

Project No. & Name:	10939 – Loreto College Expansion	Prepared by:	Checked by:	Rev:	Date:
Document Ref:	10939-WML-00-XX-RP-C-9002	Daniel Baker	Loughlin O’Gorman	P01	April 2023

Background

1. The below Drainage Strategy Report has been created by WML to support and inform detailed Planning Conditions for Loreto College Expansion, located at the junction of Moss Lane (B5219) & Chichester Rd S.
2. The proposed scheme involves the development of a new three-storey educational building located on the south eastern corner of the land adjacent to the Chichester Road South and Moss Lane East Road junction.
3. The location of the new building has been determined, to a degree, due to the presence of the Corn Brook Culvert which extends roughly north-east to south-west across the central site area. External areas are to comprise hardstanding for access, with car parks to the north-western and north-eastern corners of the site. These will be interspersed with pedestrian walkways and general soft landscaping.

Surface Water Drainage Strategy

4. Reference should be made to the Flood Risk Assessment – WML Consulting, April 2023, Phase 1: Desk Top Study Report – WML Consulting, February 2023 and Phase 2: Ground Investigation Report – WML Consulting, April 2023.
5. The proposed drainage strategy for this site will incorporate the principles of, and where appropriate demonstrate compliance with the NPPF and the SUDS manual.
6. The proposed drainage system should be designed in accordance with BS EN 7524 and Building Regulations Part H (2010). Approved Document H indicates the following hierarchy for the disposal of surface water drainage from the new development sites, firstly discharge via infiltration, secondly discharge via watercourse and lastly discharge to sewer.
7. These options are discussed in further detail below.
8. **Surface water discharge via infiltration:** A review of the Phase 2: Ground Investigation Report by WML Consulting has confirmed that ground conditions on the site comprise made ground underlain by glacial deposits to a depth of circa 11mbgl and weathered sandstone of the Chester Pebble Bed Formation to a maximum depth of 12mbgl. These ground conditions are considered suitable for some infiltration techniques; however, it is noted that special consideration should be given to areas of deeper made ground and proximity with the existing brick surface water culvert.
9. **Surface water discharge via watercourse:** A review of the Ordnance Survey mapping around the site has confirmed the presence of Corn Brook Culvert which passes through the site and is understood to follow the line of the original watercourse.
10. A survey of the existing culvert undertaken by Malcolm Hughes Chartered Land Surveyors, April 2023, confirmed the route of the 3.7m x 1.45m Corn Brook Culvert as it passes through the site at a depth of approximately 2.5mbgl. A copy of the survey drawings can be found appended to this report.
11. **Surface water discharge via public sewer:** A review of the United Utilities (UU) public sewer records indicate that there are existing combined water sewers located within the adjacent Chichester Rd (south) and Moss Lane (west).
12. Further to the above, a GPR Survey undertaken by Survey Operations Ltd, March 2032 confirmed an existing combined outfall from the current site to the existing UU sewer located beneath Moss Lane (west).

Surface Water Drainage Proposals

13. Reference should be made to WML drawing 10939-WML-ZZ-XX-DR-C-1001.
14. In consideration of the above drainage hierarchy, the surface water proposals outlined within this report are based upon disposal of all surface water from the proposed development via a combination of both infiltration and a connection to the existing Corn Brook Culvert.
15. As noted within section 8, the findings of the Phase 2 Ground Investigation Report suggested that infiltration might be a viable solution for this development, however careful consideration should be given to presence of varying depths of made ground and the proximity to the existing surface water culvert.
16. It is understood that Corn Brook Culvert is of brick construction and therefore concentrated infiltration techniques such as cellular soakaways in the vicinity of the existing culvert could result in a weakening/wash out of the existing mortar or softening of the adjacent ground which could ultimately lead to structural failure.
17. It is therefore proposed to incorporate infiltration for new areas of hardstanding only i.e., footpaths where a permeable construction can be utilised to disperse of captured surface water runoff over a larger area and mitigate any risk associated with the structure of the existing culvert.
18. The permeable paving construction will include a stone sub-base layer which will act as storage for the captured surface water runoff prior to its percolation into the sub-strata.
19. In the absence of site-specific percolation test results, a nominal infiltration rate of 1×10^{-6} m/s has been utilised to determine the depth of sub-base required to store and disperse captured surface water runoff for all storm durations up to and including the critical 100-year event plus a 40% climate change allowance.
20. The intention is to dispose of surface water runoff from the remainder of the site (new building roof & retained hardstanding) via a new piped connection to the existing culvert.
21. The site is currently developed and comprises an existing structure along with a mixture of hardstanding (to be retained) interspersed with areas of soft landscaping. The site is classified as a 'Brownfield' site; thus, any new development requires a minimum 50% reduction in surface water runoff rate leaving the development site as outlined within the SFRA.
22. An existing site runoff calculation has been undertaken using a rainfall intensity of 50mm/hr and has resulted in a flow rate of 100.9 l/s, which after the 50% reduction would leave an allowable discharge rate of 55 l/s.
23. It is understood that LLFA policy is that any new development should aim to discharge surface water runoff at Greenfield runoff rates therefore a further assessment has been undertaken using MicroDrainage software which concluded the following flow rates;

Return Period	Flow (l/s)
1 in 1 year	1.4
1 in 30 year	2.7
1 in 100 year	3.3

24. A copy of the MicroDrainage calculations can be found appended to this report.
25. It should be noted that the above greenfield flow rates exclude the areas of proposed infiltration described in the above sections.
26. The proposals for the new development intend to discharge all remaining surface water runoff from the site at the above Greenfield runoff rates for all critical storm durations up to and including the critical 100-year event plus a 40% climate change allowance.
27. It is proposed to collect roof water via a traditional roof drainage system and discharge via a new below ground drainage network located around the building footprint.
28. Surface water runoff from external areas of retained hardstanding will be captured via a combination existing gullies and new channel drains. Where existing gullies and the associated below ground pipework/infrastructure can be retained/reused, they will be connected into the new below ground drainage system for disposal along with the roof water via the same new connection to Corn Brook Culvert.

29. A below ground cellular attenuation tank has been incorporated within the drainage network to provide storage for all captured surface water runoff (excluding infiltration areas) where it can be then released via a flow chamber at a controlled/restricted flow rate to suit the allowable Greenfield flow rates noted above.
30. Given the limited area of retained hardstanding (car parking) and the relatively low anticipated vehicular movements across the site it is considered that the water quality being discharged to Corn Brook Culvert is acceptable, however the drainage proposals do include pollution/treatment controls and are discussed later in this report.

Residual Flood Risk Mitigation

31. As identified with the Flood Risk Assessment (FRA) – WML Consulting, April 2023, there is a low residual risk of flooding from all sources with the exception of flooding from Corn Brook Culvert which is considered as having a medium residual flood risk.
32. The FRA includes a series of modelled flood scenarios provided by the Environment Agency which offer a theoretical flood water level at 4 node points across/adjacent to the development site.
33. The most notable flood water levels are shown at node 2 located on the junction of Chichester Rd (south) and Moss Ln (west) which recorded the following levels;
 - 33.010m AOD during a simulated 0.1% probability (1:1000-year event) + 30% climate change allowance.
 - 32.630m AOD during a simulated 1% probability (1:100-year event) + 75% climate change allowance.
34. The FRA noted that the higher figure of 33.010 was the result of an extreme event with an annual exceedance probability (AEP) of 0.1%.
35. Given that there are no historic records of flooding in the vicinity of the proposed development it is considered that the following flood risk mitigation measures will be based upon the more probable flood water level of 32.630 which has an AEP of 1% i.e., a 10x greater chance of occurring in a given year.
36. In accordance with the recommendations outlined within the FRA it is proposed to set the new building's finished floor level (FFL) at 32.930m AOD which provides a 300mm freeboard above the theoretical flood water level noted above.
37. In addition, it is proposed to also contour external ground levels as such to direct any overland flow routes resulting from extreme rainfall away from the new building.
38. Given the above it is considered that the mitigation of residual risk identified within the FRA has been satisfied and that the finished floor level of 32.930 shown on WML drawing 10939-WML-ZZ-XX-DR-C-1001 is acceptable with regards to flood risk.
39. It is understood that during exceedance events, parts of the site may still have the potential to flood until such a time that the proposed drainage system has the capacity to accept the additional flows. Whilst the flooded areas pose no increased risk to the building or the safe access/egress of people to and from the site, in the very unlikely event of a sudden breach and no early warnings being received, it may not be possible to evacuate all occupants from the building in sufficient time as flood waters could prove problematic for certain individuals to pass through.
40. Should this unlikely scenario occur, the developer should have a sufficient action plan in place to move vulnerable individuals to a place of safety (i.e., an upper floor) and provide essential survival items (i.e., food and blankets), until such a time as emergency services are able to attend or the flood water has retreated/the drainage system has the capacity to accept the additional flows.
41. Finally, it is important to ensure that the aforementioned areas don't raise the risk of flooding to third party land.
42. Reference should be made to the Exceedance Flow Plan within the WML Surface Water Calculation document 10939-WML-00-XX-CA-C-0001.
43. The Exceedance Flow Plan identities demonstrates that exceedance flood routes will be directed to the adjacent highways, therefore it is considered that the risk of increasing the flood risk to third party land during exceedance events can be classified as very low.

Waste Water Drainage Strategy

44. As noted in sections 11 & 12, it is understood that there are existing United Utilities combined sewers located within the adjacent road network and that an existing combined outfall serving the current site is situated to the south of the new building.
45. It is therefore proposed to collect waste water from the proposed development via traditional soil stacks & SVPs prior and discharge via a new below ground drainage system prior to reusing the existing outfall to the public sewerage network located to the south, subject to UU approval.

SUDs Review

46. In accordance with current policies and guidelines, SUDS techniques have been considered for the development site's drainage proposals. The suitability of various SUDs techniques has been reviewed and are discussed below.
47. Storing water for later use could be a viable option for this site. Blue/green roof systems were considered as part of the design for the building however as the retail building is a lightweight long span building, the implications of including a green or blue roof system would add significant embodied carbon to the supporting structure & building foundations.
48. Given the above, the incorporation of blue/green roof systems within the drainage proposals for this site was considered not to be a sustainable solution, however the addition of a rainwater harvesting tank could allow captured rainwater to be reused for onsite operations such as cistern flushes etc. and should be discussed with the client during detailed design.
49. Above ground SUDs features such as storage basins and swales were deliberated during the drainage design for this site, however due to the limited area of soft landscaping available across the development to implement such features especially given the proximity to existing structures such as Corn Brook Culvert, they have been considered to be not a practical solution for this project.
50. Permeable paving construction has been incorporated within the drainage proposals for new external hardstanding areas across the site (footpaths), which will provide both an element of storage and treatment of captured surface water runoff.
51. The porous paving construction was considered for all areas of external parking/access roads, however due to the large areas of retained hardstanding (car parks) and the it was considered that also retaining the existing drainage arrangement currently serving these specific areas would be the most efficient/practical solution.
52. The quality of surface water runoff prior to discharge from the site should also be considered when reviewing potential SUDS options for the development works and this is reviewed in further detail below.

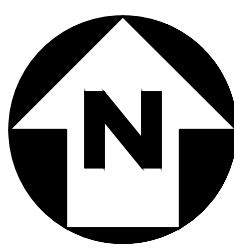
Water Treatment

53. As discussed within the above strategies, due to the limited potential for vehicle movements across the site it is considered that the water quality being discharged to Corn Brook Culvert is acceptable, however the drainage proposals include pollution/treatment controls to promote improvements in water quality leaving the site.
54. From table 26.2 of the SUDS manual, the proposed roof area is deemed to have a "low" pollution hazard level. i.e. TSS = 0.3, Metals = 0.2, Hydrocarbons = 0.05.
55. Whilst also from table 26.2 of the SUDS manual, the proposed, car park and access areas are deemed to have either a "medium" pollution hazard level. i.e., TSS = 0.7, Metals = 0.6, Hydrocarbons = 0.7.
56. Given the above it is considered that the following treatment stages will be incorporated for this project;
57. Unfortunately due to the site limitations it has not been possible to incorporate traditional SUDs treatment features (as discussed in the above SUDs review) and therefore it has been necessary to incorporate alternative proprietary systems to ensure water quality is achieved.
58. Gully traps, sump units and catch pits have been incorporated within the drainage proposals to remove contaminants/pollutants from all surface water runoff prior to disposal from the site.
59. In addition to the above a downstream defender has also been integrated into the drainage network prior the final connection with the Corn Brook Culvert to remove any remaining sediments and oils etc. that have not already been captured by the above.
60. Finally, the permeable paving sub-base incorporates a stone filtration layer which will provide mitigation indices of TSS = 0.4, Metals = 0.4, Hydrocarbons = 0.4. Though these figures are halved in line with the guidance provided in the SUDS manual.

Maintenance Plan

61. It is understood that the new drainage network will be privately owned and maintained by the client or an appointed maintenance company on their behalf and will not be offered up for adoption by United Utilities.
62. The proposed drainage system has been designed in accordance with the current standards and guidelines to achieve a minimum self-cleansing velocity, however excessive debris in the system could still result in loss of performance.
63. The proposed drainage design will consists of traditional manholes, pipes and channels.
64. It is proposed to check the underground drainage system and lift manhole/inspection chamber covers to ensure that the pipework associated with each chamber is operating correctly twice yearly and ensure drainage channels are free from debris.
65. Any problems encountered should be investigated by CCTV survey if required and any remedial works necessary carried out in a timely manner.
66. It is recommended that the biannual inspections take place in spring and autumn where there is additional risk of blockage from debris associated with fallen leaves etc.
67. Attenuation has been provided in the form of a below ground storage crate system. A recommended maintenance schedule, checklist and a preferred cleaning procedure should be included from the supplier in the O&M Manual however it is anticipated that this should include twice yearly checking that the upstream manholes are free from debris and ensure that no sediment is being passed into the storage crates.
68. Flow restriction has been achieved through the incorporation of an orifice plate flow control. A recommended maintenance schedule, checklist and a preferred cleaning procedure should be included from the supplier in the O&M Manual however it is anticipated that this should include twice yearly checking that the upstream manholes are free from debris.
69. Lastly, permeable paving construction has been incorporated within the drainage proposals for this site. It is proposed to check and clean the permeable surfaces regularly to ensure that surface water runoff is not prevented from draining into the sub-base layer, especially during the autumn period where a build-up leaves could occur and result in a loss of performance.

**Proposed Drainage GA
10939-WML-ZZ-XX-DR-C-1001**



LEGEND

- SW — SW — SW — EXISTING ADOPTED SURFACE WATER SEWER
- CW — CW — CW — EXISTING ADOPTED COMBINED WATER SEWER
- SW — SW — SW — EXISTING PRIVATE SURFACE WATER DRAIN
- FW — FW — FW — EXISTING PRIVATE FOUL WATER DRAIN
- CW — CW — CW — EXISTING PRIVATE COMBINED WATER DRAIN
- — — — — EXISTING PRIVATE DRAINAGE TO BE REMOVED
- — — — — EXISTING SURFACE WATER CULVERT
- — — — — EXISTING SURFACE WATER CULVERT - 7m EASEMENT
- — — — — PROPOSED PRIVATE SURFACE WATER SEWER
- — — — — PROPOSED PRIVATE WASTE WATER SEWER
- — — — — PROPOSED ATTENUATION TANK
- — — — — PROPOSED PERMEABLE PAVING CONSTRUCTION
- — — — — PROPOSED PERMEABLE SURFACING
- — — — — SITE BOUNDARY

DRAINAGE NOTES

- REFERENCE SHOULD BE MADE TO THE DRAINAGE STRATEGY DOCUMENT REF: 10939-WML-00-XX-RP-C-0001.
- THE EXISTING DRAINAGE SHOWN ON THIS DRAWING IS BASED UPON THE UNITED UTILITIES (U)SEWER RECORDS AND EXISTING DRAINAGE SITE PLAN PRODUCED FOR THE ADJACENT DEVELOPMENT WORKS AT TAMWORTH STREET.
- THE LOCATION OF THE EXISTING SURFACE WATER CULVERT IS SHOWN INDICATIVE ONLY AND IS BASED UPON SURVEY INFORMATION UNDERTAKEN BY MALCOLM HUGHES CHARTERED SURVEYORS - APRIL 2023.
- ALL DRAINAGE LEVELS SHOWN ARE FOR INFORMATION PURPOSES ONLY AND ARE BASED UPON THE EXISTING TOPOGRAPHICAL SURVEY AND PROPOSED FINISHED FLOOR LEVEL OF 32.93 AS OUTLINED IN THE DRAINAGE STRATEGY DOCUMENT REF: 10939-WML-00-XX-RP-C-0001.
- THE PROPOSED DRAINAGE DESIGN / INFORMATION SHOWN ON THIS DRAWING IS FOR INFORMATION PURPOSES ONLY AND IS SUBJECT TO DETAILED DESIGN.
- RAIN WATER PIPES AND SLAB PENETRATIONS ARE SHOWN INDICATIVE ONLY. ARCHITECT/MEP ENGINEER IS TO CONFIRM FINAL POSITIONS PRIOR TO CONSTRUCTION.
- (BD) DENOTES EXTERNAL BACKDROP
- (CP) DENOTES 'CATCH PIT' WITH 500mm DEEP SUMP BELOW OUTGOING INVERT LEVEL.
- (FC) DENOTES FLOW CONTROL CHAMBER
- (PVD) DENOTES PERMAVOID DIFFUSER UNITS
- (VC) DENOTES VENTED COVER

GENERAL NOTES

- DO NOT SCALE FROM THIS DRAWING WORK TO FIGURED DIMENSIONS ONLY.
- NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS ALLOWED WITHOUT PRIOR PERMISSION IN WRITING.
- ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
- THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH AND SAFETY PLAN.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH WML DRAINAGE DETAIL DRAWINGS FOR DETAILS OF MATERIALS AND WORKMANSHIP REFER TO THE SPECIFICATION.
- THE CONTRACTOR IS RESPONSIBLE FOR CHECKING INVERT LEVELS AND POSITIONS OF ALL EXISTING DRAINS, SEWERS, INSPECTION CHAMBERS AND MANHOLES SHOWN ON THIS DRAWING IMMEDIATELY ON SITE ESTABLISHMENT. ANY DISCREPANCIES MUST BE REPORTED TO WML CONSULTING IMMEDIATELY.
- WHERE THE NEW SITE DRAINAGE CONNECTS IN TO EXISTING MANHOLES IN CARRIAGEWAYS AND/OR EXISTING ADOPTED SEWERS, THE CONTRACTOR IS RESPONSIBLE FOR ALL LIAISON WITH THE RELEVANT STATUTORY UNDERTAKER AND LOCAL AUTHORITY WITH REGARD TO ROAD CLOSURES, TRAFFIC MANAGEMENT, PERMITS TO WORK, SUBMISSION OF CONTRACTORS METHOD STATEMENTS AND RISK ASSESSMENTS AND OTHER DOCUMENTATION AND CORRESPONDENCE ASSOCIATED WITH THE SITE STAGE (PART 2) ELEMENT OF THE WORKS.
- ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
- PROVIDE ADEQUATE PROTECTION TO MAINTAIN MINIMUM COVER TO DRAINS DURING THE CONSTRUCTION PERIOD.
- COVER LEVELS ON THIS DRAWING ARE FOR INFORMATION PURPOSES ONLY.
- THE LAYOUT OF DRAINAGE ON THIS DRAWING IS FOR INFORMATION PURPOSES ONLY.
- U.N.O SURFACE WATER DRAINAGE PIPES OVER Ø100mm TO BE TWIN WALLED STRUCTURED PLASTIC APPROVED BY THE ENGINEER.
- U.N.O FOUL WATER DRAINAGE PIPES TO BE SUPERSLEVE VITRIFIED CLAY PIPES OR SIMILAR.
- ALL COVERS AND RODDING ACCESS POINTS TO BE SEALED AND SCREWED TIGHT.
- ALL INTERNAL MANHOLE COVERS TO BE DOUBLE SEALED, LOOKABLE AND RECESSED TO ACCEPT FLOOR FINISHES WHERE APPLICABLE.
- SETTING OUT OF ALL INTERNAL GULLY/PLUMBING CONNECTIONS TO BE CO-ORDINATED BETWEEN THE SERVICE ENGINEERS AND THE ARCHITECT.
- ALL INTERNAL GULLIES, PLUMBING CONNECTIONS, SOIL STACKS, SVPS AND ALL OTHER CONNECTIONS OF FOUL AND SURFACE WATER DRAINS TO BELOW GROUND TO BE FITTED WITH ACCESSIBLE RODDING POINTS ABOVE SLAB LEVEL.
- ALL SURFACE WATER CONNECTIONS TO BE 100mm DIAMETER AT MINIMUM FALLS OF 1:80 UNLESS NOTED OTHERWISE.
- ALL FOUL WATER CONNECTIONS TO BE 100mm DIAMETER AT MINIMUM FALLS OF 1:40 UNLESS NOTED OTHERWISE.
- ALL CONNECTIONS TO BE MADE IN ACCORDANCE WITH STANDARD DETAIL DRAWINGS.
- ALL PIPEWORK TO BE INSTALLED WITH SOFFITS LEVEL (E.G. AT CHANGES IN PIPE SIZE) U.N.O.
- FOR DETAILS OF GREASE TRAP/MACERATOR REQUIREMENTS ASSOCIATED WITH KITCHENS REFER TO SERVICE ENGINEER.
- ON COMPLETION OF DRAINAGE WORKS, THE NEW DRAINAGE SYSTEM IS TO BE THOROUGHLY CLEANED AND A CCTV SURVEY CARRIED OUT TO CONFIRM NO CONSTRUCTION DEBRIS OR BLOCKAGES REMAIN.
- CONNECTIONS TO CARRIER DRAINS ARE TO BE 'Y' JUNCTIONS.
- ALL PRIVATE DRAINAGE IS TO COMPLY WITH BS EN 752 AND BUILDING REGS. PART H.
- PIPE GRADIENTS ARE INDICATIVE MINIMUMS.
- SURFACE CHANNEL DRAINS TO BE ACO MULTIDRAIN OR SIMILAR.

MANHOLES:

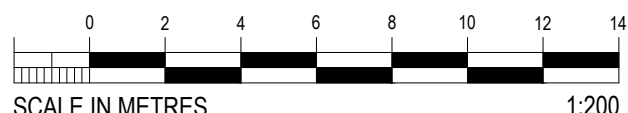
- ALL PROPOSED NEW MANHOLES TO BE PRECAST RING MANHOLES TYPE B UNLESS NOTED OTHERWISE. INTERNAL DIAMETERS OF MANHOLES TO BE 1050mm WHERE DEPTH TO PIPE SOFFIT IS LESS THAN 1.5m AND 1200mm OTHERWISE UNLESS NOTED OTHERWISE. IC - DENOTES POLYPROPYLENE INSPECTION CHAMBER BY HEPWORTHY OR SIMILAR APPROVED INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

MANHOLE COVERS:

- CARRIAGEWAYS GENERAL - EN124 CLASS D400
- CARRIAGEWAYS WITHIN 0.5m OF KERB - EN124 CLASS C250
- SLOW MOVING HDV (38t) - EN 124 CLASS B125 SLOW MOVING
- SLV (10t) - EN 124 CLASS B125 SLOW MOVING PRIVATE CARS - EN124 CLASS B125
- INTERNAL - JONES OF OSWESTRY - SUPRASTEEL DOUBLE SEALED WITH NEOPRENE GASKET AND COVER GREASE OR SIMILAR APPROVED.
- REFER TO ARCHITECTS DRAWINGS FOR DETAILS OF ANY MANHOLE COVERS WHICH REQUIRE INSET PANELS.

SUBJECT TO APPROVAL FROM
LOCAL PLANNING AUTHORITY
UNITED UTILITIES

PRELIMINARY



Rev.	Amendment	Date	By	LoG
P01	FIRST ISSUE	26.04.23	DB	LoG
Project LORETO COLLEGE EXPANSION				
ARCHITECT LORETO COLLEGE				
Title PROPOSED DRAINAGE GA				
WML Job No. 10126	Drawn DB	Checked LoG	Date MARCH 23	Scale 1:200 @ A0
WML CONSULTING Civil, Structural & Geotechnical Engineers				
No. 5 Oak Green East Road Chislehampton Chislehampton Tf. 0161 486 0000 Fax 0161 486 9210 e-mail info@wmlconsulting.com www.wmlconsulting.com				
Drawing No. 10939 - WML - ZZ - XX - DR - C - 1001				
Project 10939 - WML - ZZ - XX - DR - C - 1001				
Originator Volume Level Type Role Number Rev				

**Surface Water Drainage Calculations
10939-WML-00-XX-CA-C-0001**

Surface Water Drainage Calculations

For a site referred to as

Loreto College Expansion Project

Undertaken on behalf of

Loreto College

Job No: 10939

Document No: 10939-WML-ZZ-XX-CA-C-0001

Date: April 2023

Project No. & Name:	10939 – Loreto College Expansion	Status:	Prepared by:	Rev:	Date:
Document Ref:	10939-WML-00-XX-CA-C-0001	Preliminary	Daniel Baker	P01	April 2023

General Notes

1. The calculations within this document have been undertaken using MicroDrainage Software version 2020.
2. This document is to be read in conjunction with the following documents;
 - a. 10939-WML-ZZ-XX-DR-C-1001 – Proposed Drainage GA
 - b. 10939-WML-00-XX-RP-C-9002 – Drainage Strategy Document

Summary of Results

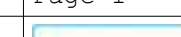
1. The following summary demonstrates that the outgoing flow rates for the new development works are less than or equal to those of the pre-development (Greenfield) site.

Greenfield Runoff Rate* (l/s)	Proposed Site Runoff Rate – Manhole S9 (l/s)
Q1: 1.4 Q30: 2.7 Q100: 3.3	1: 1.3 30: 2.1 100+40%: 3.0

Greenfield Runoff Calculation

WML Consulting Ltd		Page 1
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 16/03/2023 14:21 File	Designed by DBaker Checked by	
Innovyze		Source Control 2020.1.3
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.450 Area (ha) 0.283 Urban 0.000 SAAR (mm) 860 Region Number Region 10 Results 1/s QBAR Rural 1.6 QBAR Urban 1.6 Q1 year 1.4 Q1 year 1.4 Q30 years 2.7 Q100 years 3.3		
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Proposed Surface Water Network Calculation

WML Consulting Ltd		Page 1
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/04/2023 23:20 File 10939 - Surface Water -...	Designed by DBaker Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

« - Indicates pipe capacity < flow

Network Results Table

WML Consulting Ltd		Page 3
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 26/04/2023 23:20 File 10939 - Surface Water -...	Designed by DBaker Checked by	
Innovyze		Network 2020.1.3

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)
S1	32.930	1.290	Open Manhole	600	S3.000	31.640	225				
S2	32.930	1.400	Open Manhole	600	S3.001	31.530	225	S3.000	31.530	225	
S3	32.630	1.430	Open Manhole	600	S3.002	31.200	225	S3.001	31.200	225	
S4	32.630	1.630	Open Manhole	600	S3.003	31.000	225	S3.002	31.000	225	
S5	32.500	1.700	Open Manhole	600	S3.004	30.800	225	S3.003	30.800	225	
S6	31.750	1.030	Open Manhole	600	S4.000	30.720	225				
S7	32.500	1.980	Open Manhole	1200	S3.005	30.520	225	S3.004	30.520	225	
								S4.000	30.520	225	
S8	31.750	1.500	Open Manhole	1200	S3.006	30.250	225	S3.005	30.250	225	
S-EXMH2	32.000	1.790	Open Manhole	1200	S5.000	30.210	225				
S-TANK	32.000	1.800	Junction		S3.007	30.200	225	S3.006	30.200	225	
								S5.000	30.200	225	
S9	31.750	1.750	Open Manhole	1350	S3.008	30.000	225	S3.007	30.200	225	
S10	31.650	1.800	Open Manhole	1200	S3.009	30.000	150	S3.008	29.850	225	
S10	31.660	1.910	Open Manhole	1200		OUTFALL		S3.009	29.750	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	383323.046	395970.102	383323.046	395970.102	Required	
S2	383333.697	395972.852	383333.697	395972.852	Required	
S3	383336.863	396005.700	383336.863	396005.700	Required	
S4	383316.088	396007.748	383316.088	396007.748	Required	
S5	383314.166	395987.842	383314.166	395987.842	Required	
S6	383292.051	395961.471	383292.051	395961.471	Required	
S7	383287.046	395980.834	383287.046	395980.834	Required	

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL									
Date 26/04/2023 23:20 File 10939 - Surface Water - ...				Designed by DBaker Checked by					
Innovyze				Network 2020.1.3					
PIPELINE SCHEDULES for Storm									
Upstream Manhole									
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	
S3.000	o	225	S1	32.930	31.640	1.065	Open Manhole		600
S3.001	o	225	S2	32.930	31.530	1.175	Open Manhole		600
S3.002	o	225	S3	32.630	31.200	1.205	Open Manhole		600
S3.003	o	225	S4	32.630	31.000	1.405	Open Manhole		600
S3.004	o	225	S5	32.500	30.800	1.475	Open Manhole		600
S4.000	o	225	S6	31.750	30.720	0.805	Open Manhole		600
S3.005	o	225	S7	32.500	30.520	1.755	Open Manhole		1200
S3.006	o	225	S8	31.750	30.250	1.275	Open Manhole		1200
S5.000	o	225	S-EXMH2	32.000	30.210	1.565	Open Manhole		1200
S3.007	o	225	S-TANK	32.000	30.200	1.575	Junction		
S3.008	o	225	S9	31.750	30.000	1.525	Open Manhole		1350
S3.009	o	150	S10	31.650	30.000	1.500	Open Manhole		1200
Downstream Manhole									
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	
S3.000	11.000	100.0	S2	32.930	31.530	1.175	Open Manhole		600
S3.001	33.000	100.0	S3	32.630	31.200	1.205	Open Manhole		600
S3.002	20.876	104.4	S4	32.630	31.000	1.405	Open Manhole		600
S3.003	19.999	100.0	S5	32.500	30.800	1.475	Open Manhole		600
S3.004	28.010	100.0	S7	32.500	30.520	1.755	Open Manhole		1200
S4.000	20.000	100.0	S7	32.500	30.520	1.755	Open Manhole		1200
S3.005	12.000	44.4	S8	31.750	30.250	1.275	Open Manhole		1200
S3.006	10.048	201.0	S-TANK	32.000	30.200	1.575	Junction		
S5.000	9.940	994.0	S-TANK	32.000	30.200	1.575	Junction		
S3.007	10.722	0.0	S9	31.750	30.200	1.325	Open Manhole		1350
S3.008	15.000	100.0	S10	31.650	29.850	1.575	Open Manhole		1200
S3.009	21.208	84.8	S10	31.660	29.750	1.760	Open Manhole		1200
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)			
S3.009	S10	31.660	29.750	0.000	1200	0			
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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL																																																										
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Innovyze		Network 2020.1.3																																																								
<u>Simulation Criteria for Storm</u> <table> <tr> <td>Volumetric Runoff Coeff</td> <td>0.750</td> <td>Additional Flow - % of Total Flow</td> <td>0.000</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.000</td> <td>MADD Factor * 10m³/ha Storage</td> <td>2.000</td> </tr> <tr> <td>Hot Start (mins)</td> <td>0</td> <td>Inlet Coefficient</td> <td>0.800</td> </tr> <tr> <td>Hot Start Level (mm)</td> <td>0</td> <td>Flow per Person per Day (l/per/day)</td> <td>0.000</td> </tr> <tr> <td>Manhole Headloss Coeff (Global)</td> <td>0.500</td> <td>Run Time (mins)</td> <td>60</td> </tr> <tr> <td>Foul Sewage per hectare (l/s)</td> <td>0.000</td> <td>Output Interval (mins)</td> <td>1</td> </tr> </table> <table> <tr> <td>Number of Input Hydrographs</td> <td>0</td> <td>Number of Storage Structures</td> <td>1</td> </tr> <tr> <td>Number of Online Controls</td> <td>1</td> <td>Number of Time/Area Diagrams</td> <td>0</td> </tr> <tr> <td>Number of Offline Controls</td> <td>0</td> <td>Number of Real Time Controls</td> <td>0</td> </tr> </table> <u>Synthetic Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Profile Type</td> <td>Summer</td> </tr> <tr> <td>Return Period (years)</td> <td>1</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.000</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> <tr> <td>Ratio R</td> <td>0.360</td> <td></td> <td></td> </tr> </table>			Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000	Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000	Hot Start (mins)	0	Inlet Coefficient	0.800	Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000	Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60	Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1	Number of Input Hydrographs	0	Number of Storage Structures	1	Number of Online Controls	1	Number of Time/Area Diagrams	0	Number of Offline Controls	0	Number of Real Time Controls	0	Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	1	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	18.000	Storm Duration (mins)	30	Ratio R	0.360		
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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
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Innovyze Network 2020.1.3		
Online Controls for Storm Orifice Manhole: S9, DS/PN: S3.008, Volume (m³): 2.9 Diameter (m) 0.042 Discharge Coefficient 0.600 Invert Level (m) 30.200		
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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL																																																																																						
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Innovyze	Network 2020.1.3																																																																																					
Storage Structures for Storm Cellular Storage Manhole: S-TANK, DS/PN: S3.007 Invert Level (m) 30.200 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>150.0</td><td>150.0</td><td>2.600</td><td>0.0</td><td>194.1</td></tr><tr><td>0.200</td><td>150.0</td><td>159.8</td><td>2.800</td><td>0.0</td><td>194.1</td></tr><tr><td>0.400</td><td>150.0</td><td>169.6</td><td>3.000</td><td>0.0</td><td>194.1</td></tr><tr><td>0.600</td><td>150.0</td><td>179.4</td><td>3.200</td><td>0.0</td><td>194.1</td></tr><tr><td>0.800</td><td>150.0</td><td>189.2</td><td>3.400</td><td>0.0</td><td>194.1</td></tr><tr><td>1.000</td><td>0.0</td><td>194.1</td><td>3.600</td><td>0.0</td><td>194.1</td></tr><tr><td>1.200</td><td>0.0</td><td>194.1</td><td>3.800</td><td>0.0</td><td>194.1</td></tr><tr><td>1.400</td><td>0.0</td><td>194.1</td><td>4.000</td><td>0.0</td><td>194.1</td></tr><tr><td>1.600</td><td>0.0</td><td>194.1</td><td>4.200</td><td>0.0</td><td>194.1</td></tr><tr><td>1.800</td><td>0.0</td><td>194.1</td><td>4.400</td><td>0.0</td><td>194.1</td></tr><tr><td>2.000</td><td>0.0</td><td>194.1</td><td>4.600</td><td>0.0</td><td>194.1</td></tr><tr><td>2.200</td><td>0.0</td><td>194.1</td><td>4.800</td><td>0.0</td><td>194.1</td></tr><tr><td>2.400</td><td>0.0</td><td>194.1</td><td>5.000</td><td>0.0</td><td>194.1</td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	150.0	150.0	2.600	0.0	194.1	0.200	150.0	159.8	2.800	0.0	194.1	0.400	150.0	169.6	3.000	0.0	194.1	0.600	150.0	179.4	3.200	0.0	194.1	0.800	150.0	189.2	3.400	0.0	194.1	1.000	0.0	194.1	3.600	0.0	194.1	1.200	0.0	194.1	3.800	0.0	194.1	1.400	0.0	194.1	4.000	0.0	194.1	1.600	0.0	194.1	4.200	0.0	194.1	1.800	0.0	194.1	4.400	0.0	194.1	2.000	0.0	194.1	4.600	0.0	194.1	2.200	0.0	194.1	4.800	0.0	194.1	2.400	0.0	194.1	5.000	0.0	194.1
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Stanley Green Business Park

Earl Rd, Cheadle Hulme, SK8 6QL

Date 26/04/2023 23:20

File 10939 - Surface Water - ...

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Network 2020.1.3

Micro Drainage

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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coefficient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Online Controls 1

Number of Offline Controls 0

Number of Storage Structures 1

Number of Time/Area Diagrams 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

US/MH

PN

Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

S3.000

S1

15 Winter

30

+0%

S3.001

S2

15 Winter

30

+0%

S3.002

S3

15 Winter

30

+0%

100/15 Summer

S3.003

S4

15 Winter

30

+0%

100/15 Summer

S3.004

S5

15 Winter

30

+0%

100/15 Summer

S4.000

S6

15 Winter

30

+0%

100/15 Summer

S3.005

S7

15 Winter

30

+0%

100/15 Summer

S3.006

S8

360 Winter

30

+0%

30/15 Summer

S5.000

S-EXMH2

360 Winter

30

+0%

30/60 Summer

S3.007

S-TANK

360 Winter

30

+0%

30/30 Winter

S3.008

S9

360 Winter

30

+0%

1/15 Summer

S3.009

S10

360 Winter

30

+0%

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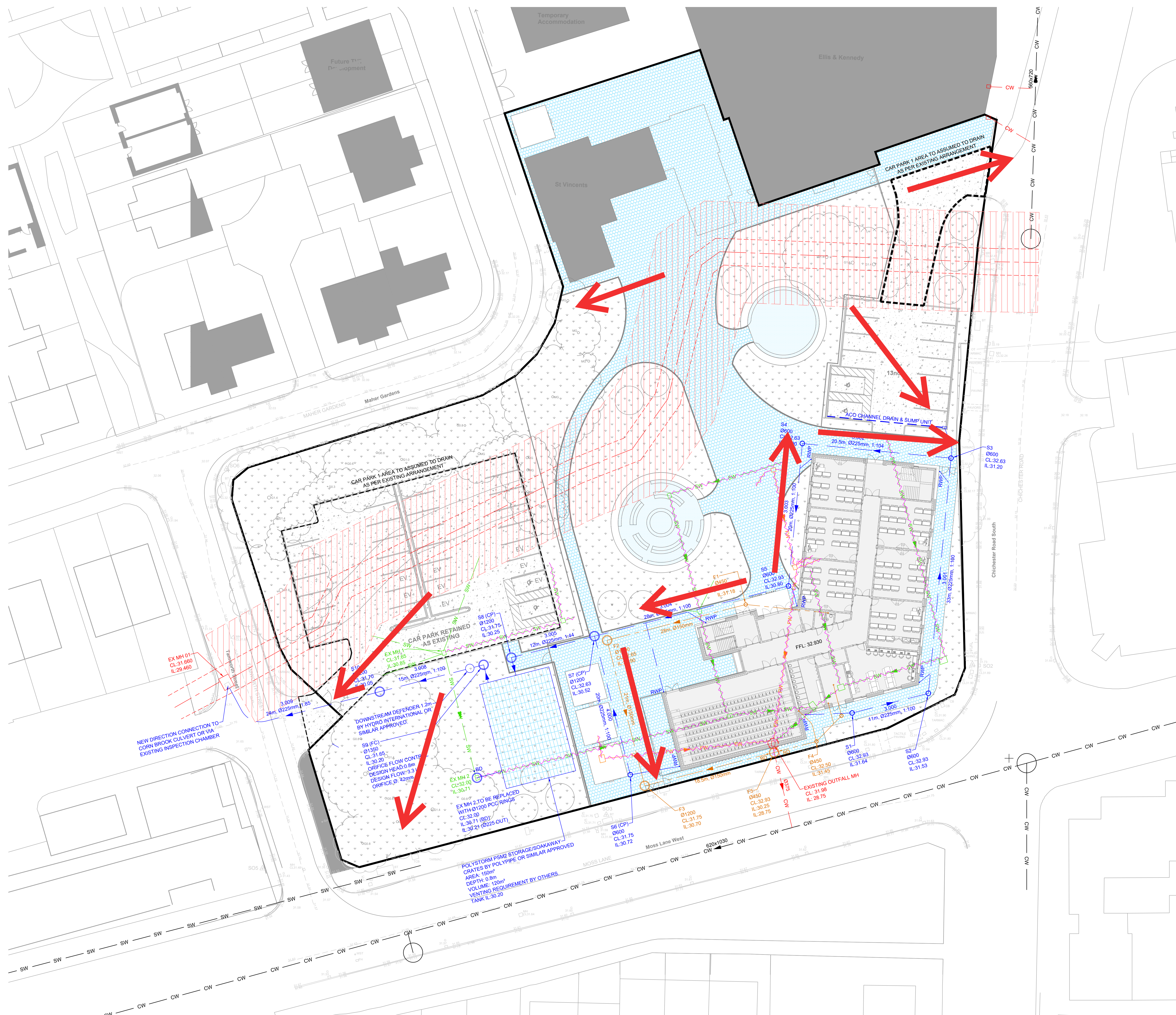
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Innovyze		Network 2020.1.3

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.000	S1	31.686	-0.179	0.000	0.09		4.1	OK
S3.001	S2	31.590	-0.165	0.000	0.16		7.8	OK
S3.002	S3	31.308	-0.117	0.000	0.46		21.4	OK
S3.003	S4	31.116	-0.109	0.000	0.51		23.9	OK
S3.004	S5	30.930	-0.095	0.000	0.62		29.9	OK
S4.000	S6	30.773	-0.172	0.000	0.13		5.9	OK
S3.005	S7	30.676	-0.069	0.000	0.71		47.8	OK
S3.006	S8	30.550	0.075	0.000	0.24		7.2	SURCHARGED
S5.000	S-EXMH2	30.547	0.112	0.000	0.00		0.0	SURCHARGED
S3.007	S-TANK	30.548	0.123	0.000	0.12	312	2.0	SURCHARGED*
S3.008	S9	30.545	0.320	0.000	0.05		2.1	SURCHARGED
S3.009	S10	30.034	-0.116	0.000	0.12		2.1	OK

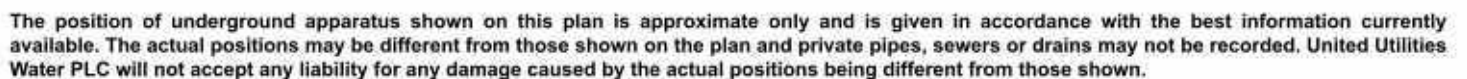
PN	US/MH Name	Level Exceeded
S3.000	S1	
S3.001	S2	
S3.002	S3	
S3.003	S4	
S3.004	S5	
S4.000	S6	
S3.005	S7	
S3.006	S8	
S5.000	S-EXMH2	
S3.007	S-TANK	
S3.008	S9	
S3.009	S10	

Exceedance Flow Routes



EXCEEDANCE FLOW ROUTES

United Utilities Sewer Records



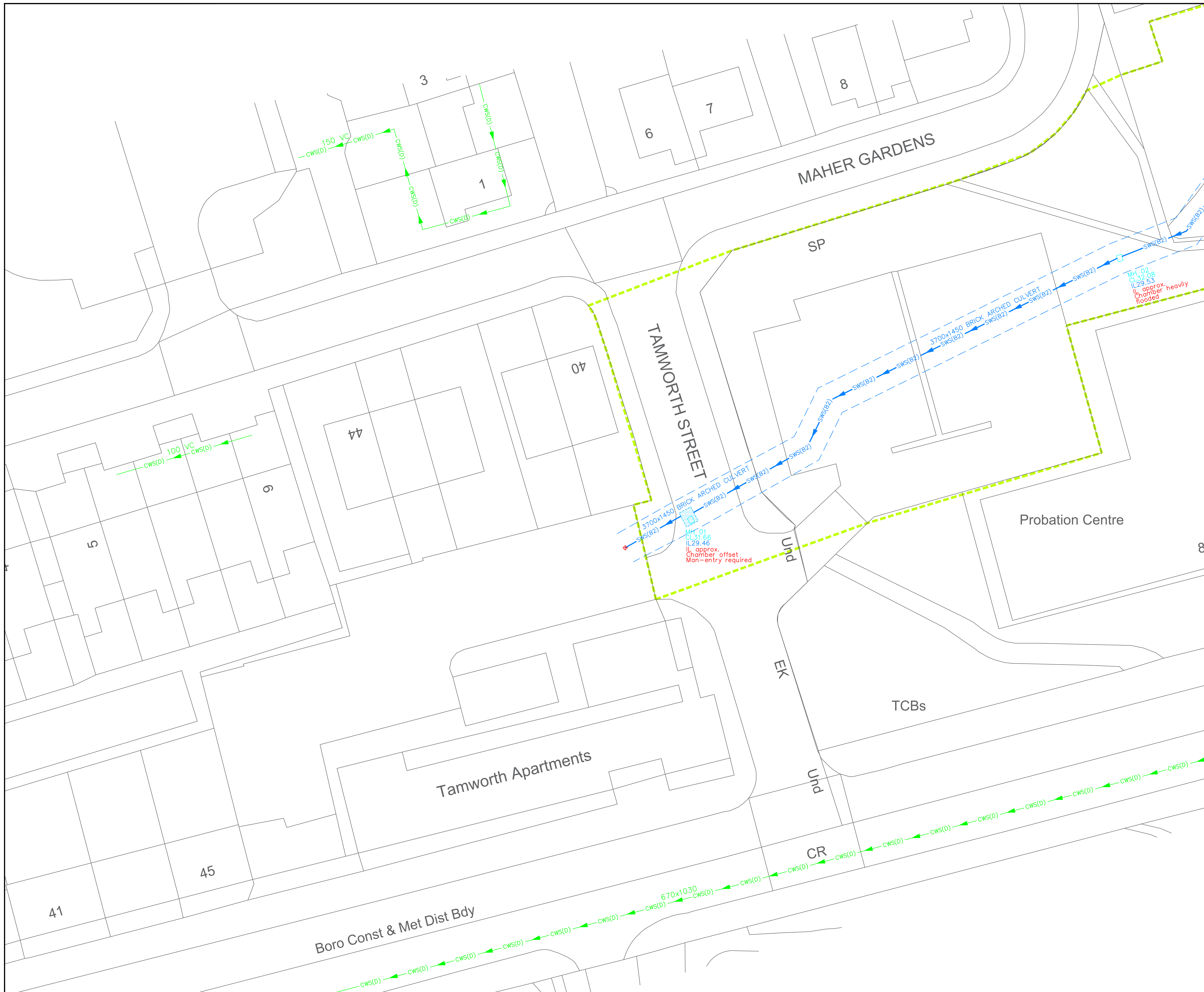
Wastewater Symbolology

Abandoned	Foul	Surface Water	Combined	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main
				Sludge Main
				Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	

Corn Brook Culvert Survey Drawings

[illegible]

