

Our ref: 7956_FCA

Flood Consequences Assessment
and Drainage Strategy

for

Land off Mold Road

Gwersyllt, Wrexham

For : Castle Green Homes Ltd
Unit 20, St Asaph Business Park
St Asaph
Denbighshire
LL17 0LJ

20th October 2025

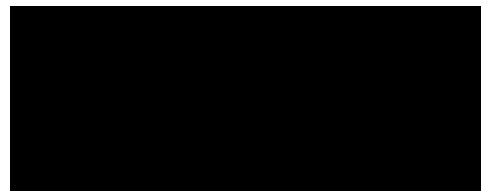
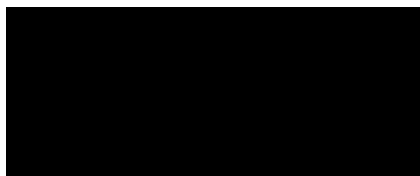
Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham

Document Verification

Project Title	Land Off Mold Road, Gwersyllt, Wrexham
Project Number	7956
Document Title	Flood Consequences Assessment and Drainage Strategy
Document Number	7956_FCA_Issue 6
This document is not to be used for contractual or engineering purposes unless the document verification sheet is signed where indicated by the approver of the document.	

Prepared by

Checked and Approved



A Jones

P R Sykes

*Senior Infrastructure Engineer**BSc (Hons), MSc (Eng), CGeol, FGS***Document Revision**

Report Reference	Date	Description	Prepared	Checked and Approved
7956_FCA_Issue 6	20/10/2025	Flood Consequences Assessment	A Jones	P R Sykes

This report has been prepared for and on behalf of our client, in accordance with the terms and conditions of the appointment agreement with Coopers. Other than where specifically allowed for in the said appointment agreement, any other party using this report for any purpose whatsoever does so at their own risk and any duty of care to that party is specifically excluded.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

Contents

<u>Section</u>	<u>Page No.</u>
1.0 Introduction.....	3
2.0 Site Characteristics.....	4
3.0 Sources of Flood Risk Information.....	5
4.0 Sources of Flood Risk.....	7
5.0 Surface Water Drainage.....	8
6.0 Conclusions and Recommendations.....	12

Figures

Figure 1	- Site Location	4
Figure 2	- Natural Resources Wales Flood Map for Planning (River and Sea)	5
Figure 3	- Natural Resources Wales Surface Water Flooding Map	6
Figure 4	- Natural Resources Wales Reservoir Flooding Map	8

List of Appendices

Appendix 1	- Reference Drawings
Appendix 2	- Infiltration Consideration
Appendix 3	- Correspondence
Appendix 4	- Calculations

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

1.0 Introduction

Coopers (Chester) Ltd, (Coopers) have been appointed by Castle Green Homes Ltd to assess the risk of flooding and to provide a Drainage Strategy for a site off Mold Road in Gwersyllt, Wrexham. Castle Green Homes Ltd are proposing a new housing development, comprising of approximately 90 No. dwellings.

Castle Green Homes Ltd are planning the construction of a mixture of semi-detached and detached residential properties with associated access road, parking, vehicular access and landscaping subject to conditions. It is understood the site does not currently benefit from any planning decision.

This flood consequences assessment (FCA) evaluates the proposals with regards to flood risk, identifying and appraising potential flood risk both to and from the whole site. Coopers have carried out the following:

- i. Assessment of the development potential of the site in line with the Welsh Government's Technical Advice Note 15: Development and Flood Risk (TAN15) and;
- ii. An assessment of surface water runoff and drainage strategy

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100sq.m. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

2.0 Site Characteristics

2.1 Site Location

The site is a parcel of agricultural land in Gwersyllt, Wrexham. The site is situated off Mold Road at approximate grid reference SJ322525.

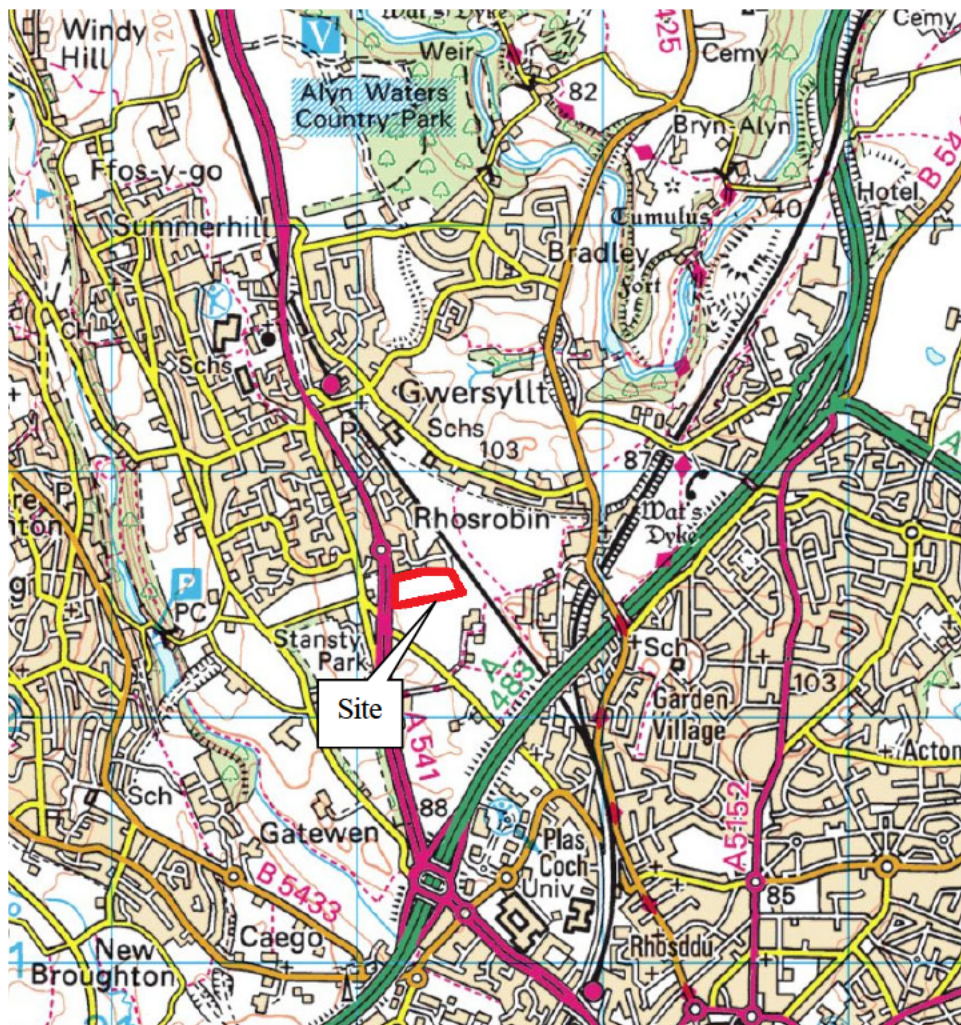


Figure 1 – Site Location

2.2 Site Description

The site covers an area of 3.13 Hectares and consists of a single agricultural field.

The topography of the site varies from a highpoint of 95.5m AOD at the western end of the site, which falls to 84.5m AOD to the east. Refer to topographical survey in Appendix 1.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

3.0 Sources of Flood Risk Information

3.1 The Welsh Government Development Advice Map

The Welsh Government Development Advice Map shows the site is located within Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 1 in 1000 (0.1%) annual probability of flooding in any given year.

The proposed residential development is considered to be a ‘highly vulnerable’ development in accordance with Figure 2 of the Welsh Governments Technical Advice Note 15. Highly vulnerable development is considered to be appropriate within Flood Zone A.

3.2 Natural Resources Wales

The NRW Flood Map shows the site is located within Flood Zone 1 – an area considered to have the lowest probability of fluvial flooding. It is assessed as having a less than 0.1% annual probability of flooding in any given year.

It should be noted that the Flood Map only covers flooding from rivers and the sea. Flooding can occur at any time and in any place from sources such as rising groundwater levels, burst water mains, blocked road drains, run-off from hillsides, sewer overflows, etc.



Figure 2 – Natural Resources Wales Flood Map for Planning (River and Sea)

Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham

The Natural Resources Wales long term flood risk map indicates the site has a low risk of flooding from Surface Water. There is a depression of approximately 0.5m deep located towards the eastern end of site which is currently shown to be at risk of surface water flooding. This is only taking flows from within the site and will be mitigated by regrading of the site. Post development there will be no surface water flood risk within the site and no increased flood risk outside the site boundary.



Figure 3 – Natural Resources Wales Surface Water Flooding Map

3.3 Wrexham LLFA

The Wrexham County Borough Council Local Flood Risk Management Strategy (June 2014) contains no records of any flooding at or near to the site. WCBC have confirmed they have no information of any known historical flooding within the vicinity of the site. Refer to Appendix 3 correspondence.

Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham

4.0 Sources of Flood Risk

4.1 Fluvial

Extreme fluvial flood events have the potential to cause rapid inundation of the site whilst posing a threat to welfare and users. As outlined in Section 3.2; the site is within Flood Zone 1 and is therefore not at risk from extreme fluvial or tidal flooding. Therefore, the risk from extreme fluvial flooding to the site is considered to be low.

4.2 Infrastructure Failure (Existing and Proposed)

The failure of infrastructure such as culverts or bridges could increase the risk of flooding at the site. The risk of flooding is considered as very low.

4.3 Overland Flow

Overland flow occurs when the infiltration capacity of the ground is exceeded in a storm event. This can result in water travelling as a sheet flow overland or excess water being conveyed from location to another via local road networks. Due to the topography of the site sloping to the southern end of the site and the road layout / proposed public open space, overland flow is not considered a significant risk. Overland flows from the site will be significantly reduced post development with the incorporation of positive drainage and an internal road network.

4.4 Sewer Flooding

If the capacity of the sewers is exceeded in an extreme event, or a blockage occurs, surcharging of the network can result in surface flooding. Welsh Water sewer plans which are included in Appendix 3, indicate that there are currently no existing adopted sewers located within the site boundary.

We have requested any information Welsh Water may have on any known flooding within the vicinity of the site and are currently waiting for a response.

The overall risk from sewer flooding is considered as low.

4.5 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying superficial deposits, bedrock or from springs.

There is currently no site investigation information for review at this stage so potential for groundwater flooding will need to be assessed when data is available.

At this stage the overall risk from groundwater flooding is considered as low.

4.6 Coastal Flooding

The site is not located in proximity of any tidal waterway or within close proximity to the sea and is therefore not at risk from tidal inundation.

4.7 Reservoirs

The site is not located in proximity of any reservoirs. Additionally, the NRW maps indicate the site is not at risk of flooding from reservoirs.

Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham



Figure 4 – Natural Resources Wales Reservoir Flooding Map

5.0 Surface Water Drainage

5.1 General

The design for a surface water drainage system for the proposed development will be guided by the principles set out in the Welsh Government's 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems' (2017)

The SuDS Standards Wales sets out the following hierarchy for surface water runoff destination:

- Priority Level 1: Surface water runoff is collected for use;
- Priority Level 2: Surface water runoff is infiltrated to ground;
- Priority Level 3: Surface water runoff is discharged to a surface water body;
- Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;
- Priority Level 5: Surface water runoff is discharged to a combined sewer.

Note that Priority Level 1 is the preferred (highest priority) and that 4 and 5 should only be used in exceptional circumstances.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

5.2 Existing Surface Water Drainage

The site does not benefit from any existing drainage and will rely on infiltration and surface water run-off to dispose of surface water flows. The flows will follow topography and will fall in a easterly direction towards the watercourse located outside the site boundary.

5.3 Existing Site Runoff

The greenfield run-off rates for the site have been calculated using the HR Wallingford Greenfield runoff rate estimation tool. The default soil type is 2 which would indicate a freely draining permeable soil (sand / gravel). As we don't have any site investigation information at this stage, we have also run the greenfield run-off calculation for soil type 3 (mixed areas of permeable and impermeable) and soil type 4 (impermeable)

Soil Type 2 (Default)	Sand / gravel	QBAR = 4.53 l/s
Soil Type 3 (mixed)	Sand / gravel / clay	QBAR = 9.38 l/s
Soil Type 4 (impermeable)	Clay	QBAR = 12.00 l/s

Refer to Appendix 4 for calculations

5.4 Proposed Surface Water Drainage and Runoff Rates

Priority Level 1

Whilst rainwater harvesting has been considered for the proposed development it should be noted that any device enabling water re-use cannot be taken into account when sizing attenuation as the storage facility may be full when a storm event occurs. Therefore, an overflow to an infiltration device (where ground conditions allow) or to a watercourse / sewer will be required.

Castle Green Homes Ltd are not proposing to incorporate rainwater harvesting within the development; however, they are proposing to install a water butt to each dwelling which will allow for water collection for garden re-use.

Priority Level 2

There is currently no site investigation available for review. However local geology mapping and knowledge of nearby sites indicates that there is potential for infiltration techniques to dispose of surface water flows from the development. We understand the St Giles Park development to the north of the site has some plots of the western half draining to private soakaways with the remainder of the development draining to the watercourse along the eastern boundary alongside the railway.

BGS borehole information available for the surrounding area shows a mix of till / sands and gravels.

Infiltration tests will need to be undertaken to determine potential for priority level 2 techniques. It should be noted that whilst slow rates may not be good enough to drain the site during a 100-year storm event they will potentially provide for slow infiltration SuDS components to deal with low flow events and provide for 5mm interception. Permeable paving (partial infiltration) and bioretention components such as tree pits and rain gardens can be considered appropriate.

Refer to Appendix 2 for infiltration consideration information.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

Priority Level 3

The nearest main river is the River Alyn approximately 1.2km to the northeast of the site.

There is an ordinary watercourse flowing in a southeast direction along the eastern site boundary. This runs to the west of the railway and consists of infiltration basins, open watercourses / culverts and serves the 2 developments to the north developed by Morris Homes (St Giles Park) and Redrow Homes (Hardwick Drive). The development site drains towards this watercourse via overland flows as levels on the western end of the site are at 95.5m AOD falling to 84.5m AOD to the east. The greenfield flow rate and volume of surface water currently being passed forward to this watercourse will depend on the soil type and its permeability characteristics.

There is also a watercourse flowing southeast along the southern boundary of the development site. This takes from highway drainage from Old Mold Road and the Gower Homes development (Maes Gwyrdd). This watercourse discharges into the ordinary watercourse flowing in a southeast direction along the eastern site boundary.

Refer to topographical survey in Appendix 1 and Coopers Drawing No. 7956/SK01 for details of the existing drainage arrangement.

Priority Level 4

The nearest surface water water sewers recorded on the Welsh Water sewer maps are within the St Giles Park development to the north of the development. These are part of a large diameter on-line attenuation system before the flows are passed forward to the ordinary watercourse. A gravity connection into the surface water sewers from the development site will not be achievable.

There will also be a highway drainage network within the A541 (Mold Road) to the west of the development site. However, this is unlikely to provide a gravity connection from surface water flows within the site due to site levels.

As a connection into a higher priority level is possible a connection into the surface water sewer / highway drain should not be considered.

Priority Level 5

The nearest combined sewer is approximately 200m north of the development in Hardwick Drive (Redrow development). A gravity connection into the surface water sewers from the development site will not be achievable.

As a connection into a higher priority level is possible a connection into the combined sewer should not be considered.

Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham

5.5 SuDS Approval Bodies

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100sq.m. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Every SuDS application should go to every attempt to satisfy the Principles and Standards of the legislation. When vetting an application, the SAB officer will look at the clear red line boundary area of the site when considering space for SuDS and water management features and not the space that's left on the proposed site layout.

The principles are as follows:

SuDS schemes should aim to:

- 1. manage water on or close to the surface and as close to the source of the runoff as possible;*
- 2. treat rainfall as a valuable natural resource;*
- 3. ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;*
- 4. manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;*
- 5. take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;*
- 6. use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single "end of pipe" feature, such as a pond, to serve the whole development);*
- 7. maximise the delivery of benefits for amenity and biodiversity;*
- 8. seek to make the best use of available land through multifunctional usage of public spaces and the public realm;*
- 9. perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;*
- 10. avoid the need for pumping where possible; and*
- 11. be affordable, taking into account both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system.*

Applicants seeking SAB Approval must demonstrate how they have complied with these principles or provide justification for any departure.

As noted in 5.4 there is no site investigation report or infiltration test results for review at this stage, so whilst the preferred option would be to discharge all surface water via infiltration, we have developed a strategy based on the site being underlain with clay. This would give us a design flow rate of 15.7 l/s and would require an attenuated surface water design before flows are passed forward to the watercourse at a restricted flow rate.

Flood Consequences Assessment and Drainage Strategy for Land Off Mold Road, Gwersyllt, Wrexham

The surface water strategy presented in Appendix 1 is providing all attenuation within a SuDS basin at the end of the network with a hydro brake flow control device to restrict the flows. This is considered to be a 'end of pipe solution' and whilst it complies with standards for quantity it provides limited compliance to other criteria such as water quality, amenity and biodiversity. Therefore, incorporation of additional source control SuDS components such as water butts, permeable paving and bio retention (tree pits and rain gardens) will need to be considered further at detailed design stage.

5.6 Foul Drainage

We are proposing to discharge all foul flows into the foul gravity network within the St Giles Park development to the north of the development site. However, a gravity connection will not be achievable and therefore a foul pumping station will be required at the eastern (lower) end of the site allowing flows to then be pumped along a rising main to a suitable discharge point within the St Giles Park foul public sewer network, subject to Welsh Water approval.

6.0 Conclusions and Recommendations

The site is located in Flood Zone 1 and has been shown to be at low risk of flooding from rivers, surface water, groundwater, sewers and climate change. Therefore, mitigation measures are not considered necessary for any future development at the site.

All potential sources of flooding have been considered as part of this report. There are no known records of historical flooding at the site.

No site investigation or infiltration tests have currently been undertaken to confirm the ground conditions and underlying soils, but local geology mapping and available data for neighbouring sites indicates there is potential to drain at least a portion of the site via infiltration. We advise undertaking the necessary site investigations as soon as possible.

The surface water strategy presented in Appendix 1 is providing all attenuation within a SUDS basin with a flow control device to restrict the flows. This is based on no infiltration and all flows discharging into this network. Following site investigation and infiltration tests there may be opportunity to reduce this volume if infiltration components are incorporated into the design.

All surface water run-off from highways, roof and private drives will be collected into gravity piped networks, temporarily stored in a SuDS basin and will discharge at a restricted rate into the watercourse which mimics the existing situation.

Additional on-site source control components such as permeable paving and bioretention components (tree pits and rain gardens) should be considered further at detailed design stage for compliance with the 5mm interception criteria.

The design flow rate will be based on greenfield flow rates and will be confirmed once the soil classification for the development site has been established using confirmed data and not a theoretical soil type.

Flood Consequences Assessment and Drainage Strategy
for Land Off Mold Road, Gwersyllt, Wrexham

The development will increase the impermeable area of the site. This results in an increase in surface water runoff rates and volumes. In order to ensure the increase in runoff will not have an impact elsewhere flow restrictions and on-site attenuation will be incorporated into the design.

The provision of trapped highway gullies, the SUDS detention basin and additional source control components will provide adequate treatment to surface water flows prior to discharge to the watercourse.

All foul sewers should be designed in accordance with Sewers for Adoption 7th Edition / Welsh Ministers Standards and will be subject to S104 Agreement.

A SuDS Maintenance and Management Plan should be produced to outline the activity and frequency of inspections and maintenance works required on any SuDS components subject to SAB Approval / Adoption.

This Flood Consequences Assessment and Drainage Strategy should be submitted to the Local Planning Authority in support of the planning application.

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100sq.m. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Flood Consequences Assessment and Drainage Strategy
for Land off Mold Road, Gwersyllt, Wrexham

Appendix 1

Reference Drawings

<u>Drawing No.</u>	<u>Revision</u>	<u>Title</u>
B444-00_Figure 01	01	Topographic and GPR Utility Survey
7956 / SK01	H	Drainage Strategy
7956 / SK02	D	Highway and Drainage Longsections
7956 / SK03	E	SW Impermable Areas

Welsh Water Sewer Records

This information is confidential and the copyright property of CWLS Ltd. It is released on the condition that none of the information shall be disclosed or reproduced in whole or part to/by any third party without prior written consent from CWLS Ltd. Subject to Terms & Conditions a copy of which is available upon request.

Survey Control Markers have been established for Topographic Mapping purposes only and should not be used for Construction or Setting-Out without written approval from CWLS Ltd

Legend

RS

△

Road Sign

GP

△

Road Gully

LP

○

Lighting Column or Post

EP

○

Electric Transmission Pole

GP

□

Gate Post

Gate

□

Gate

Tree/Large Shrub

○

△

5

PGM / Site Control Station

MH

○

Manhole Cover Circular

MH

□

Manhole Cover Rectangular

—

—

Kerb Channel Line

—

—

Kerb Top/Back

—

—

Verge

—

—

Fenceline

—

—

Extents of Vegetation Canopy

Station	Easting	Northing	Level
2	332157.252	352364.969	91.145
3	332145.818	352375.469	92.508
3	332109.614	352388.312	94.094
4	332106.210	352402.092	93.906
5	332102.207	352455.922	93.571
6	332098.169	352499.726	93.178
7	332095.771	352539.062	92.890

BURIED ASSETS DETECTED ON SITE:

LINETYPE	SERVICE DESCRIPTION
BT	TELECOMMUNICATIONS (BT)
CATV	TELECOMMUNICATIONS (CATV)
TELE	TELECOMMUNICATIONS (OTHER)
G	GAS
TCSU	TRAFFIC CONTROL SENSOR UNIT
SL	STREET LIGHTING
LV	LOW VOLTAGE
HV	HIGH VOLTAGE
W	WATER
FWD	FOUL WATER DRAINAGE
SWD	SURFACE WATER DRAINAGE
FWRM	FOUL WATER RISING MAIN
CS	COMBINED SEWER
OF	OIL/FUEL
U(GPR)	UNKNOWN UTILITY (GPR)
U(EMI)	UNKNOWN UTILITY (RADIO)

EOT	END OF TRACE	A/R	ASSUMED ROUTE	
01	07/12/21	CW	TB	CW

Issue	Date	By	Chkd	Appd
-------	------	----	------	------

Carl Williams Land Surveys Ltd
The Studio
15 Milfield
Neston
CH64 3TF
info@cwlandsurveys.com
www.cwlandsurveys.com

Client
Castle Green Homes

Job Title
Land off Mold Road
Gwersyllt

Drawing Title
Topographic & GPR
Utility Surveys

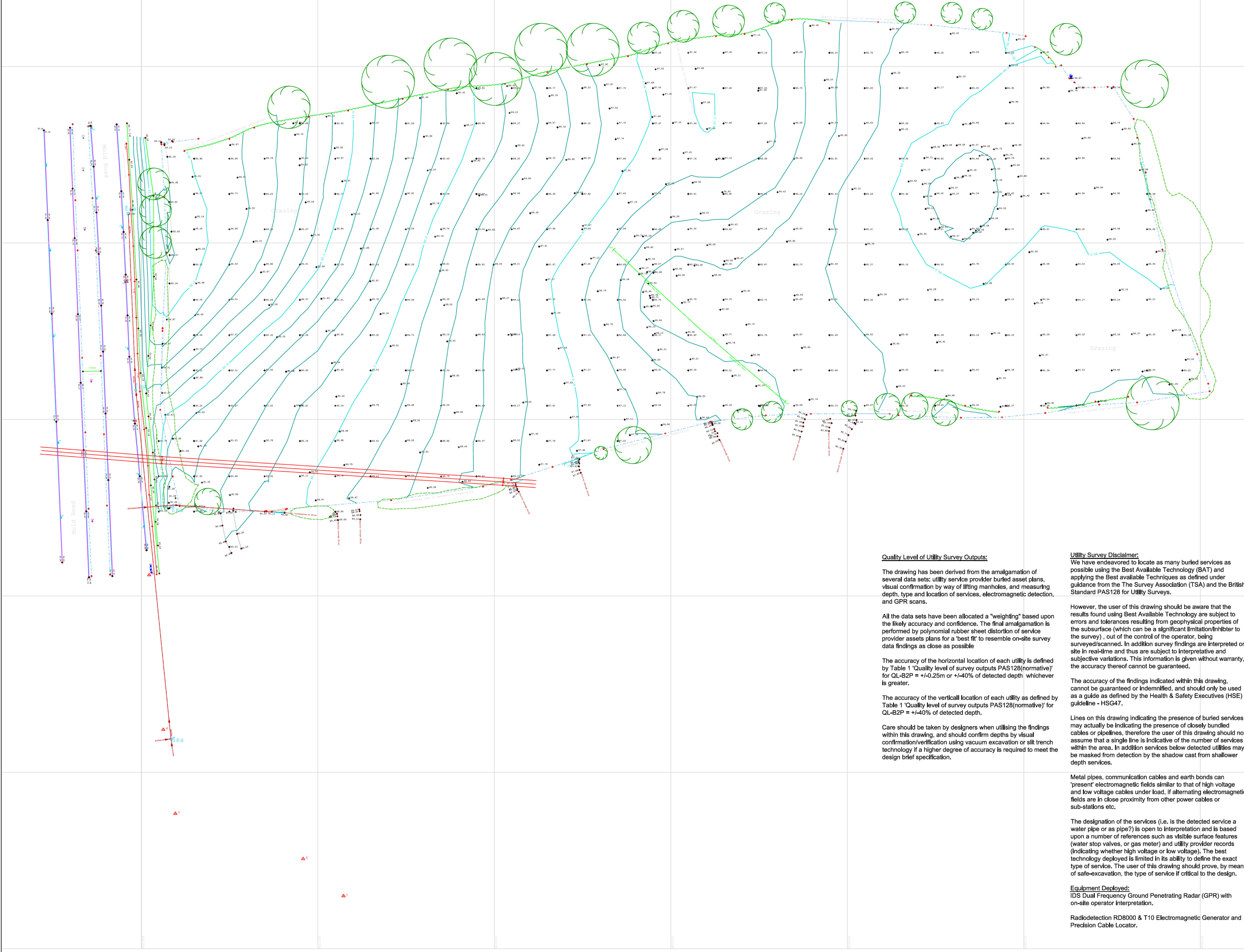
Scale at A1
1:500

Plot ID

Drawing Status

For Information

Job No B444-00	Drawing No Figure 01	Issue 01
--------------------------	--------------------------------	--------------------





Surface Water Flow Rates

Site Area = 3.13ha

Developable Area = 2.20ha

Existing Greenfield Run-off Rates
(Based on soil type 4 - Clay)

QBar = 12.04 l/s

1yr = 10.59 l/s

30yr = 21.43 l/s

100yr = 28.24 l/s

Proposed Run-off Rates

QBar = 12.04 l/s

1yr = 12.04 l/s

30yr = 12.04 l/s

100yr = 12.04 l/s

Impermeable area = 1.141 ha + 10% Urban Creep

= 1.255 ha

Estimated 100yr storage @ 50%CC required = 880m³

(based on no infiltration)

REDROW HOMES
RESIDENTIAL
SITE
(HARDWICK DRIVE)EXISTING
POND

SHALE

STORM Network 1											
Pipe Code	Diameter (mm)	Gradient (1)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Invert	Downstream Manhole Cover	Number	Cover
1.000	225	21	Circular	30.672	S1	90.50	91.93	S2	89.66	90.48	
1.001	225	19	Circular	24.037	S2	89.96	90.48	S4	87.74	89.90	
1.002	300	240	Circular	16.826	S4	87.67	89.60	S5	87.60	89.81	
1.003	375	300	Circular	22.181	S5	87.52	89.81	S6	87.45	90.09	
1.004	375	300	Circular	8.853	S6	87.45	89.89	S7	87.42	90.13	
1.005	375	300	Circular	8.126	S7	87.42	90.13	S8	87.40	90.05	
1.006	375	80	Circular	37.820	S8	87.40	90.05	S9	86.92	89.87	
1.007	375	29	Circular	52.219	S9	86.92	88.67	S10	85.59	87.53	
1.008	450	400	Circular	12.382	S10	85.02	87.03	S11	84.99	86.62	
1.009	450	400	Circular	10.488	S11	84.99	86.62	S12	84.96	86.60	
1.010	450	400	Circular	10.488	S12	84.96	86.60	S13	84.93	86.55	
1.011	450	400	Circular	28.234	S13	84.93	86.55	S20	84.86	86.51	
1.012	450	400	Circular	9.212	S20	84.86	86.51	S21	84.84	86.44	
2.000	300	240	Circular	16.989	S3	87.74	89.39	S4	87.67	89.60	
3.000	225	52	Circular	12.988	S14	86.86	87.68	S15	85.63	87.52	
3.001	225	170	Circular	16.403	S15	86.78	87.52	S16	85.67	87.28	
3.002	225	170	Circular	15.765	S16	85.67	87.28	S17	85.58	87.08	
3.003	225	170	Circular	30.069	S17	85.58	87.08	S18	85.35	86.82	
3.004	225	170	Circular	27.878	S18	85.35	86.82	S19	85.19	86.66	
3.005	300	240	Circular	25.458	S19	85.11	86.66	S20	85.01	86.51	
4.000	450	400	Circular	11.895	S22	84.68	86.45	S23	84.65	86.45	
4.001	225	170	Circular	18.889	S23	84.65	86.45	S24	84.55	85.60	

FOUL Network 2											
Pipe Code	Diameter (mm)	Gradient (1)	Pipe Type	Pipe Length	Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Invert	Downstream Manhole Cover	Number	Cover
1.000	150	15	Circular	16.694	F1	89.31	90.28	F2	87.20	89.63	
1.001	150	150	Circular	17.785	F2	87.20	89.63	F3	87.08	89.65	
1.002	150	150	Circular	25.922	F3	87.08	89.65	F4	86.90	90.10	
1.003	150	150	Circular	9.173	F4	86.90	90.10	F5	86.84	90.11	
1.004	150	150	Circular	9.970	F5	86.84	90.11	F6	86.78	89.98	
1.005	150	24	Circular	45.659	F6	86.78	89.98	F10	84.88	86.24	
1.006	150	150	Circular	30.822	F10	84.88	86.24	F11	84.67	87.15	
1.007	150	150	Circular	21.248	F11	84.67	87.15	F12	84.53	86.75	
1.008	150	150	Circular	11.036	F12	84.53	86.75	F13	84.45	86.57	
1.009	150	150	Circular	16.355	F13	84.45	86.57	F14	84.34	86.50	
1.010	150	150	Circular	2.728	F14	84.34	86.50	F15	84.32	86.50	
2.000	150	150	Circular	18.147	F7	85.28	87.08	F8	85.15	87.32	
2.001	150	150	Circular	16.654	F8	85.15	87.32	F9	85.03	87.66	
2.002	150	150	Circular	22.454	F9	85.03	87.66	F10	84.88	88.24	

Note

- This is a preliminary design demonstrating a drainage solution is achievable to discharge flows from the proposed development.
- The specification in all respects shall be in accordance with the current Wrexham CBC Specification and Construction publication in force in the county at the time of construction.

Legend

- Site Boundary
- Existing
- Existing Highway Sewer
- Existing Foul Sewer
- Existing Surface Water Sewer
- Ordinary Watercourse
- Culvert
- Proposed
- Adoptable Surface Water Sewer
- Adoptable Foul Sewer
- Slab Level
- Wall
- Underbuild
- Flag On Edge
- Gravel Board
- Step In Slab
- Rising Main
- Depth of BB (Existing to Proposed)
- +0.85
- 0.95

Note:

Retention of 300mm and above has been shown for strategy stage. Small retaining features and underbuild of up to 200mm will also be required at other locations and will be shown at detailed design stage.

MORRIS HOMES
RESIDENTIAL
SITE
(ST GILES PARK)

Adoptable FW Pumping Station (SFAT7)
CL 86.500
Sump Base Level 77
(incoming 84.340)

Rising Main to F16 Gravity network to
Existing FW Public Sewer

3m dia wet well to provide emergency
storage
(2400 x 83 = 19.92 cu.m)

Wet well base level to be supplied by
pump supplier.

For further pump station details refer to
pump supplier drawings.

Rising Main
110mm HPPE SDR17
Rising main to be
fusion welded
Length=127m

ONLINE SUDS BASIN
TOB = 86.450
Base Level = 84.690
Basin Base Area = 315m²
1 in 3 Side Slopes
Top Water Levels:
30yr = 85.414
100yr = 85.665
100yr+50%ccc+10%uc = 86.134

S23
(2.4 Dia flow control manhole)
Hydromatic Optimum
Flow Regulator
MD-SHE-0151-1200-1500-1200
Restricted to
12.00 l/s @ 1.50m design head
Orifice size = 151mm

Discharge to watercourse. Base
level of watercourse to be
confirmed by client.
Assumed level 84.55

STRATEGY

Rev.	Date	Revision	By	Appd.
H	20.10.25	Updated to suit revised layout	PW	AJ
G	05.08.25	Updated to suit revised layout	PW	AJ
F	03.04.25	Updated to suit revised layout	PW	AJ
E	13.03.25	Updated to suit revised layout	PW	AJ
D	18.11.22	Updated to suit revised layout	PW	AJ
C	07.09.22	Updated to suit revised layout	AJ	AJ
B	04.05.22	Updated to suit revised layout	PW	AJ
A	05.04.22	Dry Basin moved to suit client comment	PW	AJ

coopers
chartered consulting engineers

Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

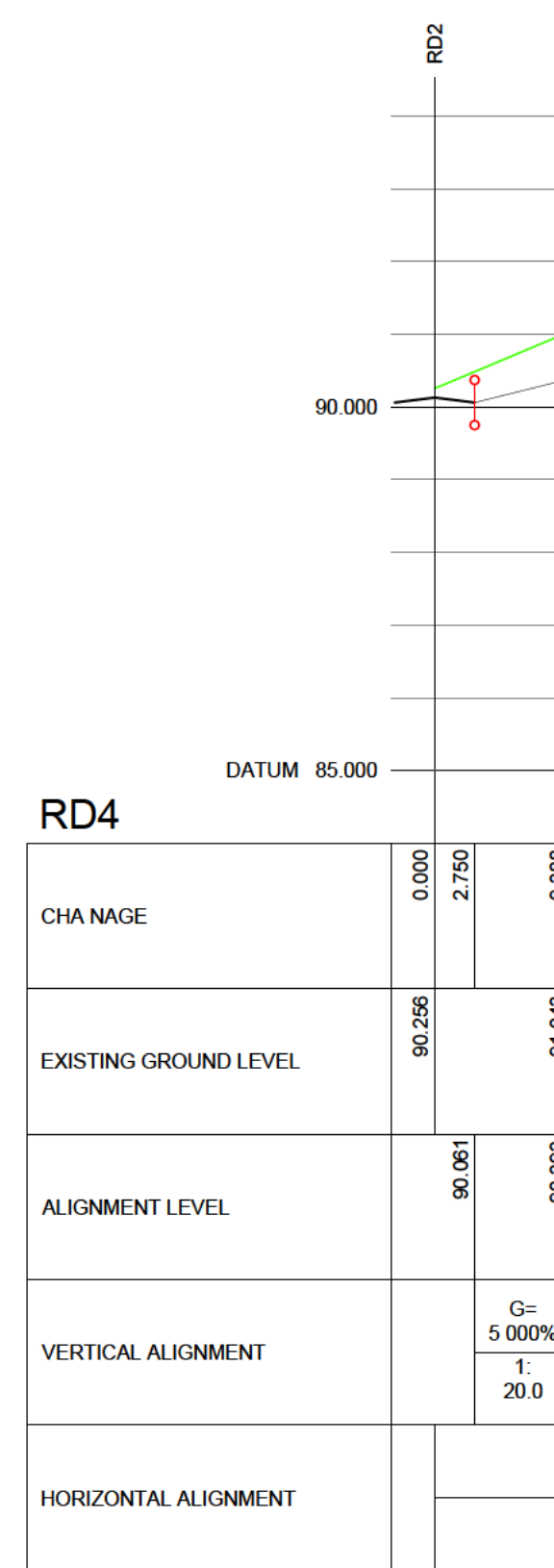
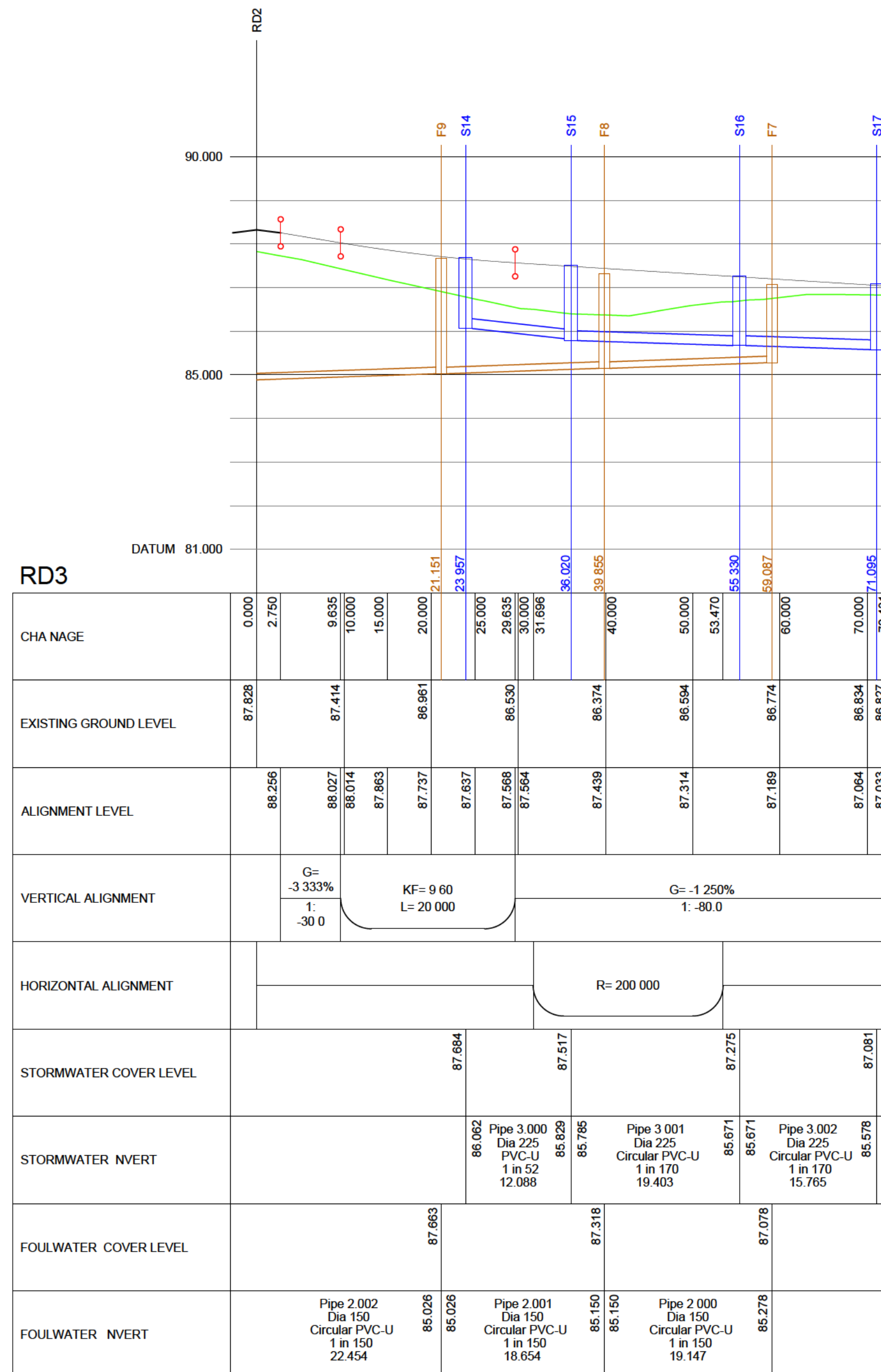
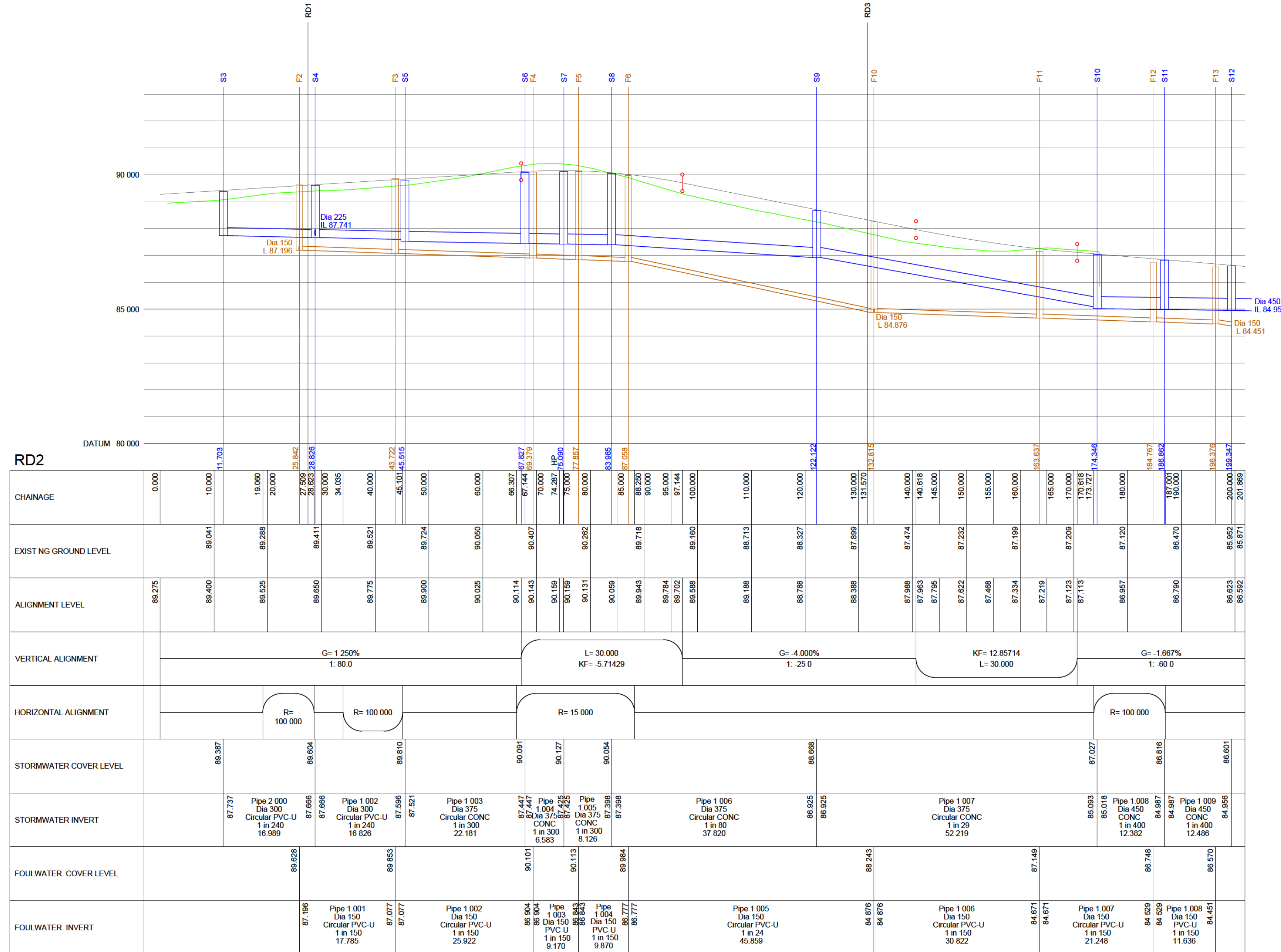
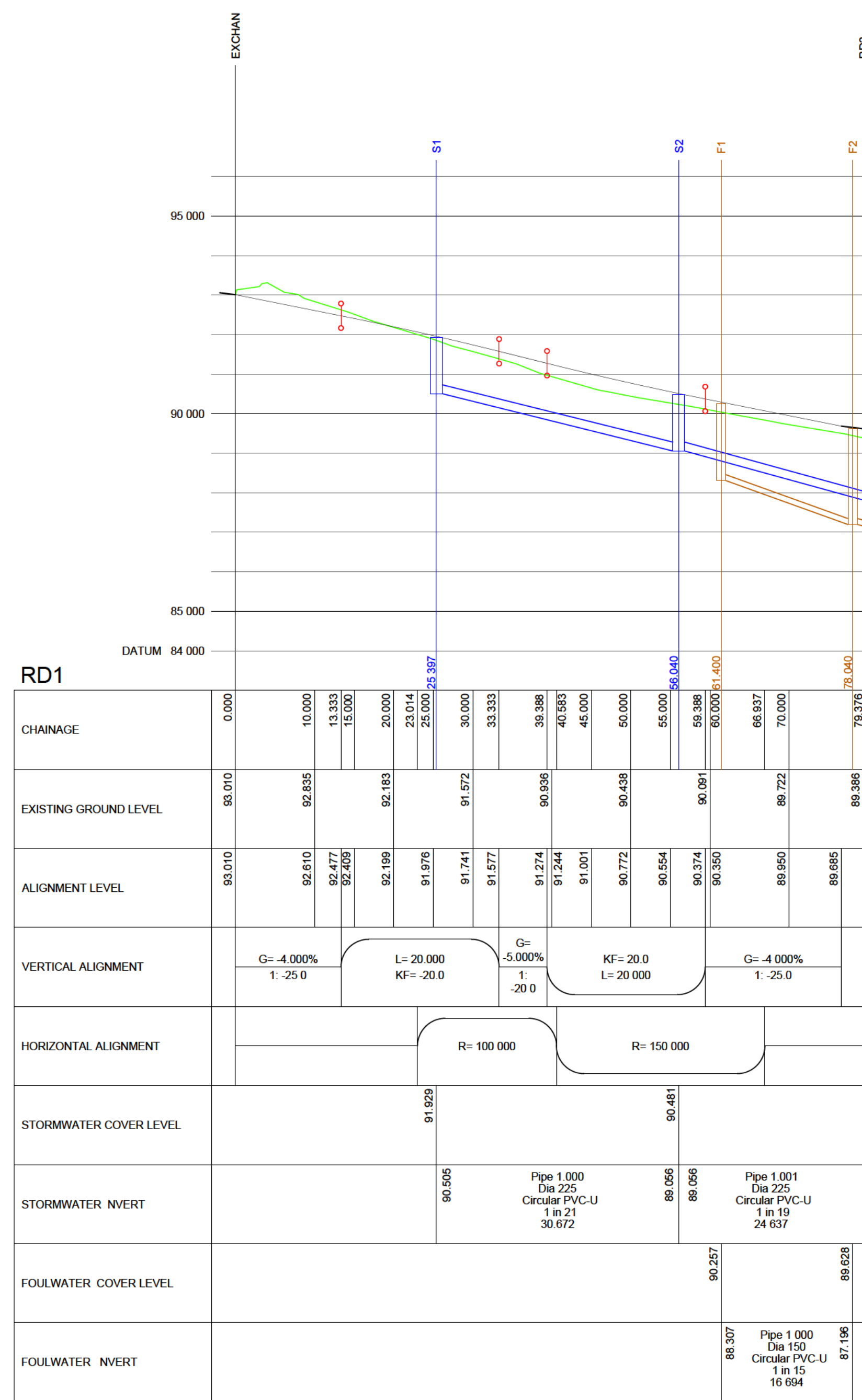
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 5QU

Client
Castle|||Green

Project
**MOLD ROAD, GWERSYLLT,
WREXHAM.**

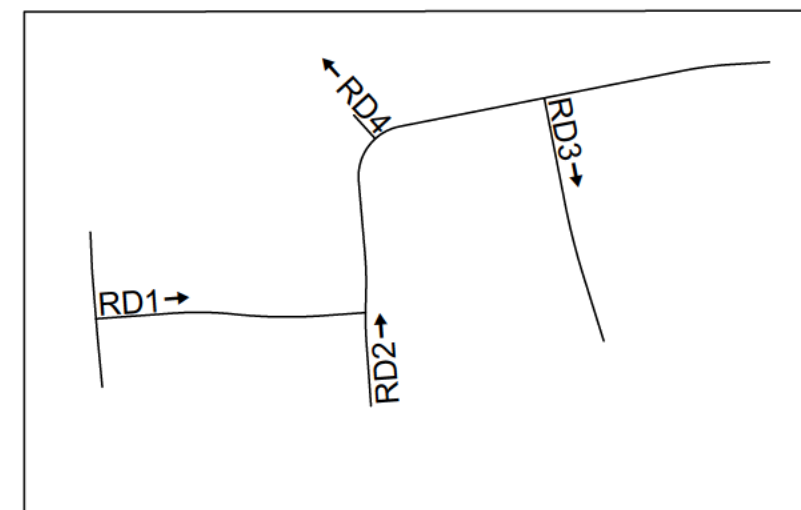
Title
Drainage Strategy

DRAWING NUMBER	SCALE at A0	1:500
7956 / SK01	DATE	25.03.22
	DRAWN	PW
	CHECKED	AJ
	REVISION	H



Class 'S' bed and surround to all pipes unless stated otherwise.
Class 'Z' bed and surround to pipes where cover < 1.2m as indicated on longsections.

All connections are soffit to soffit



Notes

- All dimensions are in millimetres unless otherwise shown.
- All adoptable drainage shall be constructed in accordance with 'Sewers for Adoption' 7th Edition, Welsh Ministers Standards and Welsh Water Details and Guidelines.
- All private drainage works are to comply fully with Part H of the Building Regulations.
- All existing invert levels to be checked by the contractor at the start of works and any other discrepancies notified to the Engineer prior to commencing works. All levels are based on topographical survey information provided by others.
- It is the responsibility of the Contractor to verify all information given with regards to existing services and drainage connections etc. prior to commencing the works.
- The Contractor shall adhere to the CDM Regulations at all times.
- Only trained personnel shall be permitted to enter confined spaces.
- All materials to bear the relevant B.S. Kitemark and comply fully with the Sewers for Adoption 7th Specification. All concrete & concrete products must use Sulphate resistant cement (unless the site investigation report proves that sulphate attack from soils and groundwater will not occur to withstand a class 3 condition).
- All opening notices etc. as required under Highways Acts etc. are to be obtained prior to commencement of works. All works are to be inspected by L.A., NHBC or Welsh Water as appropriate.
- Trench backfill in highways to within 1m of highway shall, as directed by the Highway Authority be a suitable granular material all in accordance with Sewers for Adoption.
- Cover loadings shall be as detailed on the Manhole Schedule.
- Drain trenches should not be excavated lower than the foundations of any building nearby unless either:
 - The trench is within 1m of the foundation, the trench is filled with concrete up to the lowest level of the foundation, or
 - Where the trench is further than 1m from the building, the trench is filled with concrete to a level below the lowest level for the building equal to the distance from the build, less 150mm.
- All SVP and RWP connections are indicative and shall be confirmed by the client.
- Pipe gradients out of the building to connecting manhole to be laid at 1:40 in accordance with Building Regulations, Part H, Table 6.
- Where pipe sizes are not indicated:
 - 1000 to be used for surface water unless stated otherwise.
- Minimum surface water gradients shall be:
 - 1000 laid at 1:100 with the exception of the first connection which shall be minimum 1:50.
 - 1500 laid at 1:150
- Minimum 1000 foul drainage gradient to be 1:80 with the exception of the first connection which shall be minimum 1:40.
- Manhole covers to be marked FWS or SW as appropriate.
- All manhole covers and frames shall comply with BS EN124. All adoptable manholes and chambers shall comply with Sewers for Adoption 7th Edition. Covers in roads to be grade D400 and be 150mm deep. Manhole covers in car parking areas and drives to be grade B125 and covers in landscaping areas to be grade A15. All to be sized in accordance with Building Regulations Part H, Tables 11 & 12. "In-fill" type covers should not be used. Where a cover is located in an area of block paving, the bottom of the frame should be 150mm deep.
- Precast concrete rings to be reinforced.
- Backdrops in private manholes / inspection chambers to be internal.
- Private drains laid under adopted / private roads to be Class S granular bed and surround with a minimum of 1.2m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.
- Private drains located under landscape areas or driveways / car parking bays to be Class B granular bed and surround with a minimum 0.6m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.
- Pipes have not been designed to accommodate construction traffic loading. The contractor is responsible for providing adequate protection to the pipes during construction.
- Slab levels shall not be varied without reference to the Engineer for guidance.
- The developer must self-verify and certify that the design criteria, material standards and workmanship specifications for the proposed adoptable sewers are in accordance with those set out in 'Sewers for Adoption' 7th Edition (SFA 7th). The Welsh Ministers Standards and the requirement of DCWW as the Statutory Sewerage Undertaker.
- Subject to a Section 104 Adoption Agreement being complete, a Section 106 application to connect must be made to DCWW the developer shall be given 21 days notice prior to connection. The works may only be undertaken by an SSIP Health & Safety approved contractor.

STRATEGY

D	06.08.25	Updated to suit revised layout	PW	AJ
C	13.03.25	Updated to suit revised layout	PW	AJ
B	18.11.22	Updated to suit revised layout	PW	AJ
A	04.05.22	Updated to suit revised layout	PW	AJ
Rev.	Date	Revision	By	Appd.

coopers
chartered consulting engineers

Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

Park House
Sandpiper Court
Chester Business Park
Chester
CH4 5QU

Client

Castle|||Green

Project

**MOLD ROAD, GWERSYLLT,
WREXHAM.**

Title

Highway and Drainage Longsections

DRAWING NUMBER

7956 / SK02-1

SCALE at A0

1:500 H, 1:100 V

DATE

25.03.22

REVISION

D

DRAWN

PW

CHECKED

AJ

DO NOT SCALE



MOLD ROAD

PARK

El Sub Sta

Play Area

Pond

Pond

Drain

Pc

Drain

Pond

STRATEGY

E	20.10.25	Updated to suit revised layout	PW	AJ
D	05.08.25	Updated to suit revised layout	PW	AJ
C	13.03.25	Updated to suit revised layout	PW	AJ
B	21.11.22	Updated to suit revised layout	PW	AJ
A	07.09.22	Updated to suit revised layout	PW	AJ
Rev.	Date	Revision	By	Appd.

coopers
chartered consulting engineers

Tel: 01244 684910
Email: admin@coopers.co.uk
Web: <http://coopers.co.uk>

Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Client

Castle|||Green

Project

**MOLD ROAD, GWERSYLLT,
WREXHAM.**

Title

Impermeable Areas

DRAWING NUMBER	SCALE at A1	1:250
7956 / SK03	DATE	29.03.22
	DRAWN	PW
	CHECKED	AJ
	REVISION	E

PIPE REF.	U/S MH REF.	IMPERMEABLE AREA	IMPERMEABLE AREA (+10%)
0.000	S1	1460	1610
0.000	S2	740	810
0.000	S3	420	460
0.000	S4	260	290
0.000	S5	1080	1190
0.000	S6	60	70
0.000	S7	730	800
0.000	S8	780	840
0.000	S9	1050	1160
0.000	S10	1070	1180
0.000	S11	360	400
0.000	S12	50	60
0.000	S13	-	-
0.000	S14	470	520
0.000	S15	150	170
0.000	S16	440	480
0.000	S17	670	740
0.000	S18	-	-
0.000	S19	640	700
0.000	S20	260	290
TOTAL		10,670	11,770

0 5 10 15 20 25 30 35 40 45 50
SCALE BAR (m)

© Copyright The original of this drawing contained coloured symbols and/or features. Any black and white reproduction should not be relied upon.



Dŵr Cymru
Welsh Water

Stansty Fields, 96 Mold Road



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	
○ Outfall	○ Lamphole	○ Storm Overflow	○ Rising main
○ Gravity sewer	○ Private sewer	○ Private sewer subject to Sect. 104 adoption agreement	○ Private Sewer Transfer
○ 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.

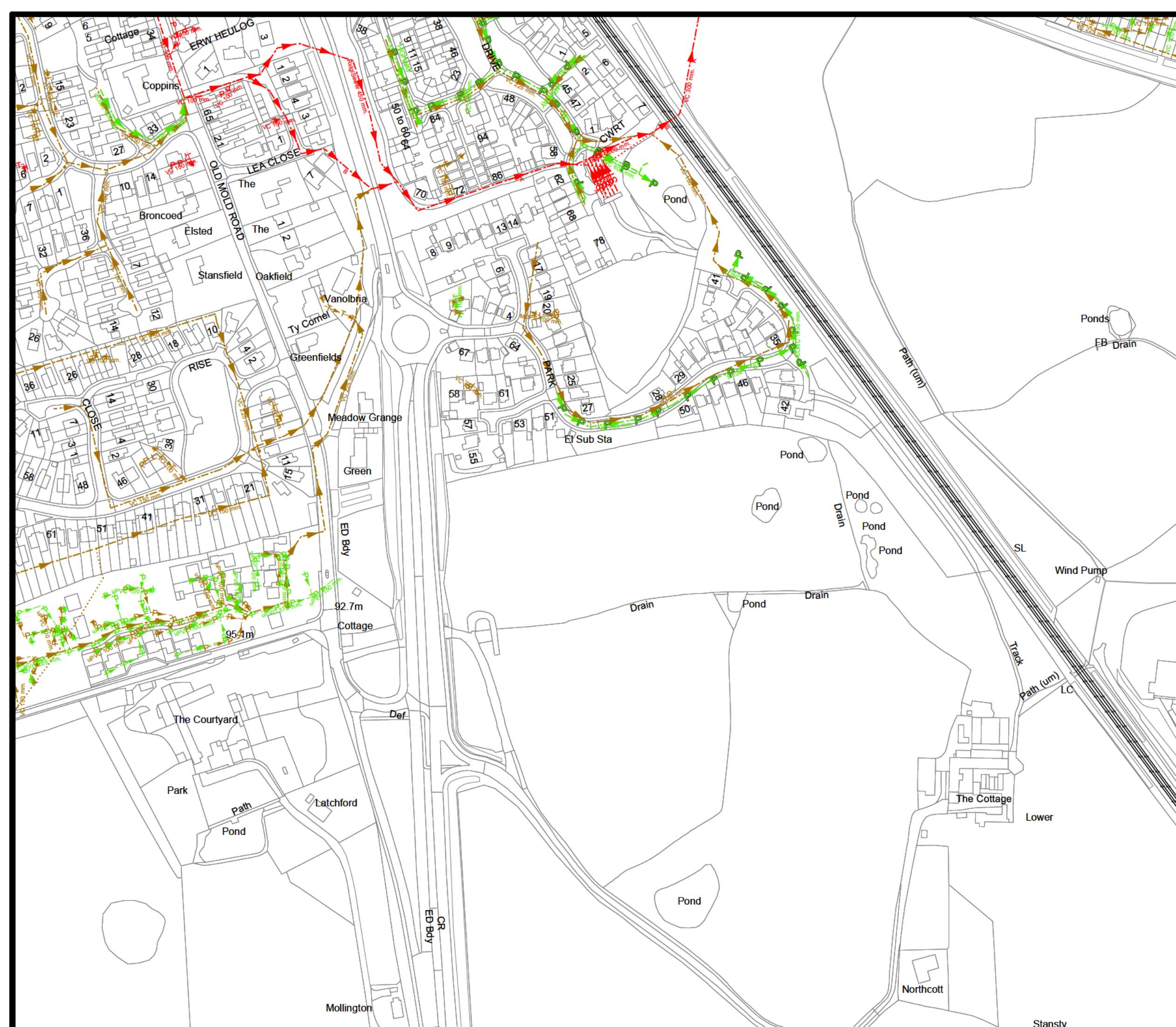
Dŵr Cymru Cyfyngedig (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations 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 190 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.**

Reproduced by permission of the Ordnance Survey on behalf of
HMSO. © Crown copyright and database right 2017.
All rights reserved.
Ordnance Survey Licence number 100019534

Map Ref: 332214,352550
Map scale: 1:2500
Printed by: John Emma
Printed on: 13 Mar 2020



Flood Consequences Assessment and Drainage Strategy
for Land off Mold Road, Gwersyllt, Wrexham

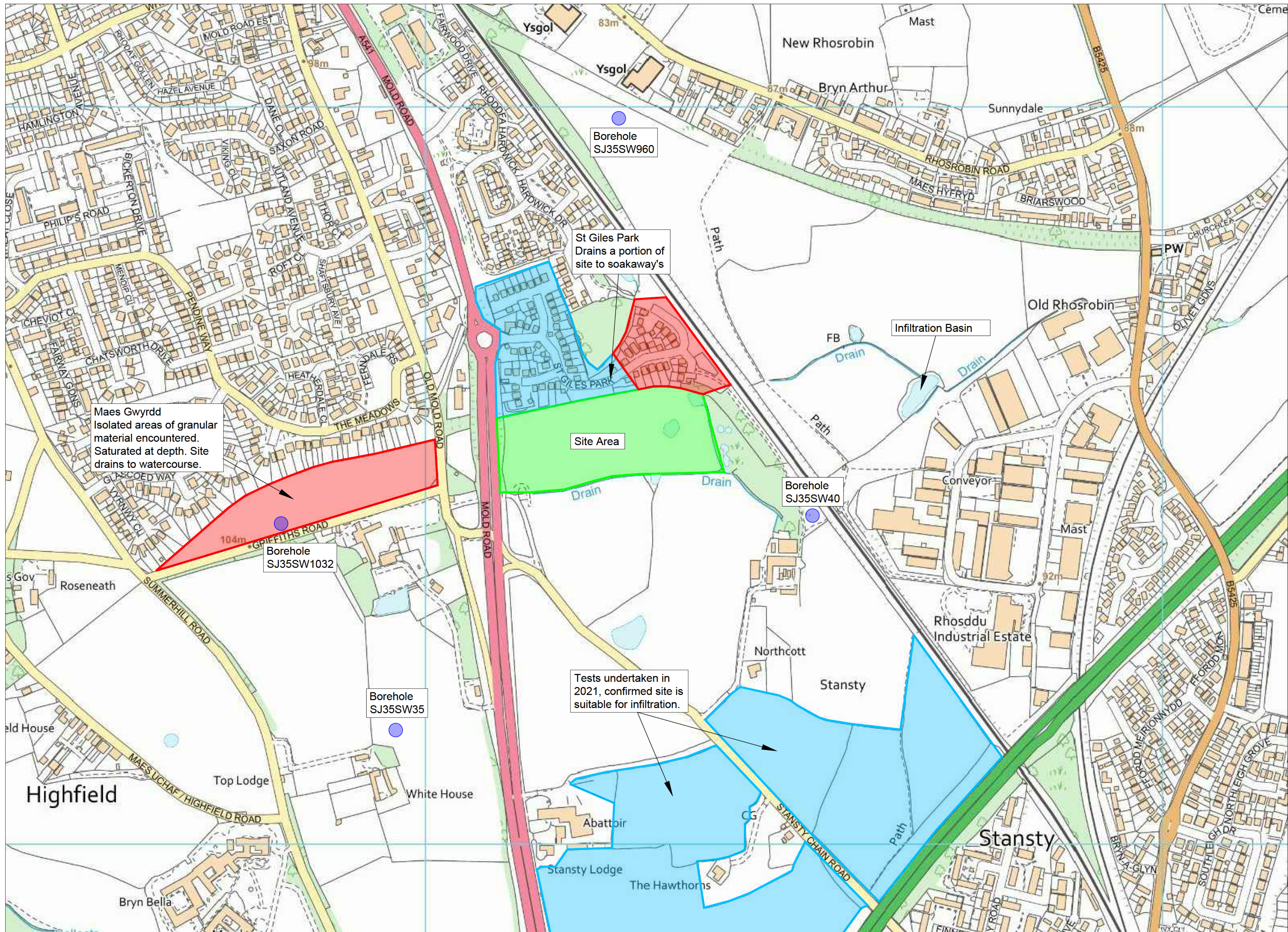
Appendix 2

Infiltration Consideration

<u>Drawing No.</u>	<u>Revision</u>	<u>Title</u>
7956 / SK04	-	Infiltration Consideration

BGS Borehole Information

BGS Geology Mapping



STRATEGY



Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk



Project
MOLD ROAD, GWERSYLLT, WREXHAM.

Title
Consideration of Infiltration

DRAWING NUMBER	SCALE at A1	1:1000
7956 / SK04	DATE	29.03.22
	DRAWN	PW
	CHECKED	AJ

SJ 35 SW 35 3191 5214 South of Stansty Park, Gwersyllt **u no. 121**

Block B

Surface level (+98.4 m) + 323 ft
Water not struck
Shell and auger 8-in (203 mm) diameter
March 1977

Overburden 1.0 m
Mineral 2.0 m
Waste 0.9 m
Mineral 13.6 m
Bedrock 0.4 m +

LOG Geological Survey

British Geological Survey

British Geological Survey

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
	Clay, sandy with coarse subrounded pebbles and cobbles of quartzite, limestone, sandstone and igneous material	0.7	1.0
Glacial Sand and Gravel	a 'Clayey' sandy gravel Gravel: coarse with fine and cobbles. Composed of subrounded to rounded quartzite with limestone and some quartz, sandstone, chert and igneous material Sand: medium with coarse and fine, subangular to subrounded, reddish brown	2.0	3.0
	Clay, red-brown, slightly sandy with pebbles and cobbles at the top. Becomes less sandy and pebbly with depth passing into laminated clay with silt and sand partings	0.9	3.9
	b Gravel, contains a thin pebbly clay between 13.5 m and 13.7 m Gravel: fine and coarse with cobbles, subangular to rounded quartzite and limestone with sandstone, igneous material and traces of quartz, chert and other sediments Sand: buff, fine, medium and coarse, subrounded quartz and quartzite with traces of coal	13.6	17.5
Coal Measures	Mudstone, pale grey, silty	0.4 +	17.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages							
Fines	Sand	Gravel		Fines	Sand			Gravel			
				- 1/16	+ 1/16-1/4	+ 1/4-1/2	+ 1/2-1	+ 1-4	+ 4-16	+ 16-64	+ 64
a	13	39	48	1.0-2.0	18	11	29	10	12	20	0
				2.0-3.0	8	7	16	6	17	36	10
				Mean	13	9	22	8	15	28	5
b	7	40	53	3.9-4.9	15	46	19	5	4	11	0
				4.9-5.9	3	6	7	6	9	26	43
				5.9-6.9	2	2	6	18	23	22	27
				6.9-7.9	2	6	11	14	25	32	10
				7.9-8.9	2	5	8	17	38	30	0
				8.9-9.9	3	14	16	7	13	24	23
				9.9-10.9	2	9	11	10	19	32	17
				10.9-11.9	3	6	14	16	21	17	23
				11.9-13.5	6	4	6	10	14	48	12
				13.7-15.5	11	20	23	12	15	19	0
				15.5-16.5	13	31	22	11	12	11	0
				16.5-17.5	6	22	21	21	11	11	8
				Mean	7	14	14	12	16	24	13
a + b	8	39	53	Mean	8	13	15	11	16	25	12

COMPOSITION

	Depth below surface (m)	Percentages by weight in + 8 mm fraction						
		Quartz	Quartzite	Sandstone	Limestone	Other sediments	Igneous	Chert, flint
a	1.0-3.0	2	72	2	17	3	3	1
b	3.9-6.9	Trace	50	2	45	3	1	Trace
	6.9-9.9	Trace	63	17	12	2	6	Trace
	9.9-13.5	Trace	43	6	39	1	12	Trace
	13.7-17.5	1	53	1	28	1	16	1

SJ 35 SW 40 3252 5244 Lower Stansty, Gwersyllt 1st no. 121

Block B

Surface level (+85.8 m) +282 ft
 Groundwater conditions not recorded
 Shell and auger 8-in (203 mm) diameter
 March 1977

Overburden 3.9 m
 Mineral 8.3 m
 Waste 4.1 m
 Mineral 7.7 m +

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground, ashes and slag	3.0	3.0
Boulder Clay	Clay, orange-brown to grey with occasional thin sandy laminae and coarse sandstone clasts	0.9	3.9
Glacial Sand and Gravel	Gravel, becomes sandy and clayey at the base Gravel: fine and coarse, with cobbles between 6.9 m and 7.9 m. Subrounded quartzite with sandstone, limestone, volcanics and some quartz Sand: brown, fine, medium and coarse, subangular to subrounded	8.3	12.2
Glacial Silt	Clay, alternating with silt and clayey sand	4.1	16.3
Glacial Sand and Gravel	Gravel Gravel: coarse and fine with cobbles, subrounded quartzite with volcanics, sandstone, limestone and some quartz, chert and other sediments Sand: coarse, medium and fine, subrounded	7.7	24.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines	Sand			Gravel			
						-1/16	+1/16-1/4	+1/4-1	+1-4	+4-16	+16-64	+64
a	6	42	52	3.9-4.9	2	3	15	18	33	29	0	
				4.9-5.9	1	5	7	12	33	42	0	
				5.9-6.9	2	12	17	15	27	27	0	
				6.9-7.9	2	4	6	12	28	25	23	
				7.9-8.9	3	10	13	18	32	24	0	
				8.9-9.9	2	4	6	18	27	43	0	
				9.9-12.2	15	53	10	6	11	5	0	
				Mean	6	18	11	13	25	24	3	
				b	4	31	65	16.3-16.8	4	2	2	6
16.8-17.5	3	6	28					37	24	2	0	
17.5-19.0	2	7	11					8	27	34	11	
19.0-20.0	3	4	12					6	10	46	19	
20.0-21.5	8	12	9					6	17	29	19	
21.5-24.0	4	7	12					14	35	28	0	
Mean	4	7	12					12	25	31	9	
a + b	5	37	58	Mean	5	13	12	12	25	27	6	

COMPOSITION

	Depth below surface (m)	Percentages by weight in + 8 mm fraction						
		Quartz	Quartzite	Sandstone	Limestone	Other sediments	Igneous	Chert, flint
a	3.9-6.9	3	66	9	6	2	14	Trace
	6.9-12.2	2	76	4	7	4	5	1
b	16.3-19.0	1	46	20	22	5	5	1
	19.0-24.0	2	64	4	20	1	8	1

SJ35SW 960

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

5-7 NEW YORK ROAD

LEEDS 2

3229
5302

Contract No. 16907/B.369.

Borehole No. 1

Location Wrexham - Rhosrobin J.T.C.

Ground Level

Client Denbigh County Architect.

Date 20th January, 1965.

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c. lb./sq. ft.	Ø deg.	m.c. %	γ lb./cu. ft.	N
Top Soil.		1'6"	1'6"						
Soft Brown Sand with Slight Clay and Stones.		2'6"	1'0"						
Stiff Brown Clay with Sand.		4'6"	2'0"	3'6"	1800		27	120	
Brittle Reddish Clay with Pebbles and Sand.		11'0"	6'6"						

Water struck at

Maximum Observed Water Level

Undisturbed Sample □
 Disturbed Sample ○
 Water Sample Δ
 Penetration Test I

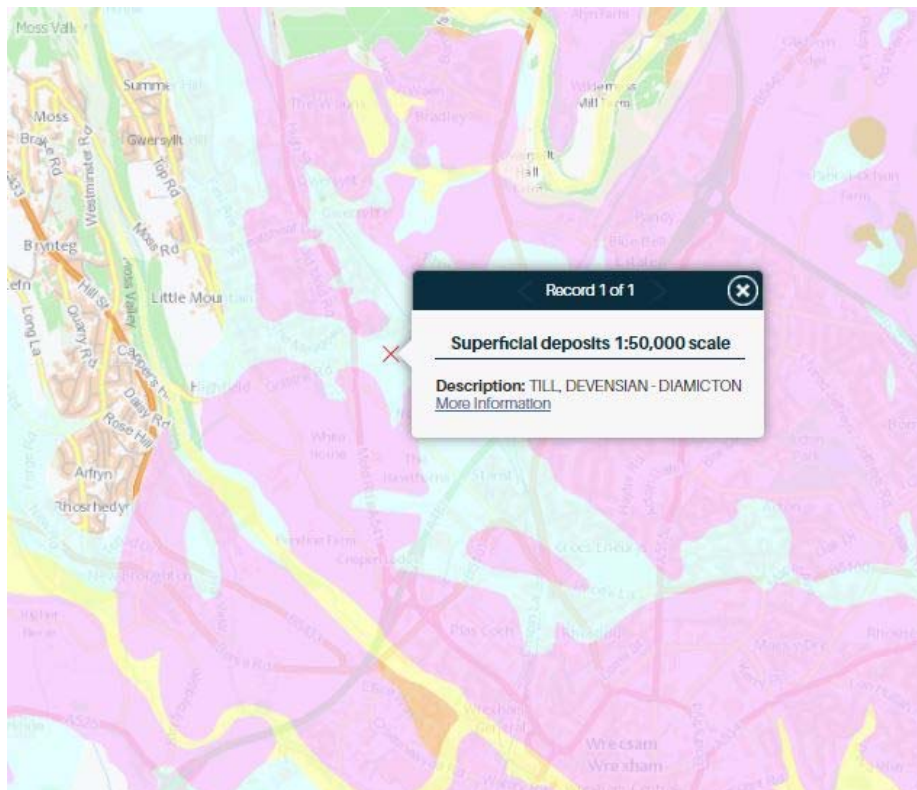
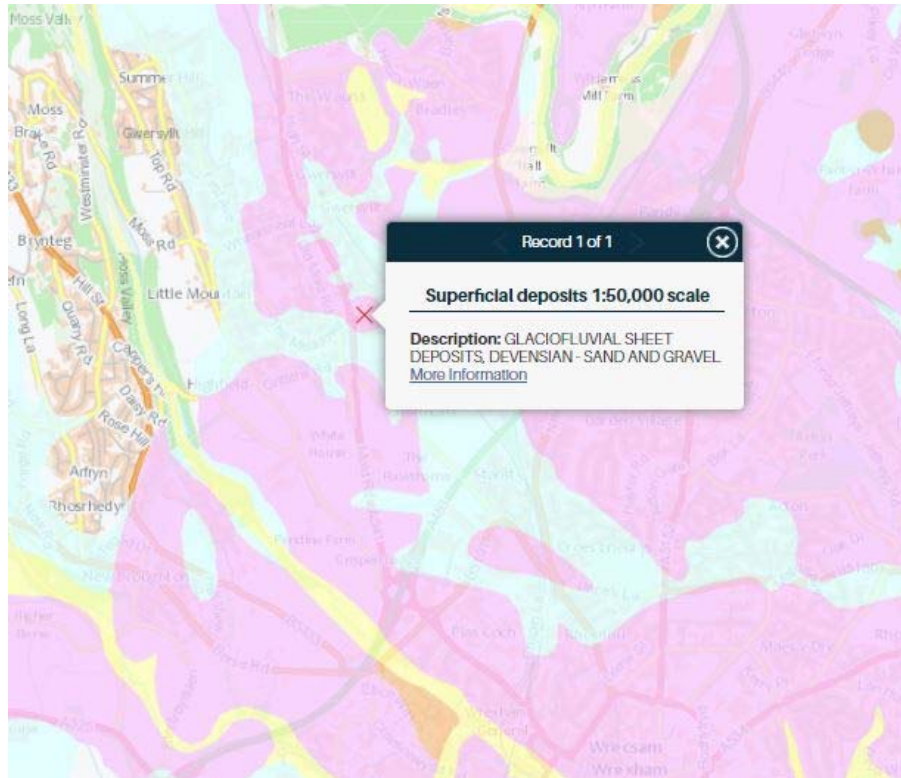
c = Cohesion
 Ø = Angle of Internal Friction
 m.c = Moisture Content
 γ = Dry Density
 N = Standard Penetration Value

Water levels may be subject to seasonal or tidal variation and should not be taken as constant.

STRATA SURVEYS LTD., HOLMES CHAPEL ROAD, MIDDLEWICH, CHESHIRE. CW10 0JB Telephone: 0606 84 4637 Fax: 0606 84 6657					Trial Pit No. : 3 Sheet No. 1 Of 1. Depth 0 to 4 metres. Dates : 31st August, 1990				
Job Number : 5687 Location : Ty Gwyn Lane, Wrexham. Client : Whelmar (Chester) Ltd					Equipment and Methods JCB 3CX Hydraulic Excavator, 333182 Engineer : nfj 352430				
Description of Strata	Red. Level	Legend	Thick-ness	Depth m	Sample Depths	Sample Types	NMC	Cu	Remarks
Grass over dark brown sandy Topsoil			(0.40)	0.00	0.20	D 1			
very compact dry light brown clayey fine grained SAND			(0.50)	0.40					
stiff and very stiff reddish brown very sandy CLAY with bands of finer-medium grained sand.			(1.10)	0.90					
compact reddish brown fine-medium-coarse grained SAND with fine -medium rounded gravel occasional rounded cobble			(1.50)	2.00					
----- End of Trial Pit -----				3.50					End of Pit
Key Sample Types U Undisturbed D Disturbed B Bulk Disturbed W Water In-Situ Tests V Vane Test Pb Plate Bearing Test CBR In-Situ CBR Test					Pp Pocket Penetrometer Progress / Water Levels Borehole Depth Water Level Water Strike				
General Remarks No water encountered during excavation.									
Sketch/Plan									

7956 Land off Mold Road, Gwersyllt, Wrexham

BGS Geology Mapping Information



Flood Consequences Assessment and Drainage Strategy
for Land off Mold Road, Gwersyllt, Wrexham

Appendix 3

Correspondence

Dwr Cymru Welsh Water Historical Flooding

Wrexham County Borough Council Historical Flooding

Natural Resources Wales Historical Flooding

Andy Jones

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 11 March 2022 15:20
To: Andy Jones
Subject: RE: FCA Land off Mold Road, Gwersyllt, Wrexham

Dear Mr Jones

Request for information

We refer to your request for information which was received on 4th March 2022.

We are dealing with your request as one made under the Environmental Information Regulations 2004 ("the Regulations").

In accordance with the Regulations, we will respond to your request within 20 working days of the date of receipt.

For completeness, we advise that the Information Commissioner's Office states that the time period for responding should be calculated from the day after the request is received.

In the meantime, if you have any queries, please contact us on email at EnvironmentalInformationRequests@dwrcymru.com

We have assigned reference **EIR/1086/2022** to your request. Please kindly note this in all correspondence with us regarding this matter.

Yours sincerely,
Dŵr Cymru Welsh Water

From: Andy Jones <ajones@coopers.co.uk>
Sent: 04 March 2022 10:53
To: Sewerage Services <Sewerage.Services@dwrcymru.com>
Subject: FCA Land off Mold Road, Gwersyllt, Wrexham

***** External Mail *****

7956 Land off Mold Road, Gwersyllt, Wrexham
FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment and Drainage Strategy for the above site (see attached Site Location Plan) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.

Regards

Andy Jones
Senior Infrastructure Engineer

Andy Jones

From: SAB <SAB@wrexham.gov.uk>
Sent: 07 March 2022 13:59
To: Andy Jones
Subject: RE: FCA Land off Mold Road, Gwersyllt, Wrexham

Hi Andy,

I'll be dealing with these requests from now on.

Our systems are showing no historical flooding incidents and no underground sewers at the site.

The below map shows surface water flooding in relation to 1 in 30, 1 in 100 and 1 in 1000 year events.



If there is anything else you require let me know.

Regards,

James

From: Andy Jones <ajones@coopers.co.uk>
Sent: 04 March 2022 11:07
To: SAB <SAB@wrexham.gov.uk>
Subject: FCA Land off Mold Road, Gwersyllt, Wrexham

Hi James

Any idea who this email should be directed to? Either a email address or person would be helpful

Thanks

Andy

7956 Land off Mold Road, Gwersyllt, Wrexham
FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment and Drainage Strategy for the above site (see attached Site Location Plan) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.

Regards

Andy Jones
Senior Infrastructure Engineer
COOPERS
Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

☎: (01244) 684910 ☎: Direct Dial No. (01244) 684933
📠: (01244) 684911
✉: ajones@coopers.co.uk
Web: <http://www.coopers.co.uk>

Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.

Ewch i weld - mi fedrwch chi dalu, rhoi gwybod, gwneud cais, dweud eich dweud, a dod o hyd i wybodaeth ar-lein yn www.wrecsam.gov.uk. Arbedwch bapur - meddylwch cyn argraffu!

Mae'r neges e-bost hon ac unrhyw atodiadau wedi eu bwriadu ar gyfer yr unigolyn neu'r sefydliad y?i cyfeirir atynt yn unig. Am yr amodau llawn yngl?n ? chynnwys a defnyddio?r neges e-bost hon, ac unrhyw atodiadau, cyfeiriwch at www.wrecsam.gov.uk/top_navigation/disclaimersw.htm

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 10 March 2022 15:13
To: Andy Jones
Subject: RE: ATI23023a Land off Mold Road, Gwersyllt, Wrexham

Dear Mr Jones,

Further to your recent email, please note that we do not have any detailed modelling for this location.

Self Service Open Data:

You can now make the most of open data provided **free online**:

- Please see the [Flooding](#) pages on the NRW website for the NRW Flood Risk Map Viewer and the Development Advice Map/Flood Map for Planning. You will find many spatial risk layers including the Flood Risk Assessment Wales (FRAW) maps, reservoir hazard data, Recorded Flood Extents, flood defences and more.
- [DataMapWales](#): Spatial data is free to download, view and use within your own GIS system. The flood datasets include: Flood Risk Assessment Wales (FRAW) Maps, Flood Map for Planning (FMfP), Recorded Flood Extents, Flood Defences, Areas Benefitting from Flood Defences, FMfP TAN 15 Defences Zones and LIDAR data.
- Please note that you can find a GIS layer of our flood models in the Flood Map for Planning viewer. This is not an exhaustive list but does give a good idea as to the most relevant models for an area. This can be accessed via the following link: <https://flood-map-for-planning.naturalresources.wales/>. Select the 'Detailed Map' tab and the layer in question is called 'NRW Local Model Manager'.

Please Note the Following:

- Extreme Sea Level Information around the Welsh coastline is available from: [Coastal Design Sea Levels - Coastal Flood Boundary Gauge Data \(2018\)](#)
- All information supplied will need to be verified by the recipient **PRIOR** to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA. Please see our website for further information on [Modelling for Flood Consequence Assessments](#) and [Developing hydraulic models for flood risk](#).
- Climate change allowances will need to be applied carefully to ensure compliance with [Welsh Government climate change allowances and flood consequence assessments](#).
- For Coastal and Estuarine sites NRW will require assessment of wave overtopping. It is up to the developer to justify why an assessment *isn't* required.
- Shoreline Management Plan (SMP) information is available on our website via our [Flood Risk Viewer Map](#) and also on Welsh Government's [DataMapWales Portal](#). You may need to consider the policy implications of the SMP when assessing the suitability and sustainability of new development on your site of interest. For proposed development sites in Gwynedd & Anglesey a Local Development Plan Policy (POLICY ARNA 1: Coastal Change Management)

sets out how the Local Planning Authority will consider new development proposals within a Coastal Change Management Area. We recommend that you contact the relevant Planning Authority for further information and guidance in relation to this.

- **Pre-application Advice:** As part of our advice service to developers, NRW offer a free initial opinion on your proposal. However, in cases where you would like to access any extra advice that falls outside of our statutory duties, we can only offer this as part of our Discretionary Planning Advice Service (DPA Service). For more information regarding free service and our discretionary planning can be found in the following links: [Welsh Version](#) / [English version](#).

Your request for our free or charged discretionary advice service needs to be accompanied by the relevant 'Request Form' which is available to download from our website. You will then need to send the form to northplanning@cyfoethnaturiolcymru.gov.uk who will coordinate our response.

Apologies we could not have been of any further assistance to you in this matter.

Yn gywir / Yours sincerely,

Michelle Lewis

Cyfoeth Naturiol Cymru / Natural Resources Wales

Ffôn/ Phone: 03000 653577

Symudol / Mobile: 07917243096

Office Location Llys Afon, Hwlfordd / Office Location River Court, Haverfordwest

Cwsmer, Cyfarthrebu a Masnach - Customer, Communications and Commercial

Oriau gwaith arferol/Normal working hours – Mon-Fri, 9 to 5

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

cyfoethnaturiol.cymru / naturalresources.wales

[Twitter](#) | [Facebook](#) | [LinkedIn](#) | [Instagram](#)

From: Data Distribution

Sent: 07 March 2022 17:22

To: 'Andy Jones' <ajones@coopers.co.uk>

Subject: AT123023a Land off Mold Road, Gwersyllt, Wrexham

Dear Mr Jones,

Thank you for your email concerning the above.

For historical mapping, please see this datalink - <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

Please note that we do not produce product 4s anymore. Please see the attached documentation for further information on this.

We can provide if the data is available, a product 5 which is the flood model report which is free of charge. Also a product 6 if available, which is the flood model raw output data which is also free of

charge. You would need the appropriate software to analyse the results, more information on this is in the attached. We could also provide product 7 which is the full flood model for a fee of £180.00 inclusive of VAT.

Please also accept this as an acknowledgement that your request has been received.

It can take up to [20 working days](#) to supply data that is not available [online](#), therefore if you have any queries on your data request, please [contact us](#).

For further information on what you can expect from us, please visit our website:

[Natural Resources Wales / Contact us](#) or call the Customer Hub on 0300 065 3000 (open 9am-5pm, Monday to Friday).

We will therefore be in touch in due course and provide if available, products 5 & 6 and advise on product 7.

Yn gywir / Yours sincerely,

Michelle Lewis

Cyfoeth Naturiol Cymru / Natural Resources Wales

Ffôn/ Phone: 03000 653577

Symudol / Mobile: 07917243096

Office Location Llys Afon, Hwlfordd / Office Location River Court, Haverfordwest

Cwsmer, Cyfarthrebu a Masnach - Customer, Communications and Commercial

Oriau gwaith arferol/Normal working hours – Mon-Fri, 9 to 5

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

[cyfoethnaturiol.cymru](#) / [naturalresources.wales](#)

[Twitter](#) | [Facebook](#) | [LinkedIn](#) | [Instagram](#)

From: Andy Jones <ajones@coopers.co.uk>

Sent: 04 March 2022 10:54

To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>

Subject: FCA Land off Mold Road, Gwersyllt, Wrexham

7956 Land off Mold Road, Gwersyllt, Wrexham
FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment and Drainage Strategy for the above site (see attached Site Location Plan) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.

Flood Consequences Assessment and Drainage Strategy
for Land off Mold Road, Gwersyllt, Wrexham

Appendix 4

MicroDrainage Calculation

Source Control Greenfield Run-off Calculation

Preliminary Surface Water Design

Calculated by:	Patrick Walsh
Site name:	Mold Road
Site location:	Wrexham

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.06559° N
Longitude:	3.01384° W
Reference:	4032095193
Date:	Mar 11 2025 11:30

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	2.2
-----------------------	-----

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{\text{BAR}} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	779	779
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

(3) Is $\text{SPR}/\text{SPRHOST} \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	4.54	12.04
1 in 1 year (l/s):	4	10.59
1 in 30 years (l/s):	8.09	21.43
1 in 100 year (l/s):	9.91	26.24
1 in 200 years (l/s):	11.18	29.61

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.309	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.161	5.00	91.930	1500	332122.947	352506.950	1.425
2	0.081	5.00	90.481	1500	332153.596	352505.762	1.425
3	0.046	5.00	89.387	1500	332179.024	352490.153	1.650
4	0.029	5.00	89.604	1500	332178.195	352507.122	1.938
5	0.119	5.00	89.810	1500	332178.032	352523.947	2.289
6	0.007	5.00	90.079	1500	332176.081	352546.042	2.632
7	0.080	5.00	90.076	1500	332177.768	352552.405	2.651
8	0.084	5.00	89.956	1500	332183.334	352558.325	2.558
9	0.116	5.00	88.508	1500	332220.422	352565.729	1.583
10	0.118	5.00	86.927	1500	332271.574	352576.233	1.909
11	0.040	5.00	86.716	1500	332283.871	352577.682	1.729
12	0.006	5.00	86.601	1500	332296.347	352578.193	1.645
13	0.000	5.00	86.550	1500	332302.351	352569.596	1.620
14	0.052	5.00	87.684	1500	332232.941	352545.193	1.622
15	0.017	5.00	87.517	1500	332235.301	352533.338	1.732
16	0.048	5.00	87.275	1500	332240.374	352514.610	1.604
17	0.074	5.00	87.082	1500	332244.959	352499.526	1.504
18	0.000	5.00	86.823	1500	332281.283	352510.887	1.469
19	0.070	5.00	86.659	1500	332308.635	352516.275	1.544
20	0.029	5.00	86.510	1500	332305.486	352541.537	1.651
21	0.000		86.450		332314.684	352542.053	1.731
22	0.000	5.00	86.450		332326.740	352525.484	1.759
23	0.000	5.00	86.450	2400	332334.315	352516.352	1.789
24			85.600	1200	332342.196	352499.186	1.050

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	30.672	0.600	90.505	89.056	1.449	21.2	225	5.18	50.0
1.001	2	4	24.637	0.600	89.056	87.741	1.315	18.7	225	5.31	50.0
2.000	3	4	16.989	0.600	87.737	87.666	0.071	240.0	300	5.28	50.0
1.002	4	5	16.826	0.600	87.666	87.596	0.070	240.0	300	5.59	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.856	113.6	21.8	1.200	1.200	0.161	0.0	66	2.215
1.001	3.037	120.7	32.8	1.200	1.638	0.242	0.0	80	2.588
2.000	1.010	71.4	6.2	1.350	1.638	0.046	0.0	59	0.626
1.002	1.010	71.4	43.0	1.638	1.914	0.317	0.0	168	1.055

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	5	6	22.181	0.600	87.521	87.447	0.074	300.0	375	5.95	50.0
1.004	6	7	6.583	0.600	87.447	87.425	0.022	300.0	375	6.05	50.0
1.005	7	8	8.126	0.600	87.425	87.398	0.027	300.0	375	6.18	50.0
1.006	8	9	37.820	0.600	87.398	86.925	0.473	80.0	375	6.49	50.0
1.007	9	10	52.219	0.600	86.925	85.093	1.832	28.5	375	6.75	50.0
1.008	10	11	12.382	0.600	85.018	84.987	0.031	400.0	450	6.95	50.0
1.009	11	12	12.486	0.600	84.987	84.956	0.031	400.0	450	7.16	50.0
1.010	12	13	10.486	0.600	84.956	84.930	0.026	400.0	450	7.33	50.0
1.011	13	20	28.234	0.600	84.930	84.859	0.071	400.0	450	7.80	50.0
3.000	14	15	12.088	0.600	86.062	85.829	0.233	51.9	225	5.11	50.0
3.001	15	16	19.403	0.600	85.785	85.671	0.114	170.0	225	5.43	50.0
3.002	16	17	15.765	0.600	85.671	85.578	0.093	170.0	225	5.70	50.0
3.003	17	18	38.059	0.600	85.578	85.354	0.224	170.0	225	6.33	50.0
3.004	18	19	27.878	0.600	85.354	85.190	0.164	170.0	225	6.80	50.0
3.005	19	20	25.458	0.600	85.115	85.009	0.106	240.0	300	7.22	50.0
1.012	20	21	9.212	0.600	84.859	84.836	0.023	400.0	450	7.95	50.0
4.000	22	23	11.865	0.600	84.691	84.661	0.030	400.0	450	5.20	50.0
1.015	23	24	18.889	0.600	84.661	84.550	0.111	170.2	225	5.51	50.0

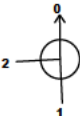
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.041	114.9	59.1	1.914	2.257	0.436	0.0	191	1.048
1.004	1.041	114.9	60.0	2.257	2.276	0.443	0.0	192	1.051
1.005	1.041	114.9	70.9	2.276	2.183	0.523	0.0	214	1.093
1.006	2.027	223.9	82.3	2.183	1.208	0.607	0.0	157	1.878
1.007	3.404	376.0	98.0	1.208	1.459	0.723	0.0	130	2.880
1.008	1.010	160.7	114.0	1.459	1.279	0.841	0.0	281	1.092
1.009	1.010	160.7	119.4	1.279	1.195	0.881	0.0	290	1.102
1.010	1.010	160.7	120.2	1.195	1.170	0.887	0.0	291	1.104
1.011	1.010	160.7	120.2	1.170	1.201	0.887	0.0	291	1.104
3.000	1.820	72.4	7.0	1.397	1.463	0.052	0.0	47	1.161
3.001	1.000	39.7	9.4	1.507	1.379	0.069	0.0	74	0.821
3.002	1.000	39.7	15.9	1.379	1.279	0.117	0.0	99	0.945
3.003	1.000	39.7	25.9	1.279	1.244	0.191	0.0	132	1.062
3.004	1.000	39.7	25.9	1.244	1.244	0.191	0.0	132	1.062
3.005	1.010	71.4	35.4	1.244	1.201	0.261	0.0	149	1.008
1.012	1.010	160.7	159.5	1.201	1.164	1.177	0.0	369	1.144
4.000	1.010	160.7	0.0	1.309	1.339	0.000	0.0	0	0.000
1.015	0.999	39.7	0.0	1.564	0.825	0.000	0.0	0	0.000

Pipeline Schedule

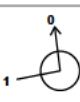
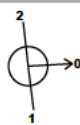
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	30.672	21.2	225	Circular_Default Sewer Type	91.930	90.505	1.200	90.481	89.056	1.200
1.001	24.637	18.7	225	Circular_Default Sewer Type	90.481	89.056	1.200	89.604	87.741	1.638
2.000	16.989	240.0	300	Circular_Default Sewer Type	89.387	87.737	1.350	89.604	87.666	1.638
1.002	16.826	240.0	300	Circular_Default Sewer Type	89.604	87.666	1.638	89.810	87.596	1.914
1.003	22.181	300.0	375	Circular_Default Sewer Type	89.810	87.521	1.914	90.079	87.447	2.257
1.004	6.583	300.0	375	Circular_Default Sewer Type	90.079	87.447	2.257	90.076	87.425	2.276
1.005	8.126	300.0	375	Circular_Default Sewer Type	90.076	87.425	2.276	89.956	87.398	2.183
1.006	37.820	80.0	375	Circular_Default Sewer Type	89.956	87.398	2.183	88.508	86.925	1.208
1.007	52.219	28.5	375	Circular_Default Sewer Type	88.508	86.925	1.208	86.927	85.093	1.459
1.008	12.382	400.0	450	Circular_Default Sewer Type	86.927	85.018	1.459	86.716	84.987	1.279
1.009	12.486	400.0	450	Circular_Default Sewer Type	86.716	84.987	1.279	86.601	84.956	1.195
1.010	10.486	400.0	450	Circular_Default Sewer Type	86.601	84.956	1.195	86.550	84.930	1.170
1.011	28.234	400.0	450	Circular_Default Sewer Type	86.550	84.930	1.170	86.510	84.859	1.201
3.000	12.088	51.9	225	Circular_Default Sewer Type	87.684	86.062	1.397	87.517	85.829	1.463
3.001	19.403	170.0	225	Circular_Default Sewer Type	87.517	85.785	1.507	87.275	85.671	1.379
3.002	15.765	170.0	225	Circular_Default Sewer Type	87.275	85.671	1.379	87.082	85.578	1.279
3.003	38.059	170.0	225	Circular_Default Sewer Type	87.082	85.578	1.279	86.823	85.354	1.244
3.004	27.878	170.0	225	Circular_Default Sewer Type	86.823	85.354	1.244	86.659	85.190	1.244
3.005	25.458	240.0	300	Circular_Default Sewer Type	86.659	85.115	1.244	86.510	85.009	1.201
1.012	9.212	400.0	450	Circular_Default Sewer Type	86.510	84.859	1.201	86.450	84.836	1.164
4.000	11.865	400.0	450	Circular_Default Sewer Type	86.450	84.691	1.309	86.450	84.661	1.339
1.015	18.889	170.2	225	Circular_Default Sewer Type	86.450	84.661	1.564	85.600	84.550	0.825

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
1.001	2	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
2.000	3	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
1.002	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.003	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.004	6	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.005	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.006	8	1500	Manhole	Adoptable	9	1500	Manhole	Adoptable
1.007	9	1500	Manhole	Adoptable	10	1500	Manhole	Adoptable
1.008	10	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
1.009	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
1.010	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.011	13	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
3.000	14	1500	Manhole	Adoptable	15	1500	Manhole	Adoptable
3.001	15	1500	Manhole	Adoptable	16	1500	Manhole	Adoptable
3.002	16	1500	Manhole	Adoptable	17	1500	Manhole	Adoptable
3.003	17	1500	Manhole	Adoptable	18	1500	Manhole	Adoptable
3.004	18	1500	Manhole	Adoptable	19	1500	Manhole	Adoptable
3.005	19	1500	Manhole	Adoptable	20	1500	Manhole	Adoptable
1.012	20	1500	Manhole	Adoptable	21		Junction	
4.000	22		Junction		23	2400	Manhole	Adoptable
1.015	23	2400	Manhole	Adoptable	24	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	332122.947	352506.950	91.930	1.425	1500	 0	1.000	90.505	225
2	332153.596	352505.762	90.481	1.425	1500	 1 0	1.000	89.056	225
3	332179.024	352490.153	89.387	1.650	1500	 0	1.001	89.056	225
4	332178.195	352507.122	89.604	1.938	1500	 1 2 0	2.000	87.737	300
5	332178.032	352523.947	89.810	2.289	1500	 1 0	2.000	87.666	300
6	332176.081	352546.042	90.079	2.632	1500	 1 0	1.001	87.741	225
7	332177.768	352552.405	90.076	2.651	1500	 1 0	1.002	87.666	300
8	332183.334	352558.325	89.956	2.558	1500	 1 0	1.002	87.596	300
9	332220.422	352565.729	88.508	1.583	1500	 1 0	1.003	87.521	375
10	332271.574	352576.233	86.927	1.909	1500	 1 0	1.003	87.447	375
11	332283.871	352577.682	86.716	1.729	1500	 1 0	1.004	87.447	375
12	332296.347	352578.193	86.601	1.645	1500	 1 0	1.004	87.425	375
13	332302.351	352569.596	86.550	1.620	1500	 1 0	1.004	87.425	375
						 1 0	1.005	87.398	375
						0	1.006	87.398	375
						1	1.006	86.925	375
						0	1.007	86.925	375
						1	1.007	85.093	375
						0	1.008	85.018	450
						1	1.008	84.987	450
						0	1.009	84.987	450
						1	1.009	84.956	450
						0	1.010	84.956	450
						1	1.010	84.930	450
						0	1.011	84.930	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
14	332232.941	352545.193	87.684	1.622	1500		0	3.000	86.062	225
15	332235.301	352533.338	87.517	1.732	1500		1	3.000	85.829	225
							0	3.001	85.785	225
16	332240.374	352514.610	87.275	1.604	1500		1	3.001	85.671	225
							0	3.002	85.671	225
17	332244.959	352499.526	87.082	1.504	1500		1	3.002	85.578	225
							0	3.003	85.578	225
18	332281.283	352510.887	86.823	1.469	1500		1	3.003	85.354	225
							0	3.004	85.354	225
19	332308.635	352516.275	86.659	1.544	1500		1	3.004	85.190	225
							0	3.005	85.115	300
20	332305.486	352541.537	86.510	1.651	1500		1	3.005	85.009	300
							2	1.011	84.859	450
							0	1.012	84.859	450
21	332314.684	352542.053	86.450	1.731			1	1.012	84.836	450
22	332326.740	352525.484	86.450	1.759			0	4.000	84.691	450
23	332334.315	352516.352	86.450	1.789	2400		1	4.000	84.661	450
							0	1.015	84.661	225
24	332342.196	352499.186	85.600	1.050	1200		1	1.015	84.550	225

Simulation Settings

Rainfall Methodology FSR
Rainfall Events Singular
FSR Region England and Wales
M5-60 (mm) 18.000
Ratio-R 0.310
Summer CV 0.750

Winter CV 0.840
Analysis Speed Detailed
Skip Steady State x
Drain Down Time (mins) 240
Additional Storage (m³/ha) 20.0
Starting Level (m)

Simulation Settings

Check Discharge Rate(s)	✓	100 year 360 minute (m³)
Check Discharge Volume	✓	

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 23 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	84.661	Product Number	CTL-SHE-0151-1200-1500-1200
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.0	Min Node Diameter (mm)	1500

Node 22 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	28.391
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	84.691	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.035

Inlets

21

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	315.0	0.0	0.400	401.0	0.0	0.800	497.0	0.0	1.200	601.0	0.0
0.200	357.0	0.0	0.600	448.0	0.0	1.000	548.0	0.0	1.400	657.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.566	0.061	18.7	0.2463	0.0000	OK
15 minute winter	2	10	89.130	0.074	27.9	0.2161	0.0000	OK
15 minute winter	3	11	87.827	0.090	5.3	0.2102	0.0000	OK
15 minute winter	4	11	87.826	0.160	35.6	0.3298	0.0000	OK
15 minute winter	5	11	87.708	0.187	48.6	0.5237	0.0000	OK
15 minute winter	6	11	87.647	0.200	49.4	0.3637	0.0000	OK
15 minute winter	7	11	87.611	0.186	57.8	0.4407	0.0000	OK
15 minute winter	8	11	87.547	0.149	66.8	0.3612	0.0000	OK
15 minute winter	9	11	87.040	0.115	79.2	0.3714	0.0000	OK
15 minute winter	10	12	85.310	0.292	91.3	0.8781	0.0000	OK
15 minute winter	11	12	85.279	0.292	92.1	0.6503	0.0000	OK
15 minute winter	12	12	85.241	0.285	92.8	0.5248	0.0000	OK
15 minute winter	13	12	85.200	0.270	92.6	0.4776	0.0000	OK
15 minute winter	14	10	86.107	0.045	6.0	0.1084	0.0000	OK
15 minute winter	15	11	85.852	0.067	7.9	0.1314	0.0000	OK
15 minute winter	16	11	85.763	0.092	13.4	0.2174	0.0000	OK
15 minute winter	17	11	85.699	0.121	21.4	0.3325	0.0000	OK
15 minute winter	18	12	85.474	0.120	21.5	0.2120	0.0000	OK
15 minute winter	19	12	85.250	0.135	28.2	0.3623	0.0000	OK
15 minute winter	20	12	85.132	0.273	122.5	0.5789	0.0000	OK
240 minute winter	21	176	85.002	0.283	32.9	0.0000	0.0000	OK
240 minute winter	22	176	85.002	0.311	21.9	0.0000	0.0000	OK
240 minute winter	23	176	85.002	0.341	11.5	1.5412	0.0000	SURCHARGED
240 minute winter	24	180	84.632	0.082	11.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	18.5	1.838	0.163	0.3091	
15 minute winter	2	1.001	4	27.8	2.337	0.230	0.3036	
15 minute winter	3	2.000	4	5.3	0.237	0.074	0.4753	
15 minute winter	4	1.002	5	35.6	0.991	0.499	0.6051	
15 minute winter	5	1.003	6	48.6	0.849	0.423	1.2689	
15 minute winter	6	1.004	7	49.1	0.864	0.427	0.3757	
15 minute winter	7	1.005	8	57.6	1.213	0.502	0.3869	
15 minute winter	8	1.006	9	66.5	1.924	0.297	1.3110	
15 minute winter	9	1.007	10	78.4	1.950	0.209	2.4631	
15 minute winter	10	1.008	11	88.5	0.838	0.551	1.3478	
15 minute winter	11	1.009	12	92.3	0.873	0.574	1.3398	
15 minute winter	12	1.010	13	92.6	0.902	0.576	1.0766	
15 minute winter	13	1.011	20	92.0	0.920	0.572	2.8257	
15 minute winter	14	3.000	15	5.9	1.078	0.082	0.0663	
15 minute winter	15	3.001	16	7.8	0.625	0.196	0.2437	
15 minute winter	16	3.002	17	13.2	0.715	0.332	0.2912	
15 minute winter	17	3.003	18	21.5	1.004	0.541	0.8202	
15 minute winter	18	3.004	19	21.0	1.001	0.528	0.5841	
15 minute winter	19	3.005	20	28.0	0.940	0.391	0.7575	
15 minute winter	20	1.012	21	121.6	1.291	0.757	0.8675	
240 minute winter	21	Flow through Pond	22	21.9	0.047	0.001	102.9277	
240 minute winter	22	4.000	23	11.5	0.278	0.071	1.4569	
240 minute winter	23	1.015	24	11.4	0.849	0.287	0.2535	175.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.604	0.099	45.7	0.3973	0.0000	OK
15 minute winter	2	10	89.176	0.120	68.3	0.3477	0.0000	OK
15 minute winter	3	11	88.057	0.320	13.1	0.7448	0.0000	SURCHARGED
15 minute winter	4	11	88.052	0.386	85.1	0.7978	0.0000	SURCHARGED
15 minute winter	5	11	87.916	0.395	115.8	1.1083	0.0000	SURCHARGED
15 minute winter	6	11	87.816	0.369	117.7	0.6714	0.0000	OK
15 minute winter	7	11	87.760	0.335	138.8	0.7941	0.0000	OK
15 minute winter	8	11	87.654	0.256	160.8	0.6207	0.0000	OK
15 minute winter	9	11	87.111	0.186	191.2	0.6021	0.0000	OK
15 minute winter	10	12	85.850	0.832	221.9	2.4984	0.0000	SURCHARGED
15 minute winter	11	12	85.749	0.762	222.9	1.6996	0.0000	SURCHARGED
15 minute winter	12	12	85.638	0.682	224.8	1.2554	0.0000	SURCHARGED
15 minute winter	13	12	85.535	0.605	225.1	1.0698	0.0000	SURCHARGED
15 minute winter	14	10	86.135	0.073	14.8	0.1753	0.0000	OK
15 minute winter	15	12	85.983	0.198	19.4	0.3891	0.0000	OK
15 minute winter	16	12	85.967	0.296	32.4	0.7003	0.0000	SURCHARGED
15 minute winter	17	12	85.919	0.341	46.4	0.9376	0.0000	SURCHARGED
15 minute winter	18	12	85.640	0.286	43.5	0.5048	0.0000	SURCHARGED
15 minute winter	19	12	85.430	0.315	60.9	0.8434	0.0000	SURCHARGED
240 minute winter	20	228	85.415	0.556	72.6	1.1773	0.0000	SURCHARGED
240 minute winter	21	228	85.415	0.696	70.8	0.0000	0.0000	OK
240 minute winter	22	228	85.415	0.724	41.9	0.0000	0.0000	SURCHARGED
240 minute winter	23	228	85.414	0.753	12.7	3.4084	0.0000	SURCHARGED
180 minute summer	24	104	84.634	0.084	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	45.3	2.372	0.399	0.5858	
15 minute winter	2	1.001	4	67.6	2.443	0.560	0.7543	
15 minute winter	3	2.000	4	14.5	0.268	0.204	1.1964	
15 minute winter	4	1.002	5	84.0	1.193	1.177	1.1849	
15 minute winter	5	1.003	6	115.8	1.050	1.007	2.4416	
15 minute winter	6	1.004	7	117.4	1.097	1.022	0.7036	
15 minute winter	7	1.005	8	138.4	1.498	1.204	0.7480	
15 minute winter	8	1.006	9	160.2	2.375	0.716	2.5486	
15 minute winter	9	1.007	10	190.4	2.017	0.506	4.3052	
15 minute winter	10	1.008	11	214.0	1.351	1.332	1.9618	
15 minute winter	11	1.009	12	223.5	1.411	1.391	1.9783	
15 minute winter	12	1.010	13	225.1	1.421	1.401	1.6614	
15 minute winter	13	1.011	20	225.3	1.422	1.402	4.4735	
15 minute winter	14	3.000	15	14.6	1.375	0.202	0.2281	
15 minute winter	15	3.001	16	18.8	0.717	0.472	0.7454	
15 minute winter	16	3.002	17	28.1	0.774	0.707	0.6270	
15 minute winter	17	3.003	18	43.5	1.131	1.095	1.5136	
15 minute winter	18	3.004	19	42.2	1.162	1.063	1.1087	
15 minute winter	19	3.005	20	57.0	1.003	0.798	1.7927	
240 minute winter	20	1.012	21	70.8	1.040	0.441	1.4596	
240 minute winter	21	Flow through Pond	22	41.9	0.060	0.002	278.6570	
240 minute winter	22	4.000	23	12.7	0.330	0.079	1.8799	
240 minute winter	23	1.015	24	12.0	0.861	0.302	0.2634	291.3

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.619	0.114	58.9	0.4581	0.0000	OK
15 minute winter	2	11	89.215	0.159	88.0	0.4621	0.0000	OK
15 minute winter	3	11	88.353	0.616	16.8	1.4324	0.0000	SURCHARGED
15 minute winter	4	11	88.348	0.682	109.3	1.4089	0.0000	SURCHARGED
15 minute winter	5	11	88.120	0.599	149.2	1.6818	0.0000	SURCHARGED
15 minute winter	6	11	87.948	0.501	150.9	0.9113	0.0000	SURCHARGED
15 minute winter	7	11	87.862	0.437	178.0	1.0354	0.0000	SURCHARGED
15 minute winter	8	11	87.711	0.313	206.6	0.7577	0.0000	OK
15 minute winter	9	12	87.190	0.265	245.7	0.8581	0.0000	OK
15 minute winter	10	12	86.254	1.236	279.1	3.7124	0.0000	SURCHARGED
15 minute winter	11	12	86.090	1.103	283.5	2.4606	0.0000	SURCHARGED
15 minute winter	12	12	85.911	0.955	285.2	1.7578	0.0000	SURCHARGED
15 minute winter	13	12	85.746	0.816	285.2	1.4413	0.0000	SURCHARGED
15 minute winter	14	12	86.316	0.254	19.0	0.6111	0.0000	SURCHARGED
15 minute winter	15	12	86.305	0.520	25.1	1.0198	0.0000	SURCHARGED
15 minute winter	16	12	86.279	0.608	35.5	1.4384	0.0000	SURCHARGED
15 minute winter	17	12	86.214	0.636	54.4	1.7487	0.0000	SURCHARGED
15 minute winter	18	12	85.837	0.483	47.8	0.8540	0.0000	SURCHARGED
360 minute winter	19	344	85.665	0.550	16.1	1.4713	0.0000	SURCHARGED
360 minute winter	20	344	85.665	0.806	67.4	1.7073	0.0000	SURCHARGED
360 minute winter	21	344	85.665	0.946	66.2	0.0000	0.0000	OK
360 minute winter	22	344	85.665	0.974	39.3	0.0000	0.0000	SURCHARGED
360 minute winter	23	344	85.665	1.004	12.5	4.5411	0.0000	SURCHARGED
120 minute winter	24	64	84.634	0.084	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	58.4	2.471	0.514	0.7588	
15 minute winter	2	1.001	4	85.2	2.454	0.706	0.8598	
15 minute winter	3	2.000	4	19.2	0.292	0.269	1.1964	
15 minute winter	4	1.002	5	108.2	1.537	1.515	1.1849	
15 minute winter	5	1.003	6	148.5	1.346	1.292	2.4465	
15 minute winter	6	1.004	7	150.5	1.365	1.310	0.7261	
15 minute winter	7	1.005	8	177.7	1.627	1.546	0.8470	
15 minute winter	8	1.006	9	205.8	2.346	0.919	3.3978	
15 minute winter	9	1.007	10	238.5	2.287	0.634	5.0573	
15 minute winter	10	1.008	11	272.1	1.717	1.694	1.9618	
15 minute winter	11	1.009	12	283.5	1.790	1.765	1.9783	
15 minute winter	12	1.010	13	285.2	1.800	1.775	1.6614	
15 minute winter	13	1.011	20	285.1	1.799	1.774	4.4735	
15 minute winter	14	3.000	15	18.9	1.352	0.261	0.4808	
15 minute winter	15	3.001	16	21.0	0.726	0.527	0.7717	
15 minute winter	16	3.002	17	31.0	0.781	0.781	0.6270	
15 minute winter	17	3.003	18	47.8	1.203	1.203	1.5136	
15 minute winter	18	3.004	19	48.8	1.227	1.228	1.1087	
360 minute winter	19	3.005	20	15.1	0.747	0.211	1.7927	
360 minute winter	20	1.012	21	66.2	0.926	0.412	1.4596	
360 minute winter	21	Flow through Pond	22	39.3	0.044	0.002	405.2790	
360 minute winter	22	4.000	23	12.5	0.312	0.078	1.8799	
360 minute winter	23	1.015	24	12.0	0.861	0.302	0.2634	341.5

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	90.988	0.483	88.3	1.9445	0.0000	SURCHARGED
15 minute winter	2	12	90.402	1.346	126.1	3.9076	0.0000	FLOOD RISK
15 minute winter	3	13	89.378	1.641	25.2	3.8151	0.0000	FLOOD RISK
15 minute winter	4	13	89.370	1.704	127.3	3.5195	0.0000	FLOOD RISK
15 minute winter	5	12	89.089	1.568	180.5	4.4005	0.0000	SURCHARGED
15 minute winter	6	12	88.874	1.427	169.1	2.5976	0.0000	SURCHARGED
15 minute winter	7	12	88.769	1.344	204.0	3.1873	0.0000	SURCHARGED
15 minute winter	8	12	88.606	1.208	238.8	2.9285	0.0000	SURCHARGED
15 minute winter	9	12	87.977	1.052	281.7	3.4024	0.0000	SURCHARGED
15 minute winter	10	12	86.776	1.758	330.6	5.2783	0.0000	FLOOD RISK
15 minute winter	11	12	86.535	1.548	346.7	3.4514	0.0000	FLOOD RISK
15 minute winter	12	12	86.267	1.311	349.6	2.4114	0.0000	SURCHARGED
480 minute winter	13	464	86.134	1.204	64.8	2.1281	0.0000	SURCHARGED
15 minute winter	14	13	87.149	1.087	28.5	2.6182	0.0000	SURCHARGED
15 minute winter	15	13	87.131	1.346	29.2	2.6418	0.0000	SURCHARGED
15 minute winter	16	13	87.080	1.409	41.9	3.3340	0.0000	FLOOD RISK
15 minute winter	17	13	86.959	1.381	70.4	3.8002	0.0000	FLOOD RISK
15 minute winter	18	13	86.281	0.927	64.4	1.6388	0.0000	SURCHARGED
480 minute winter	19	464	86.134	1.019	19.0	2.7256	0.0000	SURCHARGED
480 minute winter	20	464	86.134	1.275	85.3	2.7008	0.0000	SURCHARGED
480 minute winter	21	464	86.134	1.415	85.0	0.0000	0.0000	OK
480 minute winter	22	464	86.134	1.443	48.3	0.0000	0.0000	SURCHARGED
480 minute winter	23	464	86.134	1.473	12.5	6.6629	0.0000	SURCHARGED
30 minute summer	24	21	84.634	0.084	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	81.7	2.481	0.720	1.2199	
15 minute winter	2	1.001	4	99.1	2.491	0.821	0.9798	
15 minute winter	3	2.000	4	27.8	0.395	0.389	1.1964	
15 minute winter	4	1.002	5	128.8	1.829	1.803	1.1849	
15 minute winter	5	1.003	6	167.6	1.520	1.458	2.4465	
15 minute winter	6	1.004	7	177.3	1.607	1.542	0.7261	
15 minute winter	7	1.005	8	205.5	1.864	1.788	0.8963	
15 minute winter	8	1.006	9	235.1	2.351	1.050	4.1714	
15 minute winter	9	1.007	10	279.8	2.537	0.744	5.7596	
15 minute winter	10	1.008	11	329.6	2.080	2.052	1.9618	
15 minute winter	11	1.009	12	347.0	2.190	2.160	1.9783	
15 minute winter	12	1.010	13	349.7	2.207	2.177	1.6614	
480 minute winter	13	1.011	20	64.5	0.651	0.402	4.4735	
15 minute winter	14	3.000	15	21.9	1.381	0.302	0.4808	
15 minute winter	15	3.001	16	25.1	0.730	0.631	0.7717	
15 minute winter	16	3.002	17	40.5	1.019	1.019	0.6270	
15 minute winter	17	3.003	18	64.4	1.619	1.620	1.5136	
15 minute winter	18	3.004	19	65.5	1.646	1.647	1.1087	
480 minute winter	19	3.005	20	18.6	0.723	0.261	1.7927	
480 minute winter	20	1.012	21	85.0	0.837	0.529	1.4596	
480 minute winter	21	Flow through Pond	22	48.3	0.046	0.002	686.8835	
480 minute winter	22	4.000	23	12.5	0.319	0.078	1.8799	
480 minute winter	23	1.015	24	12.0	0.861	0.302	0.2634	428.8