DRAINAGE STRATEGY

By

BRIAN CLANCY HIGBY PARTNERSHIP

NEW LIVESTOCK BUILDINGS

at

TORRIAD FARM
BOWLING BANK
WREXHAM
LL13 9RT

4th April 2025

PETER HIGBY B.Sc.(Hons), C.Eng., M.I.Struct.E.
e-mail: peter@brianclancyhigby.co.uk
BRIAN CLANCY B.Sc.Eng),C.Eng.,F.I.C.E.,F.I.Struct.E.,F.C.I.O.B.,M.R.I.C.S.,M.C.I.Arb.,F.R.S.A.,F.Cons.E.
e-mail: brian.clancy@btinternet.com
ROBERT E. ATKINSON B.Tech,, C.Eng., M.I.C.E., M.I.Struct.E.
e-mail: bob@brianclancyhigby.co.uk
Springwood, Booths Hall, Chelford Road, Knutsford, Cheshire, WA16 8QZ
Tel: 01565 757790 Fax: 01565 757841 Website: www.brianclancyhigby.co.uk
Brian Clancy Higby Partnership is the trading name of Brian Clancy Higby Partnership Limited – Registered Office: 5 Brooklands Place, Brooklands Road, Sale, M33 3SD – Registered Company No. 5467369

1.0 INTRODUCTION

- Brian Clancy Higby Partnership Ltd have been appointed to prepare a drainage strategy for the surface water discharge, in support of the proposed new livestock buildings at Torriad Farm

- The site is currently a dairy farm, with a number of barns on the site, which drain to a 300mm diameter drain which traverses the site from the south east corner of the existing large shed, across the site, following the fall of the land, to a brook, which flows along the eastern boundary of the site.

- . The two new buildings are to be located on an existing field, with a slightly higher ground floor level, and will discharge into the existing drainage, attenuated to greenfield run off rate, for all storms up to 1 in 100 year storm, plus 45% increase to account for climate change.

- The purpose of the report is to appraise the Local Planning Authority of the drainage implications of the proposed development.

2.0 PROPOSED DRAINAGE STRATEGY

- The surface water drainage for any development site should aspire to be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the development.

- For a new development is is necessary to provide surface water storage and/or infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the

- In order to demonstrate the development is of low risk the report will show that it is feasible to discharge the surface water run-off from the new livestock building site at greenfield run off rate, into an existing brook on the eastern boundary of the site.

3.0 EXISTING SITE DRAINAGE

- Currently, the surface water discharges to the brook on the Eastern boundary of the site.

4.0 CONSIDERATION OF THE SUSTAINABLE DRAINAGE SYSTEMS

- Following the Hierarchy of Sustainable Drainage Systems (SUDS) the following options must be considered

(a) Soakaways for roof run-off and permeable surfacing for roads, drives, car parks and private access roads.
(b) Discharge to local watercourse.
(c) Discharge to local sewer.
(d) Discharge to adjacent land drains and ponds.

- Considering ground infiltration into the ground, the prevailing ground conditions are confirmed to be a clay strata, confirmed by the geological drift map for the area. And, therefore, it is not suitable for infiltration.

- There is a brook which runs across the northern boundary of the site, and down the eastern boundary, discharging to the south, to which the existing surface water drains, and into which it is proposed to discharge the additional surface water into, attenuated to limit the flow rate to greenfield run off rate.

- Refer BCHP drawing 25032092-051 P1 and 25032092-052 P1 indicating the proposed drainage scheme.

  Design calculations have been undertaken and can be found in the Appendices.

5.0 PROPOSED SURFACE WATER DRAINAGE DESIGN

- It is proposed to provide attenuation storage via cellular storage tanks for the two buildings, adjacent to the buildings, with a new hydrobrake manhole to limit the flow rate, and discharged to the drain laid across the site, with a new manhole over the exist8ing drain, to discharge into the brook on the opposite side of the field.

- A proposed scheme to design drainage drawing has been prepared.:
  25032092-051 P1 and 25032092-052 P1

Signed:

Peter Higby
B.Sc. (Hons.) C. Eng. M.I.Struct.E.
Director

APPENDIX

BCHP LTD	**GREENFIELD RUN-OFF CALCULATIONS**
BCHP LTD	**SURFACE WATER DRAINAGE CALCULATIONS**
BCHP LTD DRAWING 25032092-051-P1	**PROPOSED DRAINAGE SCHEME**
BCHP LTD DRAWING 25032092-052 P1	**PROPOSED DRAINAGE SCHEDULES**
BCHP LTD	**MAINTENANCE SCHEDULE**

PETER HIGBY B.Sc.(Hons), C.Eng., M.I.Struct.E.
e-mail: peter@brianclancyhigby.co.uk
BRIAN CLANCY
B.Sc.Eng),C.Eng.,F.I.C.E.,F.I.Struct.E.,F.C.I.O.B.,M.R.I.C.S.,M.C.I.Arb.,F.R.S.A.,F.Cons.E.
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DRAINAGE CALCULATIONS

for

GREENFIELD RUN OFF RATE

NEW LIVESTOCK BUILDINGS

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	Torriad Farm Wrexham Greenfield Runoff	
Date 20/03/2025	Designed by BCH	
File	Checked by PH	
XP Solutions	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	0.210	Urban	0.000
SAAR (mm)	745	Region Number	Region 9

Results l/s

QBAR Rural	1.0
QBAR Urban	1.0
Q1 year	0.9
Q1 year	0.9
Q30 years	1.7
Q100 years	2.2

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DRAINAGE CALCULATIONS

for

SURFACE WATER DRAINAGE

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW 28-03-25.SWS

Pipe Sizes SW 28-03-25 Manhole Sizes SW 28-03-25

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.355	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
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)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for SW 28-03-25.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.035	4-8	0.157

Total Area Contributing (ha) = 0.192

Total Pipe Volume (m^3) = 22.303

Network Design Table for SW 28-03-25.SWS

- 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	25.000	0.150	166.7	0.024	3.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	25.000	0.150	166.7	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	18.150	0.125	145.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	3.41	19.175	0.024	0.0	0.0	0.0	1.01	40.2	3.2
1.001	50.00	3.83	19.025	0.048	0.0	0.0	0.0	1.01	40.2	6.5
1.002	50.00	4.10	18.875	0.048	0.0	0.0	0.0	1.08	43.1	6.5

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Network Design Table for SW 28-03-25.SWS

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
2.000	25.000	0.150	166.7	0.048	3.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	25.000	0.275	90.9	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	17.750	0.150	118.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	25.000	0.150	166.7	0.024	3.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	25.000	0.425	58.8	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	7.500	0.600	12.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	17.000#	0.050	340.0	0.000	3.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	3.000	0.025	120.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	29.999	0.175	171.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	27.420	0.250	109.7	0.000	3.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	61.885	0.400	154.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	89.305	0.550	162.4	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)
2.000	50.00	3.41	19.175	0.048	0.0	0.0	0.0	1.01	40.2	6.5
2.001	50.00	3.72	19.025	0.096	0.0	0.0	0.0	1.37	54.5	13.0
1.003	50.00	4.35	18.750	0.144	0.0	0.0	0.0	1.20	47.7	19.5
3.000	50.00	3.41	19.175	0.024	0.0	0.0	0.0	1.01	40.2	3.2
3.001	50.00	3.66	19.025	0.048	0.0	0.0	0.0	1.71	67.9	6.5
1.004	50.00	4.38	18.600	0.192	0.0	0.0	0.0	3.72	148.0	26.0
4.000	50.00	3.40	18.075	0.000	0.0	0.0	0.0	0.70	28.0	0.0
4.001	50.00	3.44	18.025	0.000	0.0	0.0	0.0	1.19	47.4	0.0
1.005	50.00	4.89	18.000	0.192	0.0	0.0	0.0	1.00	39.6	26.0
5.000	50.00	3.30	18.000	0.000	0.0	0.0	0.0	1.50	106.1	0.0
1.006	50.00	5.70	17.750	0.192	0.0	0.0	0.0	1.26	89.2	26.0
1.007	50.00	6.91	17.350	0.192	0.0	0.0	0.0	1.23	87.0	26.0

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

Manhole Schedules for SW 28-03-25.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	20.000	0.825	Open Manhole	600	1.000	19.175	225				
2	20.000	0.975	Open Manhole	600	1.001	19.025	225	1.000	19.025	225	
3	20.000	1.125	Open Manhole	600	1.002	18.875	225	1.001	18.875	225	
4	20.000	0.825	Open Manhole	600	2.000	19.175	225				
5	20.000	0.975	Open Manhole	600	2.001	19.025	225	2.000	19.025	225	
6	20.000	1.250	Open Manhole	600	1.003	18.750	225	1.002	18.750	225	
								2.001	18.750	225	
7	20.000	0.825	Open Manhole	600	3.000	19.175	225				
8	20.000	0.975	Open Manhole	600	3.001	19.025	225	3.000	19.025	225	
9	20.000	1.400	Open Manhole	600	1.004	18.600	225	1.003	18.600	225	
								3.001	18.600	225	
10	20.200	2.125	Open Manhole	600	4.000	18.075	225				
11	20.200	2.175	Open Manhole	600	4.001	18.025	225	4.000	18.025	225	
12	19.600	1.600	Open Manhole	1200	1.005	18.000	225	1.004	18.000	225	
								4.001	18.000	225	
13	19.050	1.050	Open Manhole	600	5.000	18.000	300				
14	18.600	0.850	Open Manhole	1200	1.006	17.750	300	1.005	17.825	225	
								5.000	17.750	300	
15	18.600	1.250	Open Manhole	1200	1.007	17.350	300	1.006	17.350	300	
16	17.500	0.700	Open Manhole	0		OUTFALL		1.007	16.800	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	340935.239	349070.669	340935.239	349070.669	Required	
2	340935.239	349095.669	340935.239	349095.669	Required	
3	340935.239	349120.669	340935.239	349120.669	Required	
4	340953.389	349070.669	340953.389	349070.669	Required	
5	340953.389	349095.669	340953.389	349095.669	Required	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

Manhole Schedules for SW 28-03-25.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
6	340953.389	349120.669	340953.389	349120.669	Required	
7	340971.139	349070.669	340971.139	349070.669	Required	
8	340971.139	349095.669	340971.139	349095.669	Required	
9	340971.139	349120.669	340971.139	349120.669	Required	
10	340978.639	349096.669	340978.639	349096.669	Required	
11	340978.639	349117.669	340978.639	349117.669	Required	
12	340978.639	349120.669	340978.639	349120.669	Required	
13	340974.692	349130.982	340974.692	349130.982	Required	
14	340999.852	349141.882	340999.852	349141.882	Required	
15	341056.638	349166.483	341056.638	349166.483	Required	
16	341138.584	349201.983			No Entry	

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	Torriad Farm Wrexham Surface Water Network	Micro Drainage
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

PIPELINE SCHEDULES for SW 28-03-25.SWS

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	1	20.000	19.175	0.600	Open Manhole	600
1.001	o	225	2	20.000	19.025	0.750	Open Manhole	600
1.002	o	225	3	20.000	18.875	0.900	Open Manhole	600
2.000	o	225	4	20.000	19.175	0.600	Open Manhole	600
2.001	o	225	5	20.000	19.025	0.750	Open Manhole	600
1.003	o	225	6	20.000	18.750	1.025	Open Manhole	600
3.000	o	225	7	20.000	19.175	0.600	Open Manhole	600
3.001	o	225	8	20.000	19.025	0.750	Open Manhole	600
1.004	o	225	9	20.000	18.600	1.175	Open Manhole	600
4.000	o	225	10	20.200	18.075	1.900	Open Manhole	600
4.001	o	225	11	20.200	18.025	1.950	Open Manhole	600
1.005	o	225	12	19.600	18.000	1.375	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	25.000	166.7	2	20.000	19.025	0.750	Open Manhole	600
1.001	25.000	166.7	3	20.000	18.875	0.900	Open Manhole	600
1.002	18.150	145.2	6	20.000	18.750	1.025	Open Manhole	600
2.000	25.000	166.7	5	20.000	19.025	0.750	Open Manhole	600
2.001	25.000	90.9	6	20.000	18.750	1.025	Open Manhole	600
1.003	17.750	118.3	9	20.000	18.600	1.175	Open Manhole	600
3.000	25.000	166.7	8	20.000	19.025	0.750	Open Manhole	600
3.001	25.000	58.8	9	20.000	18.600	1.175	Open Manhole	600
1.004	7.500	12.5	12	19.600	18.000	1.375	Open Manhole	1200
4.000	17.000#	340.0	11	20.200	18.025	1.950	Open Manhole	600
4.001	3.000	120.0	12	19.600	18.000	1.375	Open Manhole	1200
1.005	29.999	171.4	14	18.600	17.825	0.550	Open Manhole	1200

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

PIPELINE SCHEDULES for SW 28-03-25.SWS

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)
5.000	o	300	13	19.050	18.000	0.750	Open Manhole	600
1.006	o	300	14	18.600	17.750	0.550	Open Manhole	1200
1.007	o	300	15	18.600	17.350	0.950	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)
5.000	27.420	109.7	14	18.600	17.750	0.550	Open Manhole	1200
1.006	61.885	154.7	15	18.600	17.350	0.950	Open Manhole	1200
1.007	89.305	162.4	16	17.500	16.800	0.400	Open Manhole	0

Free Flowing Outfall Details for SW 28-03-25.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	16	17.500	16.800	0.000	0	0

Simulation Criteria for SW 28-03-25.SWS

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 Coeffiecient	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	
Return Period (years)		2	
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840
Ratio R	0.355	Storm Duration (mins)	30

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Date 01/04/2025	Designed by BCH	
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XP Solutions	Network 2020.1.3	

Online Controls for SW 28-03-25.SWS

Hydro-Brake® Optimum Manhole: 12, DS/PN: 1.005, Volume (m³): 2.2

Unit Reference	MD-SHE-0044-1000-1300-1000
Design Head (m)	1.300
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	44
Invert Level (m)	18.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	1.0
Flush-Flo™	0.195	0.7
Kick-Flo®	0.391	0.6
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	0.7	1.200	1.0	3.000	1.5	7.000	2.1
0.200	0.7	1.400	1.0	3.500	1.6	7.500	2.2
0.300	0.7	1.600	1.1	4.000	1.7	8.000	2.3
0.400	0.6	1.800	1.2	4.500	1.8	8.500	2.4
0.500	0.7	2.000	1.2	5.000	1.8	9.000	2.4
0.600	0.7	2.200	1.3	5.500	1.9	9.500	2.5
0.800	0.8	2.400	1.3	6.000	2.0		
1.000	0.9	2.600	1.4	6.500	2.1		

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

Storage Structures for SW 28-03-25.SWS

Cellular Storage Manhole: 11, DS/PN: 4.001

Invert Level (m) 18.025 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)
0.000	136.0	136.0	1.201	0.0	192.0
1.200	136.0	192.0			

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	1	+0%	100/15 Summer			
1.001	2	15 Summer	1	+0%	100/15 Summer			
1.002	3	15 Summer	1	+0%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	1	+0%	100/15 Summer			
2.001	5	15 Summer	1	+0%	100/15 Summer			
1.003	6	15 Summer	1	+0%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	1	+0%				
3.001	8	15 Summer	1	+0%	100/15 Summer			
1.004	9	15 Summer	1	+0%	100/15 Summer	100/1440 Summer		
4.000	10	600 Summer	1	+0%	2/480 Winter			
4.001	11	600 Summer	1	+0%	2/180 Summer			
1.005	12	600 Summer	1	+0%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	1	+0%				
1.006	14	1440 Winter	1	+0%				
1.007	15	1440 Winter	1	+0%				

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	Torriad Farm Wrexham Surface Water Network	Micro Drainage
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.229	-0.171	0.000	0.12			4.4	OK
1.001	2	19.094	-0.156	0.000	0.20			7.5	OK
1.002	3	18.942	-0.158	0.000	0.19			7.4	OK
2.000	4	19.252	-0.148	0.000	0.24			8.9	OK
2.001	5	19.110	-0.140	0.000	0.30			15.2	OK
1.003	6	18.866	-0.109	0.000	0.52			22.2	OK
3.000	7	19.229	-0.171	0.000	0.12			4.4	OK
3.001	8	19.077	-0.173	0.000	0.12			7.6	OK
1.004	9	18.680	-0.145	0.000	0.27			29.2	OK
4.000	10	18.226	-0.074	0.000	0.00			0.0	OK
4.001	11	18.226	-0.024	0.000	0.06		443	1.8	OK
1.005	12	18.337	0.112	0.000	0.02			0.7	SURCHARGED
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.762	-0.288	0.000	0.01			0.7	OK
1.007	15	17.362	-0.288	0.000	0.01			0.7	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	
1.007	15	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	2	+0%	100/15 Summer			
1.001	2	15 Summer	2	+0%	100/15 Summer			
1.002	3	15 Summer	2	+0%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	2	+0%	100/15 Summer			
2.001	5	15 Summer	2	+0%	100/15 Summer			
1.003	6	15 Summer	2	+0%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	2	+0%				
3.001	8	15 Summer	2	+0%	100/15 Summer			
1.004	9	15 Summer	2	+0%	100/15 Summer	100/1440 Summer		
4.000	10	480 Winter	2	+0%	2/480 Winter			
4.001	11	480 Winter	2	+0%	2/180 Summer			
1.005	12	480 Winter	2	+0%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	2	+0%				
1.006	14	1440 Winter	2	+0%				
1.007	15	1440 Winter	2	+0%				

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	Torriad Farm Wrexham Surface Water Network	Micro Drainage
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.236	-0.164	0.000	0.15			5.7	OK
1.001	2	19.104	-0.146	0.000	0.26			9.8	OK
1.002	3	18.951	-0.149	0.000	0.25			9.5	OK
2.000	4	19.265	-0.135	0.000	0.31			11.5	OK
2.001	5	19.123	-0.127	0.000	0.39			19.7	OK
1.003	6	18.887	-0.088	0.000	0.67			28.7	OK
3.000	7	19.236	-0.164	0.000	0.15			5.7	OK
3.001	8	19.085	-0.165	0.000	0.16			9.9	OK
1.004	9	18.692	-0.133	0.000	0.35			37.8	OK
4.000	10	18.303	0.003	0.000	0.00			0.0	SURCHARGED
4.001	11	18.303	0.053	0.000	0.11		470	3.3	SURCHARGED
1.005	12	18.391	0.166	0.000	0.02			0.7	SURCHARGED
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.762	-0.288	0.000	0.01			0.7	OK
1.007	15	17.362	-0.288	0.000	0.01			0.7	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	
1.007	15	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	5	+0%	100/15 Summer			
1.001	2	15 Summer	5	+0%	100/15 Summer			
1.002	3	15 Summer	5	+0%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	5	+0%	100/15 Summer			
2.001	5	15 Summer	5	+0%	100/15 Summer			
1.003	6	15 Summer	5	+0%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	5	+0%				
3.001	8	15 Summer	5	+0%	100/15 Summer			
1.004	9	15 Summer	5	+0%	100/15 Summer	100/1440 Summer		
4.000	10	480 Summer	5	+0%	2/480 Winter			
4.001	11	480 Summer	5	+0%	2/180 Summer			
1.005	12	480 Summer	5	+0%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	5	+0%				
1.006	14	1440 Winter	5	+0%				

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	Torriad Farm Wrexham Surface Water Network	Micro Drainage
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.246	-0.154	0.000	0.20			7.4	OK
1.001	2	19.116	-0.134	0.000	0.34			12.6	OK
1.002	3	18.963	-0.137	0.000	0.32			12.3	OK
2.000	4	19.278	-0.122	0.000	0.40			14.8	OK
2.001	5	19.138	-0.112	0.000	0.50			25.3	OK
1.003	6	18.914	-0.061	0.000	0.87			37.2	OK
3.000	7	19.246	-0.154	0.000	0.20			7.4	OK
3.001	8	19.094	-0.156	0.000	0.20			12.8	OK
1.004	9	18.706	-0.119	0.000	0.45			48.9	OK
4.000	10	18.393	0.093	0.000	0.00			0.0	SURCHARGED
4.001	11	18.393	0.143	0.000	0.11			3.3	SURCHARGED
1.005	12	18.479	0.254	0.000	0.02			0.7	SURCHARGED
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.762	-0.288	0.000	0.01			0.7	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	

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	Torriad Farm Wrexham Surface Water Network	
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XP Solutions	Network 2020.1.3	

5 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	15	1440 Winter	5	+0%					17.362

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	15	-0.288	0.000	0.01			0.7	OK	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	10	+0%	100/15 Summer			
1.001	2	15 Summer	10	+0%	100/15 Summer			
1.002	3	15 Summer	10	+0%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	10	+0%	100/15 Summer			
2.001	5	15 Summer	10	+0%	100/15 Summer			
1.003	6	15 Summer	10	+0%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	10	+0%				
3.001	8	15 Summer	10	+0%	100/15 Summer			
1.004	9	15 Summer	10	+0%	100/15 Summer	100/1440 Summer		
4.000	10	720 Summer	10	+0%	2/480 Winter			
4.001	11	720 Summer	10	+0%	2/180 Summer			
1.005	12	960 Winter	10	+0%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	10	+0%				
1.006	14	720 Winter	10	+0%				

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	Torriad Farm Wrexham Surface Water Network	Micro Drainage
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.251	-0.149	0.000	0.23			8.6	OK
1.001	2	19.131	-0.119	0.000	0.45			16.6	OK
1.002	3	19.009	-0.091	0.000	0.38			14.8	OK
2.000	4	19.288	-0.112	0.000	0.46			17.2	OK
2.001	5	19.160	-0.090	0.000	0.66			33.3	OK
1.003	6	18.981	0.006	0.000	1.05			45.1	SURCHARGED
3.000	7	19.251	-0.149	0.000	0.23			8.6	OK
3.001	8	19.105	-0.145	0.000	0.27			16.7	OK
1.004	9	18.718	-0.107	0.000	0.54			59.5	OK
4.000	10	18.471	0.171	0.000	0.00			0.0	SURCHARGED
4.001	11	18.471	0.221	0.000	0.05			1.6	SURCHARGED
1.005	12	18.640	0.415	0.000	0.02			0.7	SURCHARGED
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.762	-0.288	0.000	0.01			0.7	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	15 720	Winter	10	+0%					17.362

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	15	-0.288	0.000	0.01			0.7	OK	

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	30	+0%	100/15 Summer			
1.001	2	15 Summer	30	+0%	100/15 Summer			
1.002	3	15 Summer	30	+0%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	30	+0%	100/15 Summer			
2.001	5	15 Summer	30	+0%	100/15 Summer			
1.003	6	15 Summer	30	+0%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	30	+0%				
3.001	8	15 Summer	30	+0%	100/15 Summer			
1.004	9	15 Summer	30	+0%	100/15 Summer	100/1440 Summer		
4.000	10	600 Winter	30	+0%	2/480 Winter			
4.001	11	600 Winter	30	+0%	2/180 Summer			
1.005	12	480 Winter	30	+0%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	30	+0%				
1.006	14	600 Winter	30	+0%				

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	Torriad Farm Wrexham Surface Water Network	
Date 01/04/2025	Designed by BCH	
File SW 28-03-25.MDX	Checked by BCH	
XP Solutions	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.262	-0.138	0.000	0.29			10.8	OK
1.001	2	19.147	-0.103	0.000	0.56			20.8	OK
1.002	3	19.099	-0.001	0.000	0.47			18.0	OK
2.000	4	19.305	-0.095	0.000	0.58			21.7	OK
2.001	5	19.205	-0.045	0.000	0.80			40.3	OK
1.003	6	19.054	0.079	0.000	1.25			53.5	SURCHARGED
3.000	7	19.262	-0.138	0.000	0.29			10.8	OK
3.001	8	19.116	-0.134	0.000	0.34			21.1	OK
1.004	9	18.738	-0.087	0.000	0.65			71.0	OK
4.000	10	18.624	0.324	0.000	0.00			0.0	SURCHARGED
4.001	11	18.624	0.374	0.000	0.11			3.2	SURCHARGED
1.005	12	18.739	0.514	0.000	0.02			0.7	SURCHARGED
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.762	-0.288	0.000	0.01			0.7	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	

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XP Solutions	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	15	600 Winter	30	+0%					17.362

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	15	-0.288	0.000	0.01			0.7	OK	

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	Torriad Farm Wrexham Surface Water Network	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.355
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	450.0
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, 2, 5, 10, 30, 100
Climate Change (%)	0, 0, 0, 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	100	+45%	100/15 Summer			
1.001	2	15 Summer	100	+45%	100/15 Summer			
1.002	3	960 Summer	100	+45%	100/15 Summer	100/600 Winter		
2.000	4	15 Summer	100	+45%	100/15 Summer			
2.001	5	15 Summer	100	+45%	100/15 Summer			
1.003	6	15 Summer	100	+45%	10/15 Summer	100/960 Summer		
3.000	7	15 Summer	100	+45%				
3.001	8	15 Summer	100	+45%	100/15 Summer			
1.004	9	960 Summer	100	+45%	100/15 Summer	100/1440 Summer		
4.000	10	720 Winter	100	+45%	2/480 Winter			
4.001	11	720 Winter	100	+45%	2/180 Summer			
1.005	12	960 Summer	100	+45%	1/15 Summer	100/1440 Summer		
5.000	13	15 Summer	100	+45%				
1.006	14	720 Winter	100	+45%				

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	19.924	0.524	0.000	0.52			19.1	FLOOD RISK
1.001	2	19.895	0.645	0.000	0.75			27.6	FLOOD RISK
1.002	3	19.819	0.719	0.126	0.46			17.7	FLOOD
2.000	4	19.998	0.598	0.000	0.87			32.3	FLOOD RISK
2.001	5	19.995	0.745	0.000	1.12			56.5	FLOOD RISK
1.003	6	19.718	0.743	0.000	1.76			75.2	FLOOD RISK
3.000	7	19.369	-0.031	0.000	0.55			20.2	OK
3.001	8	19.343	0.093	0.000	0.59			36.8	SURCHARGED
1.004	9	19.472	0.647	0.000	0.14			15.7	SURCHARGED
4.000	10	19.221	0.921	0.000	0.00			0.0	SURCHARGED
4.001	11	19.222	0.972	0.000	0.17			5.0	SURCHARGED
1.005	12	19.517	1.292	0.000	0.03			1.0	FLOOD RISK
5.000	13	18.000	-0.300	0.000	0.00			0.0	OK
1.006	14	17.766	-0.284	0.000	0.01			1.0	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
2.001	5	
1.003	6	
3.000	7	
3.001	8	
1.004	9	
4.000	10	
4.001	11	
1.005	12	
5.000	13	
1.006	14	

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XP Solutions	Network 2020.1.3	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW 28-03-25.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	15	720 Winter	100	+45%					17.366

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	15	-0.284	0.000	0.01			1.0	OK	

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Scale 1:1,250

Cobham Farm Lane

Torriad Farm

Pond

Pond

Pond

Existing building 1

Existing building 2

S13 Existing
CL19.050
IL18.000

300dia EXISTING @ 1:110

Levels to be determined and confirmed with engineer prior to all works commencing

S14 1200dia
CL18.600
IL17.825 225dia
IL17.750 300dia

300dia EXISTING @ 1:155

S15 Node
CL18.600
IL17.350

225dia ESVC @ 1:71

S3 600dia
CL20.000
IL18.875

S6 600dia
CL20.000
IL18.750

S9 600dia
CL20.000
IL18.600

225dia ESVC @ 1:145

225dia ESVC @ 1:118

225dia @ 1:13

S12 1200dia
CL19.600
IL18.000

S12 Flow Control
44mm HydroBrake limiting Surface Water discharge rate to Greenfield Q_{BAR} 1.00 L/sec for all storm events up yo and including 1 in 100yr + 45% Climate Change

225dia

S11 ATT.
CL20.200
IL18.025

S10 ATT.
CL20.200
IL18.075

S10-11 - Online Cellular Attenuation
≈ 160m³ for all storm events up to 100yr+45%
17.00m x 8.00m x 1.20m High
Minimum ground level 20.20m (+900mm cover)

POLYSTORM LITE ATTENUATION CELLS
17.00m (17) x 8.00m (16) x 1.20m (3)
816 total units required
(including maintenance cells and access)

225dia ESVC @ 1:167

225dia ESVC @ 1:191

225dia ESVC @ 1:169

225dia ESVC @ 1:167

225dia ESVC @ 1:167

225dia ESVC @ 1:167

S2 600dia
CL20.000
IL19.025

S5 600dia
CL20.000
IL19.025

S8 600dia
CL20.000
IL19.025

FFL 20.00m

FFL 20.00m

proposed levels

proposed levels

S1 600dia
CL20.000
IL19.175

S4 600dia
CL20.000
IL19.175

S7 600dia
CL20.000
IL19.175

Proposed livestock building 1

Proposed livestock building 2

ST11

ST09

Effluent Pond

S16 Outfall
CL17.500
IL16.800

Levels to be determined and confirmed with engineer prior to all works commencing

300dia EXISTING @ 1:162

S15 Node
CL18.600
IL17.350

This scale bar is for microfilming purposes only.

0 10 20 30 40 50 60 70

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All dimensions to be checked on site prior to commencement of work.

Figured dimensions to be used in preference to scale.

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S ARCHITECT'S AND SPECIALIST'S DRAWINGS, THE SPECIFICATIONS AND CONTRACT DOCUMENTS.

2. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE SITE INVESTIGATION REPORT BY:-.

3. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL SETTING OUT DIMENSIONS AND LEVELS PRIOR TO COMMENCING WORK.

5. THE G.C. SHALL BE SOLELY RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF ALL TEMPORARY WORKS, PROPPING AND SHORING.

6. THE G.C. SHALL INFORM THE ENGINEER IMMEDIATELY OF ANY VARIATIONS IN THE EXISTING CONSTRUCTION FROM THAT NOTED ON THE DRAWINGS.

7. ALL WORK IS TO COMPLY WITH ALL RELEVANT HEALTH AND SAFETY LEGISLATION AND REGULATIONS AND THE SAFETY PLAN.

Rev.	Date		Rev. by	Chkd. by
P1	02.04.25	PRELIMINARY ISSUE	WW	PH

BRIAN CLANCY HIGBY PARTNERSHIP
Springwood,Booths Hall, Chelford Road, Knutsford. WA16 8QZ
Tel. 01565 757790

Client :
Andrew Jones

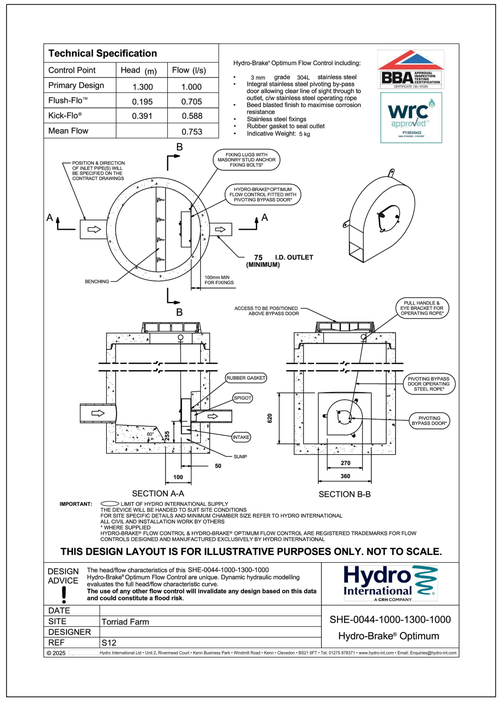
Project Title :
New Livestock Buildings
Torriad Farm, Bowling Bank
Wrexham, LL13 9RT

Drg Title :
Preliminary
Drainage Layout

Drg No. :	Revision :
25032092-051	P1
Scale :	Drawn By / Date :
1:250 @ A1	APRIL 2025

Surface Water Drainage Schedule

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Upstream Manhole Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Number	Downstream Manhole Invert	Downstream Manhole Cover
1.000	225	167	ESVC	25.000	S1	19.175	20.000	S2	19.025	20.000
1.001	225	167	ESVC	25.000	S2	19.025	20.000	S3	18.875	20.000
1.002	225	145	ESVC	18.150	S3	18.875	20.000	S6	18.750	20.000
1.003	225	118	ESVC	17.750	S6	18.750	20.000	S9	18.600	20.000
1.004	225	12	ESVC	7.500	S9	18.600	20.000	S12	18.000	19.600
1.005	225	171	ESVC	29.999	S12	18.000	19.600	S14	17.825	18.600
1.006	300	155	EXISTING	61.885	S14	17.750	18.600	S15	17.350	18.600
1.007	300	162	EXISTING	89.305	S15	17.350	18.600	S16	16.800	17.500
2.000	225	167	ESVC	25.000	S4	19.175	20.000	S5	19.025	20.000
2.001	225	91	ESVC	25.000	S5	19.025	20.000	S6	18.750	20.000
3.000	225	167	ESVC	25.000	S7	19.175	20.000	S8	19.025	20.000
3.001	225	59	ESVC	25.000	S8	19.025	20.000	S9	18.600	20.000
4.000	225	340	ATTENUATION	17.000	S10	18.075	20.200	S11	18.025	20.200
4.001	225	120	ESVC	3.000	S11	18.025	20.200	S12	18.000	19.600
5.000	300	110	EXISTING	27.420	S13	18.000	19.050	S14	17.750	18.600



Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
S1 E. 340935.239 N. 349070.669	20.000 0.600	0	0 1.000	19.175	225	600	PPIC	D400
S2 E. 340935.239 N. 349095.669	20.000 0.750	1 0	1 1.000 0 1.001	19.025 19.025	225 225	600	PPIC	D400
S3 E. 340935.239 N. 349120.669	20.000 0.900 450mm Catchpit	450mm Catchpit 1 0	1 1.001 0 1.002	18.875 18.875	225 225	600	PPIC	D400
S4 E. 340953.389 N. 349070.669	20.000 0.600	0	0 2.000	19.175	225	600	PPIC	D400
S5 E. 340953.389 N. 349095.669	20.000 0.750	1 0	1 2.000 0 2.001	19.025 19.025	225 225	600	PPIC	D400
S6 E. 340953.389 N. 349120.669	20.000 1.025 450mm Catchpit	1 450mm Catchpit 2 0	1 1.002 2 2.001 0 1.003	18.750 18.750 18.750	225 225 225	600	PPIC	D400
S7 E. 340971.139 N. 349070.669	20.000 0.600	0	0 3.000	19.175	225	600	PPIC	D400
S8 E. 340971.139 N. 349095.669	20.000 0.750	1 0	1 3.000 0 3.001	19.025 19.025	225 225	600	PPIC	D400

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
S9 E. 340971.139 N. 349120.669	20.000 1.175 450mm Catchpit	1 450mm Catchpit 2 0	1 1.003 2 3.001 0 1.004	18.600 18.600 18.600	225 225 225	600	PPIC	D400
S10 E. 340978.639 N. 349096.669	20.200 1.900	0	0 4.000	18.075				
S11 E. 340978.639 N. 349117.669	20.200 1.950	1 0	1 4.000 0 4.001	18.025 18.025	225			
S12 E. 340978.639 N. 349120.669	19.600 1.375 300mm Sump	2 1 0	1 1.004 2 4.001 0 1.005	18.000 18.000 18.000	225 225 225	1200	PCC	D400
S13 E. 340974.692 N. 349130.982	19.050 0.750	0	Levels to be determined and confirmed with engineer prior to all works commencing			EXISTING		
S14 E. 340999.852 N. 349141.882	18.600 0.550	2 1 0	1 5.000 2 1.005 0 1.006	17.750 17.825 17.750	300 225 300	1200	PCC	D400
S15 E. 341056.638 N. 349166.483	18.600 0.950	1 0	1 1.006 0 1.007	17.350 17.350	300 300	EXISTING NODE		
S16 E. 341138.583 N. 349201.983	17.500 0.400	1	1 1.007 Levels to be determined and confirmed with engineer prior to all works commencing	16.800	300	EXISTING OUTFALL		

S10-11 - Online Cellular Attenuation
≈ 160m³ for all storm events up to 100yr+45%
17.00m x 8.00m x 1.20m High
Minimum ground level 20.20m (+900mm cover)

POLYSTORM LITE ATTENUATION CELLS
17.00m (17) x 8.00m (16) x 1.20m (3)
816 total units required
(including maintenance cells and access)

44mm HydroBrake limiting Surface Water discharge rate to Q_{BAR} max 1.00 L/sec

This scale bar is for microfilming purposes only.

0 10 20 30 40 50 60 70

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Rev.	Date		Rev. by	Chkd. by
P1	02.04.25	PRELIMINARY ISSUE	WW	PH

BRIAN CLANCY HIGBY PARTNERSHIP
Springwood,Booths Hall, Chelford Road, Knutsford. WA16 8QZ
Tel. 01565 757790

Client :
Andrew Jones

Project Title :
New Livestock Buildings
Torriad Farm, Bowling Bank
Wrexham, LL13 9RT

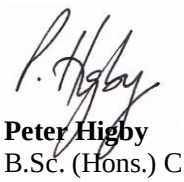
Drg Title :
Preliminary
Drainage Schedules

Drg No. : 25032092-052
Revision : P1
Scale : NTS @ A1
Drawn By / Date : APRIL 2025

DRAINAGE MAINTENANCE SCHEDULE

TORRIAD FARM

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operation correctly; If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial Actions	Repair/ rehabilitate inlets, outlets, overflows and vent s	As required
Monitoring	Inspect/ check all inlets, outlets, vents and overflows to ensure they are in good working order	Annually
	Inspect silt traps and gullies and note rate of sediment accumulation	Monthly to assess accumulation for 3 months, and then as required
	Survey inside of tanks for sediment build up and remove if necessary	Every 5 years or, as requited



Peter Higby
B.Sc. (Hons.) C. Eng. M.I.Struct.E
Director

PETER HIGBY B.Sc.(Hons), C.Eng., M.I.Struct.E.
e-mail: peter@brianclancyhigby.co.uk
BRIAN CLANCY
B.Sc.Eng),C.Eng.,F.I.C.E.,F.I.Struct.E.,F.C.I.O.B.,M.R.I.C.S.,M.C.I.Arb.,F.R.S.A.,F.Cons.E.
e-mail: brian.clancy@btinternet.com
ROBERT E. ATKINSON B.Tech,, C.Eng., M.I.C.E., M.I.Struct.E.
e-mail: bob@brianclancyhigby.co.uk
Springwood, Booths Hall, Chelford Road, Knutsford, Cheshire, WA16 8GS
Tel: 01565 757790 Fax: 01565 757841 Website: www.brianclancyhigby.co.uk
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