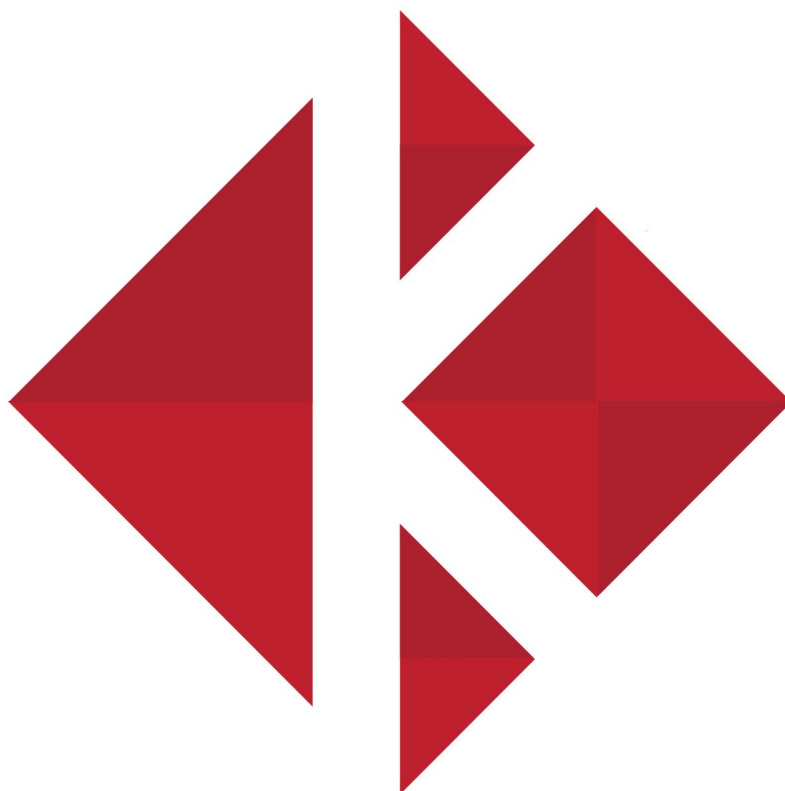




SURFACE & FOUL WATER DRAINAGE STRATEGY

BARTON HOUSE, ROSSETT

Client: ILEX Date: 20/9/2021

DOC TYPE				PROJECT				REPORT TITLE				AUTHOR				SEQ NO.				REVISION			
R	E	P	-	R	O	S	-	S	W	D	S	-	R	B	-	0	0	1	-	R	E	V	-

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1 Document History and Validation

1.1 Revision History

Revision	Issue Date	Reason for Issue
Rev-	20 September 2021	Preliminary Issue

1.2 Document Validation (Latest Issue)



Principal Author
RICHARD BROWN



Checked By
ROB KENNEDY



Verified By
GEOFF CARTER

2 Introduction

This report will provide information used in the development of the drainage design and the principles that were followed. The drainage strategy uses sustainable principles and will aim to promote approaches in keeping with the nature of the existing site and current legislation. Drawings, calculations, modelling outputs (MicroDrainage) and other relevant information will be discussed and supplied.

2.1 Design standards and guidance

The following design standards, industry guidance, government guidance and literature have been used in the development of this drainage strategy.

British Standards and European Norms (BS EN)

- BS EN 752: Drain and sewer systems outside buildings
- BS EN 12056: Gravity drainage systems inside buildings

Construction Industry Research and Information Association (CIRIA)

- C753: The SuDS manual

Department of Communities and Local Government (DCLG)

- Building Regulations Approved Document H: drainage and waste disposal published 2010
- National Planning Policy Framework (NPPF) published 2012
- Flood risk and coastal change Planning Policy Guidance, published 6 March 2014
- Climate Change Planning Policy Guidance, published 12 June 2014
- Water supply, wastewater and water quality Planning Policy Guidance, published 23 March 2015

Department of Environment, Food and Rural Affairs (DEFRA)

- Non-Statutory Technical Standards for Sustainable Drainage – Practice Guidance published 2015

Water Research Centre

- Sewers for Adoption 6th & 7th Edition

2.2 Local literature & consultation

2.2.1 Wrexham County Borough Council

Wrexham County Borough Council (WCBC) have previously commented on the development proposals. They have noted that the application site is within the catchment area of the River Dee and Bala Lake Special Area of Conservation (SAC) and that they are concerned the development may increase the level of phosphate entering the river and/or SAC.

The proposals are to discharge foul water into the public sewer system. Therefore, Welsh Water will need to be contacted to ensure that either:

- There is a capacity to treat additional wastewater and phosphorus from the proposed development (in combination with other planned development) within existing discharge permit limits, or
- The necessary treatment capacity to remain within existing discharge permit limits will be delivered within the current Asset Management Plan (AMP) period.

The council comments regarding the development are enclosed in Appendix B.

2.2.2 Welsh Water

A pre-development enquiry was submitted to Welsh Water to:

- Ensure the foul flows from the development will cause no increase in the level of phosphate entering the SAC.
- Ensure that the proposed sewer diversion (refer to section 2.3.4) can take place.

Welsh Water's response is enclosed in Appendix C and confirms that ...

2.3 Site Overview

2.3.1 Existing Site

The site is location off Darland Lane, in Rossett Wrexham, LL12 0EL. The site is bounded by Lavister Walks to the northwest, Darland Lane to the southwest and existing housing to the north, east and southeast.

The proposed development has an area of 0.14ha and lies on the site of an existing office building and associated car parking and soft landscaping. The building is yet to be demolished.

2.3.2 Geology

The British Geological Survey (BGS) website indicates the site is underlain by red and red-brown mudstone, and red-brown sandstone containing beds of pebbly sandstone. Superficial depositions are recorded as being alluvial deposits consisting of clay, silt, sand, and gravel.

2.3.3 Existing Drainage

Based on the plans provided by Welsh Water (enclosed in Appendix D) the following sewers are present in or adjacent to the site.

- A 450mm diameter combined sewer flows south to north through the site.
- A 150mm diameter foul located to the north-west of the site in Lavister Walks.
- A 150mm diameter highway drain is also located north-west of the site in Lavister Walks.

Two existing soakaways have been found at the site, which the existing building discharged surface water into.

2.3.4 Sewer diversion

It is proposed to divert the existing 450mm combined sewer which passes through the site. The diversion will see the sewer flow from south-east to north-west along Darland Road, it will then change direction and flow from south-west to north-east along Lavister Walks.

The 450mm diameter combined sewer diversion will also replace a section of the existing 150mm diameter foul sewer.

The sewer diversion route is shown on the proposed drainage layout enclosed in Appendix A, the diversion will be subject to agreement with Welsh Water.

2.3.5 Proposed development

The proposed redevelopment of the site will comprise the demolition of the existing office building and associated car parking. The development will consist of 4 new dwellings in the form of houses. Vehicular and pedestrian access to the developments will be from Lavister Walks and Darland Lane.

3 Proposed Surface Water Strategy

3.1 Overall Strategy

All proposed drainage systems should give preference to the SuDS hierarchy, which sets out that schemes should aim to mimic natural drainage as closely as possible, and that discharge of surface runoff should be dealt with in the following ways (in order of preference) (Department for Communities and Local Government, 2014):

- Into the ground (infiltration)
- To a surface water body
- To a surface water sewer, highway drain, or another drainage system
- To a combined sewer

Based on the presence of existing soakaways and the alluvium ground type expected to be found at the site, it is likely that infiltration can be used to dispose of surface water from the development. Therefore, it is proposed to discharge all collected surface water into a soakaway tank. Soakaway testing in accordance with BRE365 will be carried out, prior to construction taking place to ensure infiltration is viable.

If infiltration is not proved viable, then an alternative connection may be required.

The nearest watercourse is Lavister Brook, located approximately 60m north of the site. A direct connection would require crossing third party land and is not considered a viable option. Therefore, a connection to the existing 150mm highway drain in Lavister Walks may be required. Any connection to this drain would be subject to Wrexham highways approval.

The plot driveways and hard standing areas will be a porous construction to allow surface water to discharge directly to the aggregate sub-base and infiltrate to the sub soils. Runoff from the residential roof areas will be collected in an underground piped drainage system. All the flows will be directed to an attenuation/infiltration tank (geocellular tank wrapped with permeable geotextile) located in an accessible area, adjacent to Lavister Walks. The tank will have inspection chambers at the inlet and outlet to ensure that maintenance work can be carried out.

The drainage systems will be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100 year plus climate change event.

The approximate volume of attenuation provided is 22.44m³.

3.2 Flow rate

At present, as it is proposed to dispose of surface water via infiltration, no flow rate is currently required.

3.3 Climate change

In line with the NPPF, the Planning Portal Guidance documents, the SFRA and WCBC planning guidance, climate change should be considered for all developments. As LLFA, WCBC sets the criteria for climate change for the development. Following Table 2 of the EA *Flood risk assessment climate change allowances* guidance, a climate change factor of 40% will be assessed for the capacity of the proposed surface water drainage system.

3.4 Surface water treatment

All drainage runs will have pre-treatment catch pits in the form of trapped gullies, to remove silt and debris before entering the underground drains. The final inspection chamber or manhole prior to any soakaway tank will have catch pits to reduce the chance of the tank silting up.

3.5 MicroDrainage calculations

Preliminary MicroDrainage calculations are enclosed in Appendix E. The results show that:

- No flooding occurs during any storm even up to 1in100 years +40% climate change.
- Until soakaway tests are undertaken, it has been assumed that the infiltration rate is 1×10^{-5} m/s. The calculations will be run again following infiltration testing.
- A safety factor of 2 has been applied to the soakaway tank.
- Approximately 22.44m^3 of attenuation is required.

4 Proposed Foul Water Strategy

4.1 Overall strategy

A new system of drainage will be constructed for the proposed development in accordance with BS EN 752 and Building Regulation Part H. The foul flows will be collected in a separate gravity foul water drainage system. Plot 1 foul will discharge into the existing 450mm diameter combined sewer, via a new manhole. Plots 2, 3 & 4 foul will discharge into the proposed diverted 450mm diameter combined sewer.

The existing drainage between CW01 and EXCW06 will be abandoned, all drains and manholes should be removed.

These connections will be subject to agreement with Welsh Water.

4.2 Proposed flow rates

Using the Flows and Loads 4, Table of Loadings we get an average rate of 150 litres per person per day for dwellings. This gives the following flows per day:

- 20 bed x 150 = 3,000 litres per day, if every house is at full occupancy.

Assuming the majority of this flow occurs over a 12-hour period, this produces an average flow rate of 0.07 l/s and a peak flow rate (6 x average) of 0.42 l/s.

5 Maintenance

Maintenance of the foul and surface water drains, outside of the plot boundaries, for the development will fall under a private maintenance plan and be the responsibility of the site owner.

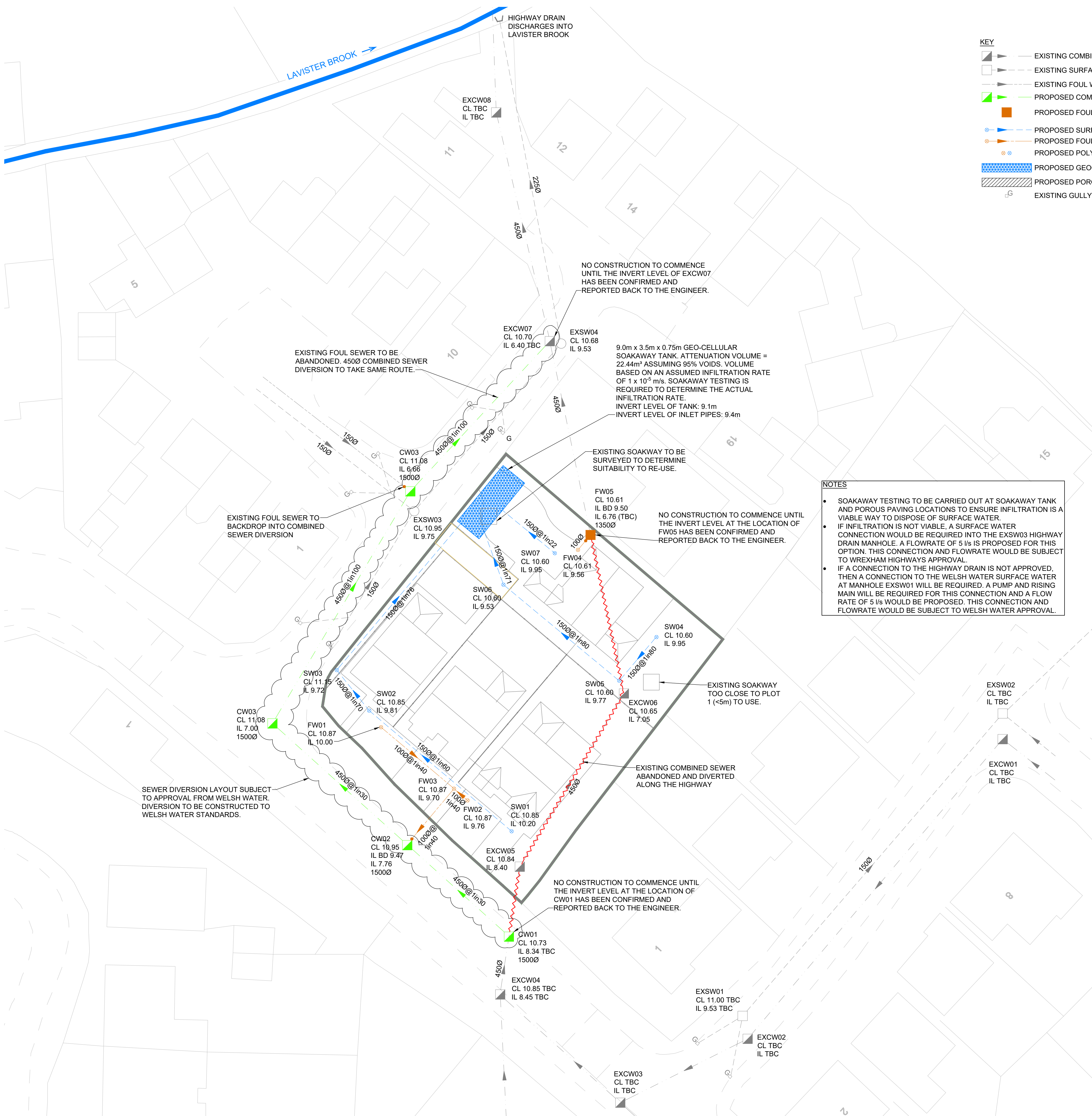
A maintenance regime should be enacted regularly as part of the normal facilities management duties. A maintenance schedule should be established following construction and updates as necessary throughout the lifetime of the plots. A record maintenance log should be kept and updated accordingly.

The following schedule should be used as the basis of maintenance at the site.

Maintenance Activity		Frequency of activity (months)				
		1	3	6	12	A/R
	Manholes (General)					
1	Check cover is not damaged and fits securely			X		
2	Check inlet and outlet are free flowing and not obstructed			X		
3	Check security of fitting for all manhole ironmongery			X		
4	Check benching for scour or build-up of debris			X		
5	Check joints in construction for damage or inflow				X	
6	Record maintenance inspection in log book			X		
	Gullies & drainage channels					
7	Check grating is undamaged and fits securely	X				
8	Inspect internal gully/sump chamber, remove debris from traps and check outfall is clear and free flowing			X		
9	Record maintenance inspection in log book	X				
	Conveyance Pipes					
10	Carry out flow test between manholes to ensure free flow of system				X	
11	Jetting and clearance of blockages, debris or silt					X
12	Inspection by CCTV – should problem arise as a result of the flow test					X
13	Cutting of growth into pipe					X
14	Record maintenance inspection in log book				X	
	Infiltration tank					
15	Inspect inlet/outlet chambers for evidence of poor operation, and clear when necessary.			X		
16	Visual inspection of any overflow pipes and vent pipes				X	
17	Remove sediment from pre-treatment sump chamber			X		
18	Monitor any inspection chambers. Check for water level and silt at base of tank.				X	
19	Record maintenance in inspection logbook			X		

	Porous Pavement			X		
20	Initial inspection (monthly for 3 months after installation)	X				
21	Inspect for evidence of poor operation and/or weed growth– if required, take remedial action	Three-monthly, 48 h after large storms in first six months				
22	Inspect for silt accumulation on surface to establish appropriated brushing frequencies. Identify any depressing which may require resetting.				X	
23	Monitor any inspection chambers. Check for water level and silt at base of pavement				X	
24	Brushing and vacuuming (adjust equipment to avoid removing jointing material)				X	X
25	Removal of weeds (treat directly with glyphosate – no spray)					X
26	Record maintenance in logbook	X				
	Landscape Adjacent to Porous Paving					
27	Grass cutting to landscaped areas					X
28	Re-level landscaping which has become level with porous paving through vegetation maintenance or soil slip					X
29	Record maintenance inspection in logbook		X			

Appendix A Proposed Drainage Layout



- ## NOTES
- SOAKAWAY TESTING TO BE CARRIED OUT AT SOAKAWAY TANK AND POROUS PAVING LOCATIONS TO ENSURE INFILTRATION IS A VIABLE WAY TO DISPOSE OF SURFACE WATER.
 - IF INFILTRATION IS NOT VIABLE, A SURFACE WATER CONNECTION WOULD BE REQUIRED INTO THE EXWS03 HIGHWAY DRAIN MANHOLE. A FLOWRATE OF 5 l/s IS PROPOSED FOR THIS OPTION. THIS CONNECTION AND FLOWRATE WOULD BE SUBJECT TO WREXHAM HIGHWAYS APPROVAL.
 - IF A CONNECTION TO THE HIGHWAY DRAIN IS NOT APPROVED, THEN A CONNECTION TO THE WELSH WATER SURFACE WATER AT MANHOLE EXWSW01 WILL BE REQUIRED. A PUMP AND RISING MAIN WILL BE REQUIRED FOR THIS CONNECTION AND A FLOW RATE OF 5 l/s WOULD BE PROPOSED. THIS CONNECTION AND FLOWRATE WOULD BE SUBJECT TO WELSH WATER APPROVAL.

- | | | | | | |
|---|----------|-------------------|-----|-----|-----|
| P01 | 20.09.21 | PRELIMINARY ISSUE | M.M | R.B | R.K |
| REV | DATE | DESCRIPTION | DRN | CHK | APR |
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MANAGING VISION | | | | | |
| CLIENT | | | | | |
|  | | | | | |
| PROJECT NAME | | | | | |
| BARTON HOUSE, ROSSETT | | | | | |
| DRAWING TITLE | | | | | |
| DRAINAGE LAYOUT | | | | | |
| | | | | | |
| DATE | SCALE | SHEET SIZE | REV | | |
| 20.09.21 | 1:250 | A1 | P01 | | |
| DRAWING STATUS | | | | | |
| S2 - ISSUED FOR INFORMATION | | | | | |
| DRAWING NUMBER | | | | | |
| 210913 - KRD - XX - EX - DR - C - 0001 | | | | | |

Appendix B Wrexham County Borough Council

Maes Y Ffynnon,
Penrhosgarnedd,
Bangor,
Gwynedd
LL572DW

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

ebost/email:
northplanning@cyfoethnaturiolcymru.gov.uk

25/08/2021

Dear Sir/Madam,

**BWRIAD / PROPOSAL: DYMCHWEL YR ADEILAD SY'N BODOLI A CHODI 6 ANNEDD
/ DEMOLITION OF EXISTING BUILDING AND ERECTION OF 6 DWELLINGS**

**LLEOLIAD / LOCATION: BARTON HOUSE, DARLAND LANE, ROSSETT, WREXHAM,
LL12 0EL**

Thank you for consulting Cyfoeth Naturiol Cymru / Natural Resources Wales about the above, which we received on 17th August 2021.

We have concerns with the application as submitted because inadequate information has been provided in support of the proposal. To overcome these concerns, you should seek further information from the applicant regarding foul drainage. If this information is not provided, we would object to this planning application. Further details are provided below.

We also advise that based on the information submitted to date, conditions regarding protected species and biosecurity should be attached to any planning permission granted and the documents identified below should be included in the approved plans and documents condition on the decision notice.

Without the inclusion of these conditions and documents we would object to this planning application.

Foul Drainage and Protected Sites

We note the application 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 (or phosphorus) 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. We have also issued [Planning Advice](#) (May 2021) which gives specific advice in respect of foul drainage arrangements for new developments.

We note from the information submitted that the development has the potential to increase the amount of phosphorus being discharged from the site. As such, we refer you to our [Planning Advice](#) and advise you to seek further information from the applicant. We note that no information has been submitted in respect of confirming any foul drainage connections for the development. We advise you to seek further information as identified in the bullet point list given in the section titled 'What does this mean for development proposals involving connection to public wastewater treatment works of that advice.

Provided this advice is followed and you are able to conclude that the development is not likely to have a significant effect on the SAC, we would have no objection to the proposal. However, should you conclude that the proposed development is likely to have a significant effect on the SAC, please consult us on your Appropriate Assessment under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended).

Protected Species

Great Crested Newt

We note that there are records of Great Crested Newt (*Triturus cristatus*) within 180m of the development site however no information is provided in the protected species report ILEX/21/01, Leigh Ecology, 06/08/21 submitted in support of the proposal. Great Crested Newts and their breeding and resting places are protected under the Conservation of Habitats and Species Regulations 2017 (as amended). We consider that there is currently not enough information to assess potential effects of the proposal on any GCN that may be present at this site.

Condition 1: No development shall commence until a species Conservation Plan (Reasonable Avoidance Measures) has been submitted to and approved in writing by the Local Planning Authority. The Conservation Plan should include:

- Details of protective measures to be taken to minimise the impacts on Great Crested Newts;
- Details of measures to prevent or reduce incidental capture or killing (Reasonable Avoidance Measures in respect of Great Crested Newt).

The species Conservation Plan shall be carried out in accordance with the approved details.

Justification: To ensure that an approved species Conservation Plan (Reasonable Avoidance Measures) is implemented, which protects any Great Crested Newt affected by the development.

Bats

We note that the bat report submitted in support of the above application (ILEX/21/01, Leigh Ecology, 06/08/21) has identified that bats were not using the application site. We therefore have no comments to make on the application as submitted.

Biosecurity

We consider biosecurity to be a material consideration owing to the location/nature of the proposal. The Bat Scoping Survey Report (ILEX/21/01, Leigh Ecology, 06/08/21)) states that no non native species were noted on site during the survey however, We note the presence of what appears to be Cherry Laurel (*Prunus laurocerasus*) to the boundary of the development site (figure 3, page 9 of the report). Cherry Laurel is a non-native invasive plant and as such further information is required in relation to boundary treatments associated with the development.

Condition 2: No development or phase of development, with the potential to impact on invasive species, shall commence until a Biosecurity Risk Assessment has been submitted to and approved in writing by the Local Planning Authority. The risk assessment shall include measures to control, remove or for the long-term management of invasive species both during construction and operation.

The Biosecurity Risk Assessment shall be carried out in accordance with the approved details.

Justification: To ensure that an approved Biosecurity Risk Assessment is implemented to secure measures to control the spread and effective management of any invasive non-native species at the site.

Other Matters

Our comments above only relate specifically to matters included on our checklist, *Development Planning Advisory Service: Consultation Topics* (September 2018), which is published on our [website](#). We have not considered potential effects on other matters and do not rule out the potential for the proposed development to affect other interests.

We advise the applicant that, in addition to planning permission, it is their responsibility to ensure they secure all other permits/consents/licences relevant to their development. Please refer to our [website](#) for further details.

Advice for the Developer

Environmental Management

All works at the site must be carried out in accordance with PPG6: 'Working at construction and demolition sites' which are available on the following website:

<http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

The activity of importing waste into the site for use as, for example hardcore, must be registered with Natural Resources Wales as an exempt/permittable activity under the Environmental Permitting Regulations 2016. The developer should contact Natural Resources Wales to discuss the necessity for an exemption/permit for any material imported to and exported from the site.

If during construction/excavation works any contaminated material is revealed, then the movement of such material either on or off site should be done in consultation with Natural Resources Wales. Any waste excavation material or building waste generated in the course of the development must be disposed of satisfactorily and in accordance with Section 34 of the Environmental Protection Act 1990. Carriers transporting waste from the site must be registered waste carriers and movement of any Hazardous Waste from the site must be accompanied by Hazardous waste consignment notes.

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

Yn gywir / Yours faithfully

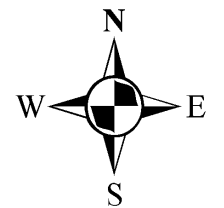
Rachael Burke

Cynghorydd - Cynllunio Datblygu / Advisor - Development Planning
Cyfoeth Naturiol Cymru / Natural Resources Wales

Appendix C Welsh Water Pre-Development Response

Appendix D Welsh Water Public Sewers Plan

Barton House Darland Lane



LEGEND(Representative of most common features)

Waste network:		Foul chamber		Surface water chamber		Combined chamber		Combined sewer overflow		Special purpose chamber		Treatment works		Pumping station		Private sewer		Private sewer subject to Sect. 104 adoption agreement		Private Sewer Transfer		Lateral Drain		Inspection Chamber
		Outfall		LH		Storm Overflow		Rising main		Gravity sewer		Private sewer		Private sewer subject to Sect. 104 adoption agreement		Private Sewer Transfer		Lateral Drain		Inspection Chamber		Lateral Drain		Inspection Chamber

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

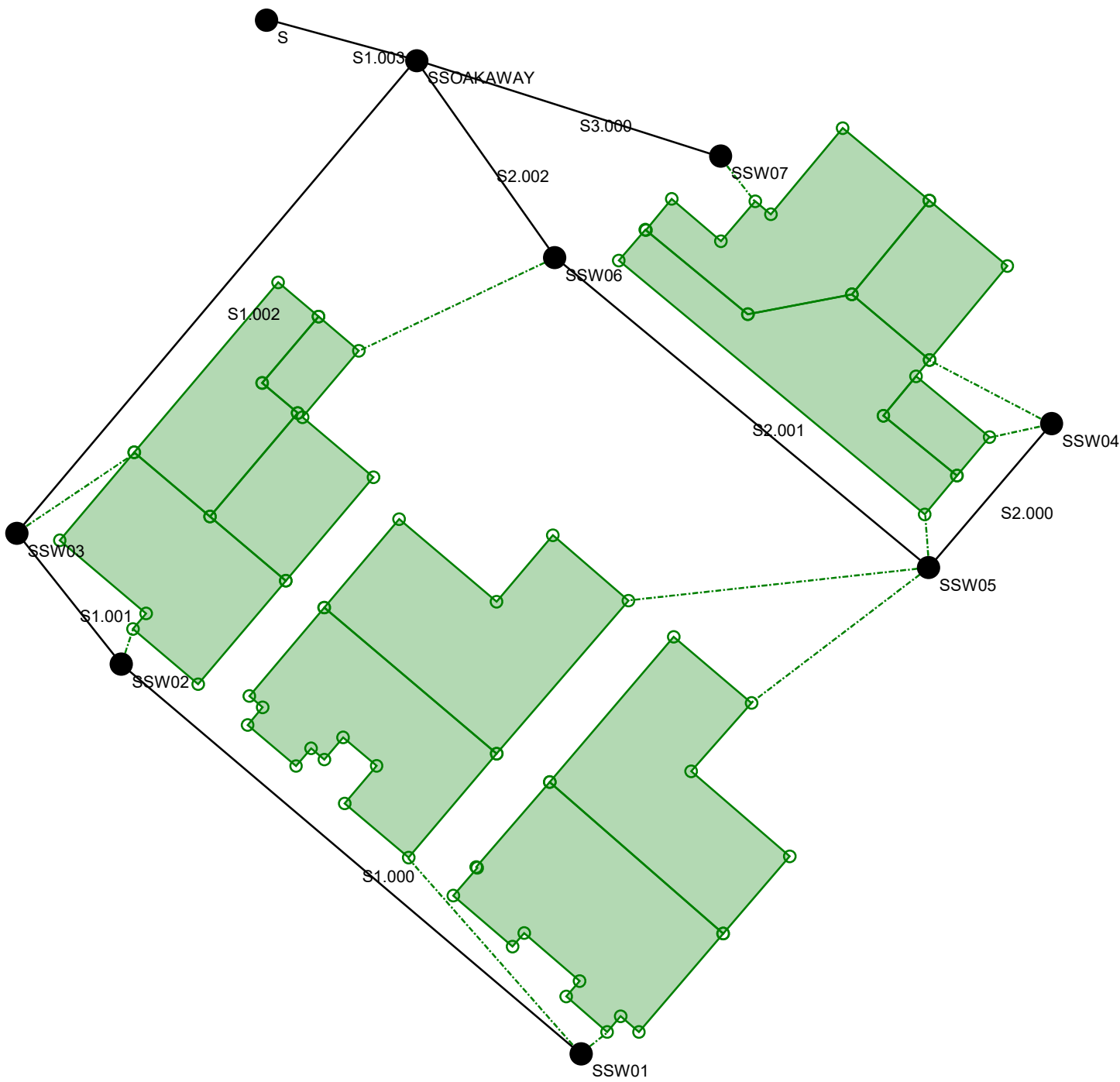
Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Appendix E MicroDrainage Calculations



Kennedy Redford Ltd		Page 1
20 Market Street Altrincham WS14 1PF	BARTON HOUSE, ROSSETT PROPOSED SW	
Date 17/09/2021	Designed by RB	
File PROPOSED SW.MDX	Checked by RK	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.343	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.034	4-8	0.005

Total Area Contributing (ha) = 0.039

Total Pipe Volume (m³) = 1.903

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	23.365	0.389	60.0	0.009	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	6.491	0.093	70.0	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	23.996	0.318	75.5	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	7.341	0.092	80.0	0.003	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	18.824	0.235	80.0	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	9.318	0.131	71.1	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	12.345	0.550	22.4	0.004	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	6.028	0.054	111.6	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)
S1.000	48.51	4.30	10.200	0.009	0.0	0.0	0.0	1.30	23.0	1.2
S1.001	48.12	4.39	9.811	0.013	0.0	0.0	0.0	1.20	21.3	1.7
S1.002	46.70	4.73	9.718	0.016	0.0	0.0	0.0	1.16	20.5	2.0
S2.000	49.35	4.11	9.950	0.003	0.0	0.0	0.0	1.12	19.9	0.3
S2.001	48.13	4.39	9.766	0.017	0.0	0.0	0.0	1.12	19.9	2.2
S2.002	47.58	4.52	9.531	0.020	0.0	0.0	0.0	1.19	21.1	2.5
S3.000	49.41	4.10	9.950	0.004	0.0	0.0	0.0	2.13	37.7	0.5
S1.003	46.29	4.84	9.100	0.039	0.0	0.0	0.0	0.95	16.8	4.9

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW01	10.850	0.650	Open Manhole	475	S1.000	10.200	150				
SSW02	10.850	1.039	Open Manhole	475	S1.001	9.811	150	S1.000	9.811	150	
SSW03	11.150	1.432	Open Manhole	475	S1.002	9.718	150	S1.001	9.718	150	
SSW04	10.600	0.650	Open Manhole	475	S2.000	9.950	150				
SSW05	10.600	0.834	Open Manhole	475	S2.001	9.766	150	S2.000	9.858	150	92
SSW06	10.600	1.069	Open Manhole	475	S2.002	9.531	150	S2.001	9.531	150	
SSW07	10.610	0.660	Open Manhole	475	S3.000	9.950	150				
SSOAKAWAY	10.750	1.650	Open Manhole	475	S1.003	9.100	150	S1.002	9.400	150	300
								S2.002	9.400	150	300
								S3.000	9.400	150	300
S	10.960	1.914	Open Manhole	0		OUTFALL		S1.003	9.046	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SSW01	337335.173	358047.339	337335.173	358047.339	Required	
SSW02	337317.345	358062.441	337317.345	358062.441	Required	
SSW03	337313.295	358067.514	337313.295	358067.514	Required	
SSW04	337353.406	358071.768	337353.406	358071.768	Required	
SSW05	337348.637	358066.187	337348.637	358066.187	Required	
SSW06	337334.144	358078.199	337334.144	358078.199	Required	
SSW07	337340.577	358082.138	337340.577	358082.138	Required	
SSOAKAWAY	337328.797	358085.831	337328.797	358085.831	Required	
S	337322.978	358087.401			No Entry	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S1.003	S	10.960	9.046	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 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 Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.343		

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Online Controls for Storm

Orifice Manhole: SSOAKAWAY, DS/PN: S1.003, Volume (m³): 1.1

Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 9.100

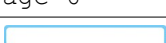
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Storage Structures for Storm

Cellular Storage Manhole: SSOAKAWAY, DS/PN: S1.003

Invert Level (m) 9.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03600

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	31.5	30.0	0.750	31.5	56.5	0.751	0.0	56.5

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

Simulation Criteria

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

 Number of Input Hydrographs 0 Number of 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 M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.355 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

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, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S1.000	SSW01	15 Winter	1	+0%					10.222	-0.128
S1.001	SSW02	15 Winter	1	+0%					9.840	-0.120
S1.002	SSW03	15 Winter	1	+0%					9.749	-0.119
S2.000	SSW04	15 Summer	1	+0%					9.964	-0.136
S2.001	SSW05	15 Winter	1	+0%					9.797	-0.119
S2.002	SSW06	15 Winter	1	+0%	100/120 Winter				9.564	-0.117
S3.000	SSW07	15 Winter	1	+0%					9.960	-0.140
S1.003	SSOAKAWAY	360 Winter	1	+0%	30/15 Summer				9.244	-0.006

PN	US/MH Name	Flooded		Half Drain		Pipe		Level Exceeded
		Volume (m³)	Flow / Cap.	Flow / (l/s)	Time (mins)	Flow (l/s)	Status	
S1.000	SSW01	0.000	0.05			1.2	OK	
S1.001	SSW02	0.000	0.09			1.5	OK	
S1.002	SSW03	0.000	0.09			1.8	OK	
S2.000	SSW04	0.000	0.02			0.3	OK	
S2.001	SSW05	0.000	0.10			1.8	OK	
S2.002	SSW06	0.000	0.11			2.1	OK	
S3.000	SSW07	0.000	0.01			0.5	OK	
S1.003	SSOAKAWAY	0.000	0.00		282	0.0	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of 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 M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.355 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S1.000	SSW01	15 Winter	30	+0%					10.236	-0.114
S1.001	SSW02	15 Winter	30	+0%					9.858	-0.102
S1.002	SSW03	15 Winter	30	+0%					9.769	-0.099
S2.000	SSW04	15 Winter	30	+0%					9.971	-0.129
S2.001	SSW05	15 Winter	30	+0%					9.820	-0.096
S2.002	SSW06	15 Summer	30	+0%	100/120 Winter				9.590	-0.091
S3.000	SSW07	15 Winter	30	+0%					9.968	-0.132
S1.003	SSOAKAWAY	480 Winter	30	+0%	30/15 Summer				9.484	0.234

PN	US/MH Name	Flooded		Half Drain		Pipe		Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	
S1.000	SSW01	0.000	0.13			2.9	OK	
S1.001	SSW02	0.000	0.22			4.0	OK	
S1.002	SSW03	0.000	0.25			4.8	OK	
S2.000	SSW04	0.000	0.05			0.8	OK	
S2.001	SSW05	0.000	0.29			5.3	OK	
S2.002	SSW06	0.000	0.33			6.2	OK	
S3.000	SSW07	0.000	0.03			1.2	OK	
S1.003	SSOAKAWAY	0.000	0.00		512	0.0	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of 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 M5-60 (mm) 18.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.355 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

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, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged
									Level (m)	Depth (m)
S1.000	SSW01	15 Winter	100	+40%					10.249	-0.101
S1.001	SSW02	15 Winter	100	+40%					9.877	-0.084
S1.002	SSW03	480 Winter	100	+40%					9.842	-0.026
S2.000	SSW04	15 Winter	100	+40%					9.979	-0.121
S2.001	SSW05	480 Winter	100	+40%					9.843	-0.073
S2.002	SSW06	480 Winter	100	+40%	100/120 Winter				9.842	0.161
S3.000	SSW07	15 Winter	100	+40%					9.974	-0.126
S1.003	SSOAKAWAY	480 Winter	100	+40%	30/15 Summer				9.842	0.592

PN	US/MH Name	Flooded		Half Drain		Pipe		Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	
S1.000	SSW01	0.000	0.24			5.2	OK	
S1.001	SSW02	0.000	0.40			7.3	OK	
S1.002	SSW03	0.000	0.05			1.0	OK	
S2.000	SSW04	0.000	0.09			1.5	OK	
S2.001	SSW05	0.000	0.06			1.1	OK	
S2.002	SSW06	0.000	0.07			1.3	SURCHARGED	
S3.000	SSW07	0.000	0.06			2.1	OK	
S1.003	SSOAKAWAY	0.000	0.00		816	0.0	SURCHARGED	