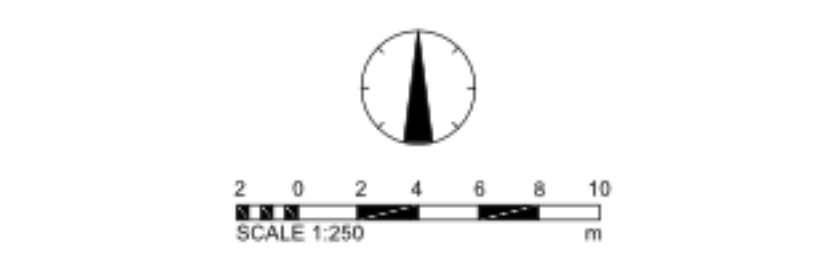
DRAINAGE KEY

- PROPOSED SW SEWER
- PROPOSED SW MANHOLE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED FILTER DRAIN
- EXISTING FW DRAIN
- EXISTING SW DRAIN

KEY

- SITE BOUNDARY
- AREA BOUNDARY

ADDITIONAL DRAINAGE SURVEY REQUIRED FOR THE SW AND FW DRAIN. POSSIBLE DIVERSION/PIPE REMOVAL TO BE CONFIRMED.



P01	PRELIMINARY ISSUE	17.02.23	AP	AM
REV	DESCRIPTION	DATE	BY	CHKD

ORIGINATOR:

RIDGE

5TH FLOOR
BELVEDERE HOUSE
12 BOOTH STREET
MANCHESTER, M2 4AW

TEL: 0161 833 9579
WWW.RIDGE.CO.UK

CLIENT:
WREXHAM GYNDWR UNIVERSITY

IN ASSOCIATION WITH:

PROJECT:
WREXHAM UNIVERSITY

TITLE:
**PROPOSED DRAINAGE GA
AREA C
SHEET 3 OF 3**

ENG/TECH:	CSE:	ICSE:	SCALE:	1:250	@ A1
AD	AM	PB	STATUS ISSUE:	S0	
STATUS:					
INFORMATION					
UNLESS ISSUED FOR CONSTRUCTION - WORKS AT CLIENT/CONTRACTORS RISK					
SUITABILITY:	S0 - Initial Status or WIP				
PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:
5020190	RDG	XX	XX	DR	C
					NUMBER:
					0502
					REV:
					P01

Appendix B – Hydraulic Calculations

Outputs from the Microdrainage software for the surface water drainage networks serving the development are provided. Pipe references from the hydraulic models can be located on the drainage layout plan.

Scott Hughes Design Ltd		Page 0
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023	Designed by AM	
File SW Area A_P2.MDX	Checked by PB	
Micro Drainage	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed SW Area A

Pipe Sizes Pipes Manhole Sizes Manhole

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.310	Minimum Backdrop Height (m)	0.500
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)	400

Designed with Level Soffits

Network Design Table for Proposed SW Area A

" - 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
1.000	7.934	0.100	79.3	0.750	5.00	0.0	0.600	0	225	Pipe/Conduit	0
1.001	12.785	0.100	127.9	0.000	0.00	0.0	0.600	0	225	Pipe/Conduit	0

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I I.Area (ha)	I Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.09	86.500	0.750	0.0	0.0	0.0	1.47	58.4	101.6
1.001	50.00	5.27	86.400	0.750	0.0	0.0	0.0	1.15	45.9	101.6

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023	Designed by AM	
File SW Area A_P2.MDX	Checked by PB	
Micro Drainage	Network 2018.1	

Manhole Schedules for Proposed SW Area A

MH Name	MH CL (n)	MH Depth (n)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (n)	Diameter (mm)	PN	Pipes In Invert Level (n)	Diameter (mm)	Backdrop (mm)
SW01	87.000	0.500	Open Manhole	1200	1.000	86.500	225				
SW02	87.000	0.600	Open Manhole	1200	1.001	86.400	225	1.000	86.400	225	
Outfall	86.920	0.620	Open Manhole	1200		OUTFALL		1.001	86.300	225	

Scott Hughes Design Ltd		Page 2
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023	Designed by AM	
File SW Area A_P2.MDX	Checked by PB	
Micro Drainage	Network 2018.1	

PIPELINE SCHEDULES for Proposed SW Area A

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)
1.000	o	225	SW01	87.000	86.500	0.275	Open Manhole	1200
1.001	o	225	SW02	87.000	86.400	0.375	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)
1.000	7.934	79.3	SW02	87.000	86.400	0.375	Open Manhole	1200
1.001	12.785	127.9	Outfall	86.920	86.300	0.395	Open Manhole	1200

Free Flowing Outfall Details for Proposed SW Area A

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.001 Outfall	86.920	86.300	0.000	1200	0
---------------	--------	--------	-------	------	---

Simulation Criteria for Proposed SW Area A

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.310		

Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023	Designed by AM	
File SW Area A_P2.MDX	Checked by PB	
Micro Drainage	Network 2018.1	

Online Controls for Proposed SW Area A

Hydro-Brake® Optimum Manhole: SW02, DS/PN: 1.001, Volume (m³): 0.9

Unit Reference	MD-SCU-0223-4000-0650-4000
Design Head (m)	0.650
Design Flow (l/s)	40.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	223
Invert Level (m)	86.400
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.650	40.0	Kick-Flo®	0.335	29.1
Flush-Flo™	0.261	30.0	Mean Flow over Head Range	-	25.9

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)	Depth (m)	Flow (l/s)
0.100	8.3	0.800	44.2	2.000	68.8	4.000	96.4	7.000	125.8
0.200	24.4	1.000	49.2	2.200	72.1	4.500	102.1	7.500	130.2
0.300	29.7	1.200	53.7	2.400	75.2	5.000	107.4	8.000	134.6
0.400	31.7	1.400	57.9	2.600	78.1	5.500	112.6	8.500	138.8
0.500	35.3	1.600	61.7	3.000	83.8	6.000	117.5	9.000	142.9
0.600	38.5	1.800	65.4	3.500	90.3	6.500	122.1	9.500	146.8

Scott Hughes Design Ltd		Page 4
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023 File SW Area A_P2.MDX	Designed by AM Checked by PB	
Micro Drainage	Network 2018.1	

Storage Structures for Proposed SW Area A

Porous Car Park Manhole: SW01, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	50.0
Membrane Percolation (mm/hr)	508	Length (m)	100.0
Max Percolation (l/s)	705.6	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.500	Membrane Depth (mm)	250

Scott Hughes Design Ltd		Page 5
The Flint Glass Works 64 Jersey Street Manchester M4 6JW		WREXHAM UNIVERSITY SW RESULTS AREA A
Date 17/02/2023 File SW Area A_P2.MDX		Designed by AM Checked by PB
Micro Drainage		Network 2018.1



1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area A

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.310 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	120 Winter	1	+0%	100/60 Summer				86.590	-0.135	0.000
1.001	SW02	120 Winter	1	+0%	30/120 Winter				86.542	-0.083	0.000

PN	US/MH Name	Flow Cap.	Flow / Overflow (l/s)	Pipe Flow (l/s)	Level Status Exceeded
1.000	SW01	0.34		15.0	OK
1.001	SW02	0.38		15.0	OK

Scott Hughes Design Ltd		Page 6
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA A	
Date 17/02/2023	Designed by AM	
File SW Area A_P2.MDX	Checked by PB	
Micro Drainage	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area A

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.310 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	120 Winter	30	+0%	100/60 Summer				86.663	-0.062	0.000
1.001	SW02	120 Winter	30	+0%	30/120 Winter				86.628	0.003	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.63		28.0	OK	
1.001	SW02	0.71		28.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area A

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.310 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	180 Winter	100	+45%	100/60 Summer				86.768	0.043	0.000
1.001	SW02	240 Winter	100	+45%	30/120 Winter				86.735	0.110	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.69		30.6	FLOOD RISK	
1.001	SW02	0.75		29.8	FLOOD RISK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed SW Area B1

Pipe Sizes Pipes Manhole Sizes Manholes

FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.307	Minimum Backdrop Height (m)	0.600
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)	400

Designed with Level Soffits

Network Design Table for Proposed SW Area B1

- Indicates pipe length does not match coordinates

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
1.000	81.500#	0.113	721.2	0.100	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	15.600#	0.127	122.8	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	12.000#	0.090	133.3	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	8.000#	0.110	72.7	0.070	15.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	26.000#	0.100	260.0	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)	I I.Area (ha)	I Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	47.00	7.35	85.525	0.100	0.0	0.0	0.0	0.58	40.8	12.7
1.001	46.48	7.53	85.412	0.200	0.0	0.0	0.0	1.42	100.2	25.2
1.002	46.08	7.68	85.285	0.300	0.0	0.0	0.0	1.36	96.1	37.4
2.000	32.87	15.07	85.525	0.070	0.0	0.0	0.0	1.85	130.5	6.2
1.003	50.00	5.54	85.195	0.000	20.0	0.0	0.0	0.81	32.1	20.0

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:08	Designed by AM	
File Eng Block (B1).MDX	Checked by PB	
Micro Drainage	Network 2018.1	

Manhole Schedules for Proposed SW Area B1

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)
SW01	86.800	1.275	Open Manhole	1350	1.000	85.525	300				
SW03	86.800	1.388	Open Manhole	1500	1.001	85.412	300	1.000	85.412	300	
SW04	86.560	1.275	Open Manhole	1350	1.002	85.285	300	1.001	85.285	300	
SW05	86.800	1.275	Open Manhole	1350	2.000	85.525	300				
SW06	86.800	1.605	Open Manhole	1500	1.003	85.195	225	1.002	85.195	300	
								2.000	85.415	300	295
MH3	86.360	1.265	Open Manhole	1200		OUTFALL		1.003	85.095	225	

Scott Hughes Design Ltd		Page 2
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:08	Designed by AM	
File Eng Block (B1).MDX	Checked by PB	
Micro Drainage		Network 2018.1

PIPELINE SCHEDULES for Proposed SW Area B1

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)
1.000	o	300	SW01	86.800	85.525	0.975	Open Manhole	1350
1.001	o	300	SW03	86.800	85.412	1.088	Open Manhole	1500
1.002	o	300	SW04	86.560	85.285	0.975	Open Manhole	1350
2.000	o	300	SW05	86.800	85.525	0.975	Open Manhole	1350
1.003	o	225	SW06	86.800	85.195	1.380	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)
1.000	81.500#	721.2	SW03	86.800	85.412	1.088	Open Manhole	1500
1.001	15.600#	122.8	SW04	86.560	85.285	0.975	Open Manhole	1350
1.002	12.000#	133.3	SW06	86.800	85.195	1.305	Open Manhole	1500
2.000	8.000#	72.7	SW06	86.800	85.415	1.085	Open Manhole	1500
1.003	26.000#	260.0	MH3	86.360	85.095	1.040	Open Manhole	1200

Free Flowing Outfall Details for Proposed SW Area B1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.003	MH3	86.360	85.095	0.000	1200	0
-------	-----	--------	--------	-------	------	---

Simulation Criteria for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
MS-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.307		

Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:08	Designed by AM	
File Eng Block (B1).MDX	Checked by PB	
Micro Drainage	Network 2018.1	

Storage Structures for Proposed SW Area B1

Cellular Storage Manhole: SW04, DS/PN: 1.002

Invert Level (m) 85.285 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)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	135.0	0.0	0.800	135.0	0.0	0.801	0.0	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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 Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 1 Number of Real Time Controls 0			
Synthetic Rainfall Details			
Rainfall Model	FSR MS-60 (mm)	18.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R	0.307 Cv (Winter) 0.840
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5 Second Increment (Extended)		
DTS Status			ON
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)			1, 30, 100
Climate Change (%)			0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	SW01	15 Winter	1	+0%	100/15 Summer				85.636	-0.189	0.000	0.26
1.001	SW03	15 Winter	1	+0%	100/30 Winter				85.509	-0.203	0.000	0.23
1.002	SW04	30 Winter	1	+0%	100/15 Summer				85.373	-0.212	0.000	0.19
2.000	SW05	30 Winter	1	+0%					85.570	-0.255	0.000	0.05
1.003	SW06	30 Winter	1	+0%	30/15 Summer				85.324	-0.096	0.000	0.62

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01		10.1	OK	
1.001	SW03		19.1	OK	
1.002	SW04		14.2	OK	
2.000	SW05		4.5	OK	
1.003	SW06		18.5	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged	Flooded	Flow / Cap.
	Name	Storm							(m)	(m)	Volume (m³)	
1.000	SW01	15 Winter	30	+0%	100/15 Summer				85.714	-0.111	0.000	0.63
1.001	SW03	15 Winter	30	+0%	100/30 Winter				85.578	-0.134	0.000	0.59
1.002	SW04	30 Winter	30	+0%	100/15 Summer				85.497	-0.088	0.000	0.37
2.000	SW05	30 Winter	30	+0%					85.597	-0.228	0.000	0.13
1.003	SW06	30 Winter	30	+0%	30/15 Summer				85.475	0.055	0.000	1.29

PN	US/MH		Pipe Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
	Name					
1.000	SW01			24.7	OK	
1.001	SW03			49.5	OK	
1.002	SW04			27.9	OK	
2.000	SW05			11.0	OK	
1.003	SW06			38.2	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume	Flow / Cap.
									(m)	(m)	(m³)	
1.000	SW01	15 Winter	100	+45%	100/15 Summer				85.898	0.073	0.000	1.17
1.001	SW03	60 Winter	100	+45%	100/30 Winter				85.738	0.026	0.000	0.63
1.002	SW04	60 Winter	100	+45%	100/15 Summer				85.708	0.123	0.000	0.59
2.000	SW05	30 Winter	100	+45%					85.689	-0.136	0.000	0.24
1.003	SW06	30 Winter	100	+45%	30/15 Summer				85.678	0.258	0.000	1.92

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01		46.0	SURCHARGED	
1.001	SW03		53.3	SURCHARGED	
1.002	SW04		44.2	SURCHARGED	
2.000	SW05		20.1	OK	
1.003	SW06		56.9	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed SW Area B1

Pipe Sizes Pipes Manhole Sizes Manholes

FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.307	Minimum Backdrop Height (m)	0.600
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)	400

Designed with Level Soffits

Network Design Table for Proposed SW Area B1

- Indicates pipe length does not match coordinates

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
1.000	31.119	0.120	259.3	0.104	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	34.825	0.120	290.2	0.134	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	24.843#	0.120	207.0	0.037	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	21.629	0.108	200.0	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)	I I.Area (ha)	I Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.53	85.525	0.104	0.0	0.0	0.0	0.97	68.7	14.1
1.001	50.00	6.17	85.405	0.238	0.0	0.0	0.0	0.92	64.9	32.2
1.002	49.45	6.55	85.285	0.275	0.0	0.0	0.0	1.09	77.0	36.8
1.003	50.00	5.39	85.165	0.000	20.0	0.0	0.0	0.92	36.6	20.0

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:04 File Other Block (B2).MDX	Designed by AM Checked by PB	
Micro Drainage	Network 2018.1	

Manhole Schedules for Proposed SW Area B1

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)
SW01	86.800	1.275	Open Manhole	1350	1.000	85.525	300				
SW03	86.800	1.395	Open Manhole	1500	1.001	85.405	300	1.000	85.405	300	
SW04	86.560	1.275	Open Manhole	1350	1.002	85.285	300	1.001	85.285	300	
SW07	86.700	1.535	Open Manhole	1800	1.003	85.165	225	1.002	85.165	300	
MH3	86.360	1.303	Open Manhole	1200		OUTFALL		1.003	85.057	225	

Scott Hughes Design Ltd		Page 2
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:04	Designed by AM	
File Other Block (B2).MDX	Checked by PB	
Micro Drainage	Network 2018.1	

PIPELINE SCHEDULES for Proposed SW Area B1

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)
1.000	o	300	SW01	86.800	85.525	0.975	Open Manhole	1350
1.001	o	300	SW03	86.800	85.405	1.095	Open Manhole	1500
1.002	o	300	SW04	86.560	85.285	0.975	Open Manhole	1350
1.003	o	225	SW07	86.700	85.165	1.310	Open Manhole	1800

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)
1.000	31.119	259.3	SW03	86.800	85.405	1.095	Open Manhole	1500
1.001	34.825	290.2	SW04	86.560	85.285	0.975	Open Manhole	1350
1.002	24.843#	207.0	SW07	86.700	85.165	1.235	Open Manhole	1800
1.003	21.629	200.0	MH3	86.360	85.057	1.078	Open Manhole	1200

Free Flowing Outfall Details for Proposed SW Area B1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.003	MH3	86.360	85.057	0.000	1200	0
-------	-----	--------	--------	-------	------	---

Simulation Criteria for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
MS-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.307		

Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:04	Designed by AM	
File Other Block (B2).MDX	Checked by PB	
Micro Drainage	Network 2018.1	

Online Controls for Proposed SW Area B1

Hydro-Brake® Optimum Manhole: SW07, DS/PN: 1.003, Volume (m³): 5.6

Unit Reference	MD-SHE-0225-3000-1850-3000
Design Head (m)	1.850
Design Flow (l/s)	30.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	225
Invert Level (m)	85.165
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.850	30.0	Kick-Flo®	1.198	24.4
Flush-Flo™	0.553	30.0	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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.800	29.3	2.000	31.1	4.000	43.4	7.000	57.0
0.200	22.4	1.000	27.9	2.200	32.6	4.500	46.0	7.500	58.9
0.300	28.2	1.200	24.4	2.400	34.0	5.000	48.4	8.000	60.8
0.400	29.4	1.400	26.2	2.600	35.3	5.500	50.7	8.500	62.6
0.500	29.9	1.600	28.0	3.000	37.8	6.000	52.9	9.000	64.4
0.600	29.9	1.800	29.6	3.500	40.7	6.500	54.9	9.500	66.1

Storage Structures for Proposed SW Area B1

Cellular Storage Manhole: SW07, DS/PN: 1.003

Invert Level (m) 85.165 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	50.0	0.0	0.800	50.0	0.0	0.801	0.0	0.0

Scott Hughes Design Ltd		Page 5
The Flint Glass Works 64 Jersey Street Manchester M4 6JW		WREXHAM UNIVERSITY SW RESULTS AREA B1
Date 11/04/2023 11:04		Designed by AM
File Other Block (B2).MDX		Checked by PB
Micro Drainage		Network 2018.1



1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
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) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	1	+0%	100/15 Summer				85.614	-0.211	0.000
1.001	SW03	15 Winter	1	+0%	100/15 Summer				85.538	-0.167	0.000
1.002	SW04	15 Winter	1	+0%	100/15 Summer	100/60 Winter			85.415	-0.170	0.000
1.003	SW07	30 Winter	1	+0%	30/15 Summer				85.325	-0.065	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status Exceeded
1.000	SW01	0.19		11.7	OK
1.001	SW03	0.40		23.7	OK
1.002	SW04	0.39		26.5	OK 1
1.003	SW07	0.49		16.4	OK

Scott Hughes Design Ltd		Page 6
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B1	
Date 11/04/2023 11:04	Designed by AM	
File Other Block (B2).MDX	Checked by PB	
Micro Drainage	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	SW01	15 Winter	30	+0%	100/15 Summer				85.729	-0.096	0.000
1.001	SW03	15 Winter	30	+0%	100/15 Summer				85.695	-0.010	0.000
1.002	SW04	30 Winter	30	+0%	100/15 Summer	100/60 Winter			85.567	-0.018	0.000
1.003	SW07	30 Winter	30	+0%	30/15 Summer				85.533	0.143	0.000

		Pipe				Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Exceeded	
1.000	SW01	0.43		27.2	OK		
1.001	SW03	1.00		59.6	OK		
1.002	SW04	0.84		57.4	OK	1	
1.003	SW07	0.87		29.1	SURCHARGED		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B1

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

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	SW01	60 Winter	100	+45%	100/15 Summer				86.605	0.780	0.000
1.001	SW03	60 Winter	100	+45%	100/15 Summer				86.591	0.886	0.000
1.002	SW04	60 Winter	100	+45%	100/15 Summer	100/60 Winter			86.560	0.975	0.037
1.003	SW07	60 Winter	100	+45%	30/15 Summer				86.533	1.143	0.000

		Pipe				Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Exceeded	
1.000	SW01	0.45		27.9	FLOOD RISK		
1.001	SW03	1.07		63.7	FLOOD RISK		
1.002	SW04	1.06		72.5	FLOOD	1	
1.003	SW07	0.90		29.9	FLOOD RISK		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed SW Area B2

Pipe Sizes Pipe Manhole Sizes Manhole			
FSR Rainfall Model - England and Wales			
Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.310	Minimum Backdrop Height (m)	0.600
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)	400

Designed with Level Soffits

Time Area Diagram for Proposed SW Area B2

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.203	4-8	0.082

Total Area Contributing (ha) = 0.285

Total Pipe Volume (m³) = 4.763

Network Design Table for Proposed SW Area B2

« - 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
1.000	19.635	0.100	196.4	0.110	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	20.881	0.100	208.8	0.117	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	5.000	0.100	50.0	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	16.550	0.080	206.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	5.000	0.500	10.0	0.058	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	10.027	0.070	143.2	0.000	0.00	0.0	0.600	o	150	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)
1.000	50.00	5.29	85.300	0.110	0.0	0.0	0.0	1.12	79.1	14.9
1.001	50.00	5.61	85.200	0.227	0.0	0.0	0.0	1.08	76.6	30.7
2.000	50.00	5.04	85.200	0.000	0.0	0.0	0.0	2.23	157.5	0.0
1.002	50.00	5.87	85.100	0.227	0.0	0.0	0.0	1.09	77.0	30.7
3.000	50.00	5.02	85.900	0.058	0.0	0.0	0.0	4.16	165.5	7.9
1.003	50.00	6.07	85.020	0.285	0.0	0.0	0.0	0.84	14.8«	38.6

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B3	
Date 19/02/2023 14:39	Designed by AM	
File SW Area B2.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

Manhole Schedules for Proposed SW Area B2

MH Name	MH CL (n)	MH Depth (n)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (n)	Diameter (mm)	PN	Pipes In Invert Level (n)	Diameter (mm)	Backdrop (mm)
SW01	86.500	1.200	Open Manhole	1200	1.000	85.300	300				
SW02	87.000	1.800	Open Manhole	1200	1.001	85.200	300	1.000	85.200	300	
SW TANK	86.360	1.160	Open Manhole	0	2.000	85.200	300				
SW03	86.360	1.260	Open Manhole	1500	1.002	85.100	300	1.001	85.100	300	
								2.000	85.100	300	
PERMEABLE PAVING	86.360	0.460	Open Manhole	0	3.000	85.900	225				
SW05	86.200	1.180	Open Manhole	1200	1.003	85.020	150	1.002	85.020	300	
								3.000	85.400	225	
MH13	86.240	1.290	Open Manhole	1200		OUTFALL		1.003	84.950	150	455



Network 2018.1

Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B3	
Date 19/02/2023 14:39	Designed by AM	
File SW Area B2.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

Online Controls for Proposed SW Area B2

Hydro-Brake® Optimum Manhole: SW05, DS/PN: 1.003, Volume (m³): 2.6

Unit Reference	MD-SCU-0150-2750-1500-2750
Design Head (m)	1.500
Design Flow (l/s)	27.5
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	150
Invert Level (m)	85.020
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	27.5	Kick-Flo®	0.224	11.2
Flush-Flo™	0.180	11.4	Mean Flow over Head Range	-	18.5

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)	Depth (m)	Flow (l/s)
0.100	6.0	0.800	20.4	2.000	31.6	4.000	44.1	7.000	57.9
0.200	11.4	1.000	22.6	2.200	33.1	4.500	46.7	7.500	59.9
0.300	12.8	1.200	24.7	2.400	34.5	5.000	49.2	8.000	61.8
0.400	14.7	1.400	26.6	2.600	35.8	5.500	51.5	8.500	63.7
0.500	16.3	1.600	28.4	3.000	38.4	6.000	53.7	9.000	65.5
0.600	17.8	1.800	30.0	3.500	41.4	6.500	55.9	9.500	67.2

Scott Hughes Design Ltd		Page 4
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA B3	
Date 19/02/2023 14:39	Designed by AM	
File SW Area B2.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

Storage Structures for Proposed SW Area B2

Cellular Storage Manhole: SW TANK, DS/PN: 2.000

Invert Level (m) 85.200 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)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	60.0	50.0	0.600	60.0	67.0	0.601	0.0	67.0

Porous Car Park Manhole: PERMEABLE PAVING, DS/PN: 3.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 20.0
Membrane Percolation (mm/hr) 500 Length (m) 24.0
Max Percolation (l/s) 67.7 Slope (1:X) 100.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 85.900 Membrane Depth (mm) 250

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B2

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 Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0		
Synthetic Rainfall Details		
Rainfall Model	FSR MS-60 (mm)	18.000 Cv (Summer) 0.750
Region England and Wales	Ratio R	0.310 Cv (Winter) 0.840
Margin for Flood Risk Warning (mm)		300.0
Analysis Timestep	2.5 Second Increment (Extended)	
DTS Status		ON
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)		1, 30, 100
Climate Change (%)		0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	15 Winter	1	+0%	30/15 Summer				85.390	-0.210
1.001	SW02	30 Winter	1	+0%	30/15 Summer				85.354	-0.146
2.000	SW TANK	30 Winter	1	+0%	30/30 Winter				85.240	-0.260
1.002	SW03	30 Winter	1	+0%	30/15 Summer				85.337	-0.063
3.000	PERMEABLE PAVING	60 Summer	1	+0%	100/60 Winter				85.928	-0.197
1.003	SW05	30 Winter	1	+0%	1/15 Summer				85.328	0.158

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.18		12.3	OK	
1.001	SW02	0.000	0.28		18.6	OK	
2.000	SW TANK	0.000	0.03		2.6	OK	
1.002	SW03	0.000	0.21		14.0	OK	
3.000	PERMEABLE PAVING	0.000	0.04		3.8	OK	
1.003	SW05	0.000	0.98		13.0	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B2

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 Offline Controls 0	Number of Time/Area Diagrams 0	Number of Real Time Controls 0
Number of Online Controls 1	Number of Storage Structures 2		

Synthetic Rainfall Details

Rainfall Model	FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales	Ratio R 0.310 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	15 Winter	30	+0%	30/15 Summer				85.683	0.083
1.001	SW02	15 Winter	30	+0%	30/15 Summer				85.658	0.158
2.000	SW TANK	60 Winter	30	+0%	30/30 Winter				85.546	0.046
1.002	SW03	15 Winter	30	+0%	30/15 Summer				85.601	0.201
3.000	PERMEABLE PAVING	15 Winter	30	+0%	100/60 Winter				85.957	-0.168
1.003	SW05	15 Winter	30	+0%	1/15 Summer				85.622	0.452

PN	US/MH Name	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.43	29.9	SURCHARGED	
1.001	SW02	0.000	0.90	60.4	SURCHARGED	
2.000	SW TANK	0.000	0.13	10.7	SURCHARGED	
1.002	SW03	0.000	0.28	18.6	SURCHARGED	
3.000	PERMEABLE PAVING	0.000	0.14	14.1	OK	
1.003	SW05	0.000	1.23	16.3	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area B2

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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.310 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	SW01	30 Winter	100	+45%	30/15 Summer				86.350	0.750
1.001	SW02	30 Winter	100	+45%	30/15 Summer				86.319	0.819
2.000	SW TANK	30 Winter	100	+45%	30/30 Winter				86.241	0.741
1.002	SW03	30 Winter	100	+45%	30/15 Summer				86.242	0.842
3.000	PERMEABLE PAVING	60 Winter	100	+45%	100/60 Winter				86.158	0.033
1.003	SW05	30 Winter	100	+45%	1/15 Summer				86.185	1.015

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.000	0.62		42.5	FLOOD RISK	
1.001	SW02	0.000	1.33		89.5	SURCHARGED	
2.000	SW TANK	0.000	0.22		17.6	FLOOD RISK	
1.002	SW03	0.000	0.86		56.2	FLOOD RISK	
3.000	PERMEABLE PAVING	0.000	0.20		20.2	FLOOD RISK	
1.003	SW05	0.000	1.74		23.0	FLOOD RISK	

Scott Hughes Design Ltd		Page 0
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA C	
Date 19/02/2023 14:47	Designed by AM	
File SW Area C.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed SW Area C

Pipe Sizes Pipe Manhole Sizes Manhole

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.307	Minimum Backdrop Height (m)	0.600
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)	400

Designed with Level Soffits

Network Design Table for Proposed SW Area C

- Indicates pipe length does not match coordinates

n - 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
1.000	7.542	0.500	15.1	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
1.001	34.000#	0.171	198.8	0.086	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
2.000	7.775	0.100	77.8	0.032	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
1.002	28.397	0.189	150.2	0.063	0.00	0.0	0.600	o	600	Pipe/Conduit	🔒
3.000	6.062	0.300	20.2	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
1.003	7.434	0.050	148.7	0.095	0.00	0.0	0.600	o	150	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)
1.000	50.00	5.04	87.000	0.037	0.0	0.0	0.0	3.39	134.7	5.0
1.001	50.00	5.37	85.400	0.123	0.0	0.0	0.0	1.72	487.3	16.7
2.000	50.00	5.09	86.000	0.032	0.0	0.0	0.0	1.48	59.0	4.3
1.002	50.00	5.60	85.229	0.218	0.0	0.0	0.0	1.98	561.1	29.5
3.000	50.00	5.03	86.000	0.085	0.0	0.0	0.0	2.92	116.3	11.5
1.003	50.00	5.76	85.040	0.398	0.0	0.0	0.0	0.82	14.5n	53.9

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA C	
Date 19/02/2023 14:47 File SW Area C.mdx	Designed by AM Checked by PB	
Micro Drainage	Network 2018.1	

Manhole Schedules for Proposed SW Area C

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)
SW01	87.430	0.430	Open Manhole	Ø	1.000	87.000	225				
SW02	87.800	2.400	Open Manhole	1800	1.001	85.400	600	1.000	86.500	225	725
SW03	86.800	0.800	Open Manhole	Ø	2.000	86.000	225				
SW04	87.150	1.921	Open Manhole	1800	1.002	85.229	600	1.001	85.229	600	
								2.000	85.900	225	296
SW05	86.750	0.750	Open Manhole	Ø	3.000	86.000	225				
SW06	86.600	1.560	Open Manhole	1800	1.003	85.040	150	1.002	85.040	600	
								3.000	85.700	225	735
SW04	86.605	1.615	Open Manhole	1200		OUTFALL		1.003	84.990	150	

PIPELINE SCHEDULES for Proposed SW Area C

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)
1.000	o	225	SW01	87.430	87.000	0.205	Open Manhole	0
1.001	o	600	SW02	87.800	85.400	1.800	Open Manhole	1800
2.000	o	225	SW03	86.800	86.000	0.575	Open Manhole	0
1.002	o	600	SW04	87.150	85.229	1.321	Open Manhole	1800
3.000	o	225	SW05	86.750	86.000	0.525	Open Manhole	0
1.003	o	150	SW06	86.600	85.040	1.410	Open Manhole	1800

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)
1.000	7.542	15.1	SW02	87.800	86.500	1.075	Open Manhole	1800
1.001	34.000#	198.8	SW04	87.150	85.229	1.321	Open Manhole	1800
2.000	7.775	77.8	SW04	87.150	85.900	1.025	Open Manhole	1800
1.002	28.397	150.2	SW06	86.600	85.040	0.960	Open Manhole	1800
3.000	6.062	20.2	SW06	86.600	85.700	0.675	Open Manhole	1800
1.003	7.434	148.7	SW04	86.605	84.990	1.465	Open Manhole	1200

Free Flowing Outfall Details for Proposed SW Area C

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003	SW04	86.605	84.990	0.000	1200	0

Simulation Criteria for Proposed SW Area C

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 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	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.307		

Scott Hughes Design Ltd		Page 3
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA C	
Date 19/02/2023 14:47	Designed by AM	
File SW Area C.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

Online Controls for Proposed SW Area C

Hydro-Brake® Optimum Manhole: SW06, DS/PN: 1.003, Volume (m³): 11.7

Unit Reference	MD-SCU-0150-3000-1800-3000
Design Head (m)	1.800
Design Flow (l/s)	30.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	150
Invert Level (m)	85.040
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	30.0	Kick-Flo®	0.224	11.2
Flush-Flo™	0.175	11.5	Mean Flow over Head Range	-	20.2

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)	Depth (m)	Flow (l/s)
0.100	6.0	0.800	20.3	2.000	31.6	4.000	44.1	7.000	57.9
0.200	11.4	1.000	22.6	2.200	33.0	4.500	46.7	7.500	59.9
0.300	12.8	1.200	24.7	2.400	34.5	5.000	49.1	8.000	61.8
0.400	14.6	1.400	26.6	2.600	35.8	5.500	51.5	8.500	63.6
0.500	16.3	1.600	28.3	3.000	38.4	6.000	53.7	9.000	65.4
0.600	17.7	1.800	30.0	3.500	41.3	6.500	55.8	9.500	67.2

Scott Hughes Design Ltd		Page 4
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA C	
Date 19/02/2023 14:47	Designed by AM	
File SW Area C.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

Storage Structures for Proposed SW Area C

Porous Car Park Manhole: SW01, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.5
Membrane Percolation (mm/hr)	508	Length (m)	22.0
Max Percolation (l/s)	48.1	Slope (1:X)	61.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	87.000	Membrane Depth (mm)	200

Porous Car Park Manhole: SW03, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0
Membrane Percolation (mm/hr)	508	Length (m)	15.0
Max Percolation (l/s)	31.8	Slope (1:X)	45.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.000	Membrane Depth (mm)	200

Porous Car Park Manhole: SW05, DS/PN: 3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	508	Length (m)	50.0
Max Percolation (l/s)	42.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	86.000	Membrane Depth (mm)	200

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area C

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 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 FSR MS-60 (mm) 18.000

Cv (Summer) 0.750

Region England and Wales

Ratio R 0.307

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

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) 1, 30, 100

Climate Change (%) 0, 0, 45

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded	
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.
1.000	SW01	60 Summer	1	+0%					87.024	-0.201	0.000	0.02
1.001	SW02	30 Winter	1	+0%	30/15 Summer				85.483	-0.517	0.000	0.02
2.000	SW03	30 Winter	1	+0%	100/15 Summer				86.034	-0.191	0.000	0.06
1.002	SW04	30 Winter	1	+0%	30/15 Summer				85.475	-0.354	0.000	0.02
3.000	SW05	15 Winter	1	+0%	100/15 Summer				86.051	-0.174	0.000	0.11
1.003	SW06	30 Winter	1	+0%	1/15 Summer				85.473	0.283	0.000	1.19

	US/MH	Overflow	Pipe Flow	Level Exceeded
PN	Name	(l/s)	(l/s)	Status
1.000	SW01		2.3	OK
1.001	SW02		7.9	OK
2.000	SW03		2.5	OK
1.002	SW04		10.0	OK
3.000	SW05		8.6	OK
1.003	SW06		14.9	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area C

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 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	FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales	Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
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)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	SW01	15 Winter	30	+0%					87.047	-0.178	0.000	0.10
1.001	SW02	30 Winter	30	+0%	30/15 Summer				86.250	0.250	0.000	0.05
2.000	SW03	60 Winter	30	+0%	100/15 Summer				86.204	-0.021	0.000	0.13
1.002	SW04	30 Winter	30	+0%	30/15 Summer				86.245	0.416	0.000	0.04
3.000	SW05	60 Winter	30	+0%	100/15 Summer				86.204	-0.021	0.000	0.17
1.003	SW06	30 Winter	30	+0%	1/15 Summer				86.241	1.051	0.000	1.89

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01		9.7	OK	
1.001	SW02		21.1	SURCHARGED	
2.000	SW03		5.9	OK	
1.002	SW04		19.3	SURCHARGED	
3.000	SW05		13.3	OK	
1.003	SW06		23.6	SURCHARGED	

Scott Hughes Design Ltd		Page 7
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	WREXHAM UNIVERSITY SW RESULTS AREA C	
Date 19/02/2023 14:47	Designed by AM	
File SW Area C.mdx	Checked by PB	
Micro Drainage	Network 2018.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed SW Area C

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 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 FSR MS-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.307 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 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) 1, 30, 100
 Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.
1.000	SW01	15 Winter	100	+45%					87.067	-0.158	0.000	0.19
1.001	SW02	60 Winter	100	+45%	30/15 Summer				86.583	0.583	0.000	0.09
2.000	SW03	60 Winter	100	+45%	100/15 Summer				86.582	0.357	0.000	0.23
1.002	SW04	60 Winter	100	+45%	30/15 Summer				86.581	0.752	0.000	0.06
3.000	SW05	60 Winter	100	+45%	100/15 Summer				86.583	0.358	0.000	0.21
1.003	SW06	60 Winter	100	+45%	1/15 Summer				86.578	1.388	0.000	2.13

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01		18.9	OK	
1.001	SW02		35.2	SURCHARGED	
2.000	SW03		10.4	FLOOD RISK	
1.002	SW04		27.8	SURCHARGED	
3.000	SW05		15.9	FLOOD RISK	
1.003	SW06		26.6	FLOOD RISK	

Appendix C – Drainage Maintenance Schedule

WREXHAM GLYNDWR UNIVERSITY - DRAINAGE MAINTENANCE SCHEDULE

Organisation responsible for maintenance: _____

Contact Details – Name: _____

Number: _____

Documents:

- Drainage Layout

SUDS have been specified for the site to promote sustainable management of surface water for both flow attenuation and water quality. This document outlines the maintenance schedules for each system in order to maintain the efficiency of the drainage network. The schedules have been created based on guidance from CIRIA C753.

Table 1: Pipes and Manholes Maintenance Schedule

Maintenance schedule	Required Action	Recommended Frequency
Occasional maintenance	Visual inspection of covers, gratings and manhole chambers.	Annually or as required.
	Cleaning out manholes.	Annually or as required.
	CCTV inspection of drainage pipes.	Annually or as required.
Remedial actions	Reactive cleaning of manholes and drains.	During flooding events.
	Cleaning out drains by water jetting.	As required.
	Replace damaged covers, grating and manhole components.	As required.
	Rehabilitation – repairs, relining or replacement.	As determined by inspections.

Table 2: Geocellular Tank Maintenance Schedule

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually or as required
	Remove debris from the catchment surface	Monthly
	Remove sediment from pre-treatment structures	Annually

Remedial Actions	Repair / rehabilitate inlets/outlet and vents	As required
Monitoring	Inspect inlets, outlets and vents to ensure they are in good condition and operating as designed.	Annually
	Survey Inside of tank for sediment build up and remove is necessary	Every 5 years or where concerned about operation

Table 3: Silt Traps

Maintenance schedule	Required Action	Recommended Frequency
Regular maintenance	Remove litter and debris	Monthly or as required.
	Cleaning out manholes.	Monthly or as required.
	Inspect inlets and Outlets and Pipework for Silt Accumulation and establish suitable silt removal frequencies.	Six Monthly
	Remove Sediment from Inlets, Outlets and Pipework	As Required

Table 4: Pervious Paving

Maintenance schedule	Required Action	Recommended Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after leaf fall, or reduced frequency as required, based on site – specific observations of clogging or manufacturer recommendations – pay particular attention to areas where water runs into pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavement.
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural hazard to users and replace lost jointing material.	As required
	Remediate any landscape which, through vegetation maintenance	As required

	or soil slip, has been raised to within 50mm or the level of the paving.	
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action.	Three monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	annually
	Monitor inspection chambers.	annually

Appendix D – Correspondances

Maes Y Ffynnon,
Penrhosgarnedd,
Bangor,
Gwynedd
LL572DW

Wrexham County Borough Council,
The Guildhall,
Wrexham,
LL11 1AY

ebost/email:
northplanning@cyfoethnaturiolcymru.gov.uk

17/01/2022

Dear Sir/Madam,

**BWRIAD / PROPOSAL: TYNNU AMOD 18 CANIATIAD CYNLLUNIO P/2018/0666 /
REMOVAL OF CONDITION 18 OF PLANNING PERMISSION P/2018/0666**

**LLEOLIAD / LOCATION: GLYNDWR UNIVERSITY, MOLD ROAD, WREXHAM, LL11
2AW**

Thank you for consulting Cyfoeth Naturiol Cymru / Natural Resources Wales about the above, which we received on 6th January 2022.

We have no comments to make in relation to the removal of condition 9 and provide the following advice.

Foul Drainage

We note the site is within the catchment of the River Dee and Bala Lake Special Area of Conservation (SAC).

As you are aware, on the 21st January 2021, we published an evidence package outlining phosphorus levels for all river SACs across Wales. As part of this package, we issued a [Planning Position Statement](#), in which we advised that any proposed development that might increase the amount of phosphate within a river SAC catchment could lead to damaging effects to the SAC. Therefore, such proposals should be screened through a Habitats Regulations Assessment (HRA), to determine whether they are likely to have a significant effect on the SAC.

The suitability of foul drainage arrangements for the proposed development is a matter for the LPA to determine. We therefore advise you to seek further information from the applicant in relation to foul drainage for any relevant future discharge of conditions submission for this proposal.

For further information, please refer to the [Planning Advice](#) on our website.

If you have any queries on the above, please do not hesitate to contact us.

Yn gywir / Yours faithfully,

Rachael Burke

Cynghorydd - Cynllunio Datblygu / Advisor - Development Planning

Cyfoeth Naturiol Cymru / Natural Resources Wales

P/2021/0967 - Response to Natural Resources Wales (NRW) representation dated 17th Jan'22

P/2021/0967 - REMOVAL OF CONDITION 18 OF PLANNING PERMISSION P/2018/0666

In accordance with their standing advice to LPAs, our understanding is that NRW have raised concerns regarding foul drainage, associated with the potential to increase the amount of phosphate within a river SAC catchment, in this case being the River Dee and Bala Lake SAC.

In line with this representation, the LPA have expressed that the development is **likely to increase** foul water flows to the WWTW (Five Fords) and therefore result in an increase in phosphate discharges into the SAC and, as such, would not be able to support the application at the present time.

It is on this matter that we respond on behalf of the applicant, our conclusion reached being that **there will not be an increase** in foul water flows to the WWTW as a result of the approved development on the Plas Coch campus. In fact, the final outcome is to the contrary to the Council's position, in that resultant development has the **potential to reduce** foul water flows.

Hence, in accordance with NRW's own standing advice to LPAs, it must be concluded that the proposal satisfies the following and so facilitate the LPA to progress the determination of the planning application:

The following developments can be screened out as not likely to have a significant effect on a river SAC in relation to phosphorus inputs, as there is unlikely to be a source of additional phosphorus or pathway for impacts:

- *any development that does not increase the volume of foul wastewater*

Justification

Our approach is to apply the same principles as those applied by Edwards Homes in their application (P/2021/0912) for discharge of condition no.18 of PP P/2018/0671, this requiring submission of a scheme for the comprehensive and integrated drainage of the site indicating provision for foul water, surface water and land drainage. In summary our approach is as follows:

- Comparison of the baseline position (at the time of determination of the original planning application) on foul water flow / water usage against the proposed position (with the PP implemented) on foul water / water usage applicable to the site
- With the benefit of a foul appliances survey across the Plas Coch campus and applying pre-pandemic student numbers across the campus we are able to generate a daily total water usage for the campus – this gives us our **baseline**.

Cont../

- We have assessed the permission (P/2018/0666) and its constituent parts, have assessed current and projected student numbers and applied the principles of more efficient systems being installed across the campus (toilets, was basins, showers etc..) – this gives us our **proposed**.
- We present a no net increase, future position actually represents a reduction in water usage at the site.

When presented with the baseline : proposed position on water usage for application P/2021/0912, NRW responded as follows:

Thank you for the additional information included in your email. Provided that you are in agreement, we confirm that the information submitted is sufficient to demonstrate that the development is unlikely to increase the amount of phosphorous entering the River Dee and Bala Lake SAC catchment. We are therefore satisfied that the proposal is not likely to have a significant effect on the River Dee an Bala Lake SAC.

Our expectation is that, further to submission of this response statement, NRW's response will mirror the above.

Foul water appliances survey – Plas Coch campus

The building surveying team at Cassidy + Ashton have undertaken a foul appliances survey across the entire Plas Coch campus. The following text is to be read in conjunction with the survey information, submitted separately. This breaks down into the following:

Buildings to be demolished

- 32 no. WC's **(A)** (1 with a long flush, 20 with a medium flush and 11 with a small flush)
- 58 no. taps/basins **(B)** (none with infrared sensors, 7 no. lever handle mixer taps, 21 no. percussion type taps and 30 no. turn type taps)
- 2 no. shower units **(C)**
- 8 no. ceramic bowl urinals **(D)** (none with infrared sensors)
- 4 no. ceramic slab urinals **(E)** (none with infrared sensors)

Applying the following industry recognised water usage rates:

- Conventional WC's – use 9 litres **(F)** or more per flush
- Conventional wash hand basin taps have a flow rate of approx. 10 litres **(G)** per minute
- Conventional urinals, installed before 1994 (there are 4 ceramic slab urinals in the Engineering Block which is to be demolished), use between 7 and 22 litres per flush (equates to average of 15 litres **(H)** per flush)

Cont../

- Many standard showers will operate around the 0.2 litres per second which equates to 12 litres **(I)** per minute. With an average shower time of five minutes, that quickly stacks up to 60 litres of water per user. There are two shower units being removed from the Human Performance Lab (Alive Hub)

Theoretically, if all appliances were in use at the same time, the buildings would generate:

1,1072 litres of water $(A \times F) + (B \times G) + (C \times I) + (D \times H) + (E \times H)$.

This gives us a **baseline** figure, based on the position at the time of determination of the 0666 planning permission.

New build elements

- 48 no. WC's **(J)** (all 48 WC's with a water-saving low flush)
- 32 no. taps/basins **(K)** (all 32 taps with water-saving infrared sensors)
- 9 no. ceramic bowl urinals **(L)** (all 9 urinals with water-saving infrared sensors)

Applying the following industry recognised water usage rates:

- Low-flush water-saving WC's - use 6 litres **(M)** per flush
- The 1999 Water Regulations require that the flow rate of a tap does not exceed 3.6 litres **(N)** per minute where basins have no plug
- Modern taps with infrared sensors will reduce the water usage and also enable the users to wash their hands hygienically
- Modern conventional urinals use approx. 11 **(O)** litres per flush.
- New Ultra Low Water Urinals utilize only 1 pint or 0.57 litres of water or less per flush. These systems combine the fixture with either a manual / infrared sensor-operated flush.

Theoretically, if all appliances were in use at the same time, the buildings would generate:

502.20 litres of water $(J \times M) + (K \times N) + (L \times O)$.

This gives us a **proposed** figure, based on the new elements of the 0666 planning permission being implemented.

Cont../

The remainder

The remainder of the buildings on site will either remain unchanged or be refurbished. In light of this, it is fair to declare that the resultant water usage would represent no net increase. In fact, the resultant situation would in fact be a decrease in resultant water usage, as existing appliances are replaced with new more efficient installations through a phased programme of works across the campus.

In summary, the proposed position (subject to the implementation of the 0666 planning permission) at the Plas Coch campus represents more than a 50% reduction in the volume of waste water generated.

Wrexham Glyndwr University's numbers on Plas Coch Campus

The following represents a summary of numbers of students enrolled, plus staff, relevant to the Plas Coch Campus. Taking the 2018/19 academic year as the baseline date (relating to the period when the 0666 planning application was determined) and working towards a projected timeframe of the completion of development phases on the campus, on the back of the 0666 planning permission.

		-----PROJECTED-----		
	18/19	22/23	23/24	24/25
Students Total	3308	3400	3400	3400
Staff Total	300	300	300	300
On site total	2886*	2220**	2220**	2220**

The above figures are a combination of full time and part time students & staff.

The uplift in 20/21 and 21/22 is most likely a reflection of repeat year students through the Covid period.

**A factor of 80% is applied to the 2018/19 figure, representing a realistic figure for actual people attending on site. A number of courses are remote learning and some staff are not based on campus.*

Academic years 2019/20, 2020/21 and 2021/22 are not referenced in the table, in light of the global pandemic and associated lockdowns. Such an exceptional circumstance does not reflect a typical position in time, hence any associated figures would not be representative.

Cont../

***A factor of 60% is applied to the projected figures 2022/23, 23/24 & 24/25, as the university applies the principles of the newly adopted Active Learning Framework (ALF). This combines making the best use of the on-campus learning spaces with student-focused online learning content that can be accessed anytime, anywhere.*

ALF embodies ways of teaching and learning that create and support a sense of belonging for students. It was created by staff across the university and there are a series of ALF champions who guide and encourage their colleagues.

It's important to note, too, that while ALF has proved invaluable during the pandemic, this was part of a wider change at Glyndwr which they were already working towards. It's flexible, accessible and inclusive - and like everything Glyndwr does, it puts the student experience right at its heart.

Conclusions

When comparing the baseline figure (at the time the planning application was determined) against the proposed position (subject to the implementation of the 0666 planning permission) at the Plas Coch campus, the position represents more than a 50% reduction in the volume of waste water generated.

In tandem with this, occupancy across the Plas Coch campus will be reduced over the forthcoming years, this being directly applicable to the timeframe for the implementation of all elements of the 0666 planning permission.

Hence, in accordance with NRW's own standing advice to LPAs, it must be concluded that, as the development has been screened out to confirm that it does not increase the volume of foul wastewater and hence is not likely to have a significant effect on a river SAC in relation to phosphorus inputs, as there is unlikely to be a source of additional phosphorus or pathway for impacts proposal, NRW's position is one of no objection and so facilitates the LPA to progress the determination of the planning application.