

Project No. & Name:	9003 – Glendene, Wythenshawe	Prepared by:	Rev:	Date:
Document Ref:	9003-WML-ZZ-XX-RP-C-1001	Daniel Baker	T04	October 2022

DRAINAGE STRATEGY – Glendene, Wythenshawe

Background

1. The below Drainage Strategy Report has been created by WML to support and inform detailed Planning Conditions for Glendene, Wythenshawe.
2. The Report relates to the construction of a new residential development, comprising 56no low rise residential houses and associated parking / landscaping following the demolition of the former children's care home.
3. The Strategy is to be read in conjunction with the Phase 2 Ground Investigation Report, Ref: 9003-WML-00-XX-RP-G-0002, WML Consulting (October 2019), Flood Risk Assessment, Ref: 9003-WML-00-XX-RP-G-0003 and WML Consulting drainage drawings 9003-WML-ZZ-XX-DR-C-1001 to 1005.

Surface Water Drainage Strategy

4. The proposed drainage strategy for this site will incorporate the principles of, and where appropriate demonstrate compliance with the NPPF and the SUDS manual.
5. 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.
6. These options are discussed in further detail below.
7. **Surface water discharge via infiltration:** The preliminary site investigation has confirmed that the site is predominantly underlain by cohesive strata which are not conducive for the use of soakaways and other infiltration techniques.
8. An executive summary of the Phase 2 Geo-Environmental Investigation and Assessment document has been appended to this report
9. **Surface water discharge via watercourse:** the nearest watercourse is Mill Brook located circa 100m to the north-east of the development site. A connection to the existing watercourse would require the installation of over 100m of new sewer laid within third party land including adoptable highways and public open space.
10. In addition to the above a new connection would likely require the incorporation of a pumping station to overcome any level difference between the water course and the development site.
11. Given the above it is considered that disposal of surface water runoff to a watercourse is not a suitable solution for this site.
12. **Surface water discharge via public sewer:** as the disposal of surface water runoff from the site via infiltration and to a watercourse are not feasible solutions, a new connection to the public sewerage system will be required.
13. A review of the United Utilities (UU) public sewer records indicate that there are existing combined public sewers located within the northern and eastern extents of the site. UU sewer records can be found appended to this report.
14. A CCTV drainage survey has been undertaken by Layer Surveys Ltd and confirmed that an existing 1200mm dia concrete combined sewer currently runs south-north along the sites eastern boundary with Greenbrow Rd, where it then increases in size to 1350mm dia and flows east-west long the site's northern boundary with Wastdale Rd.
15. It is understood that the development proposals intend to leave the existing public sewerage system insitu and provide an agreed easement to enable United Utilities to undertake any maintenance works as required.

16. The existing site has been previously developed and is currently occupied by a former children's home along with associated ancillary buildings, car parking and soft landscaping.
17. Following discussions with the LLFA and due to the fact that the existing site comprises a mixture of surface types, it is considered to be both Greenfield and Brownfield. An area assessment has been undertaken using information provided by the topographical survey and satellite imaging and can be found appended to this report.
18. The existing greenfield runoff rate has been calculated using MicroDrainage Software - version 2020 and has resulted in the following flow rates:

Greenfield Runoff Rate (l/s)
Q1: 4.3 Q30: 8.3 Q100: 10.2

19. A copy of Greenfield runoff calculations can be found appended to this report.
20. It is understood that the LLFA requests that all new developments are restricted to the Q1 year Greenfield runoff rate.
21. The existing Brownfield flow rate has been calculated based on a 50mm/Hr rainfall intensity which resulted in an existing flow rate of 72.9 l/s.
22. The SFRA requires that the existing brownfield flows leaving the site are reduced by 50% (min) which results in an allowable flow rate of 36.4 l/s.
23. Given the mixture of Greenfield & Brownfield areas present on the existing site it is proposed to restrict all surface water runoff from the new development to a total combined flow of;
$$4.3 \text{ l/s (Greenfield Q1)} + 36.4 \text{ l/s (brownfield 50\% reduction)} = 40.7 \text{ l/s.}$$
24. The site drainage system will be designed to contain all surface water for all critical storm events up to and including the 100 year event plus a 40% climate change allowance.
25. For the purposes of design, this report and the associated drawings propose to discharge all surface water runoff from the site via one of 2 No. separate connection to the existing UU sewerage network.
26. Area 1 comprises the 13 houses in the south-west corner of the site and discharges via a new connection to the existing UU combined sewer located within Greenbrow Rd. Area 2 comprises the remaining 43 houses to which discharge via a new connection to the north within Wastdale Rd.
27. Therefore it is proposed to split the total allowable runoff rate of 40.7 l/s into the following discharge rates;
 - Area 1 = 10 l/s
 - Area 2 = 30 l/s
28. In order to achieve the above flow rates, the proposed drainage system for each area will incorporate oversized pipework and flow controls to store surcharged water for all storms up to and including the critical 100 year event plus 40% climate change allowance.
29. It is understood that a portion of the new site drainage from each of the development areas described above will be offered up for adoption by United Utilities to coincide with the new lengths of adoptable highways/access roads.
30. WML drawings 9003-WML-ZZ-XX-DR-C-1001 to 1005 highlight the extent of the new adoptable drainage network, which includes the oversized pipework mentioned above. Consultation with United Utilities should be undertaken during detailed design to obtain their approval for the proposals and ascertain any additional requirements they may impose.

Foul Water Drainage Strategy

31. It is proposed to collect foul water traditional soil stacks and discharge to points along the new lengths of adoptable sewer network as highlighted on WML drawings 9003G-WML-ZZ-XX-DR-C-1001 to 1005.

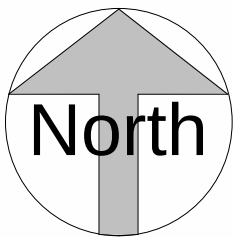
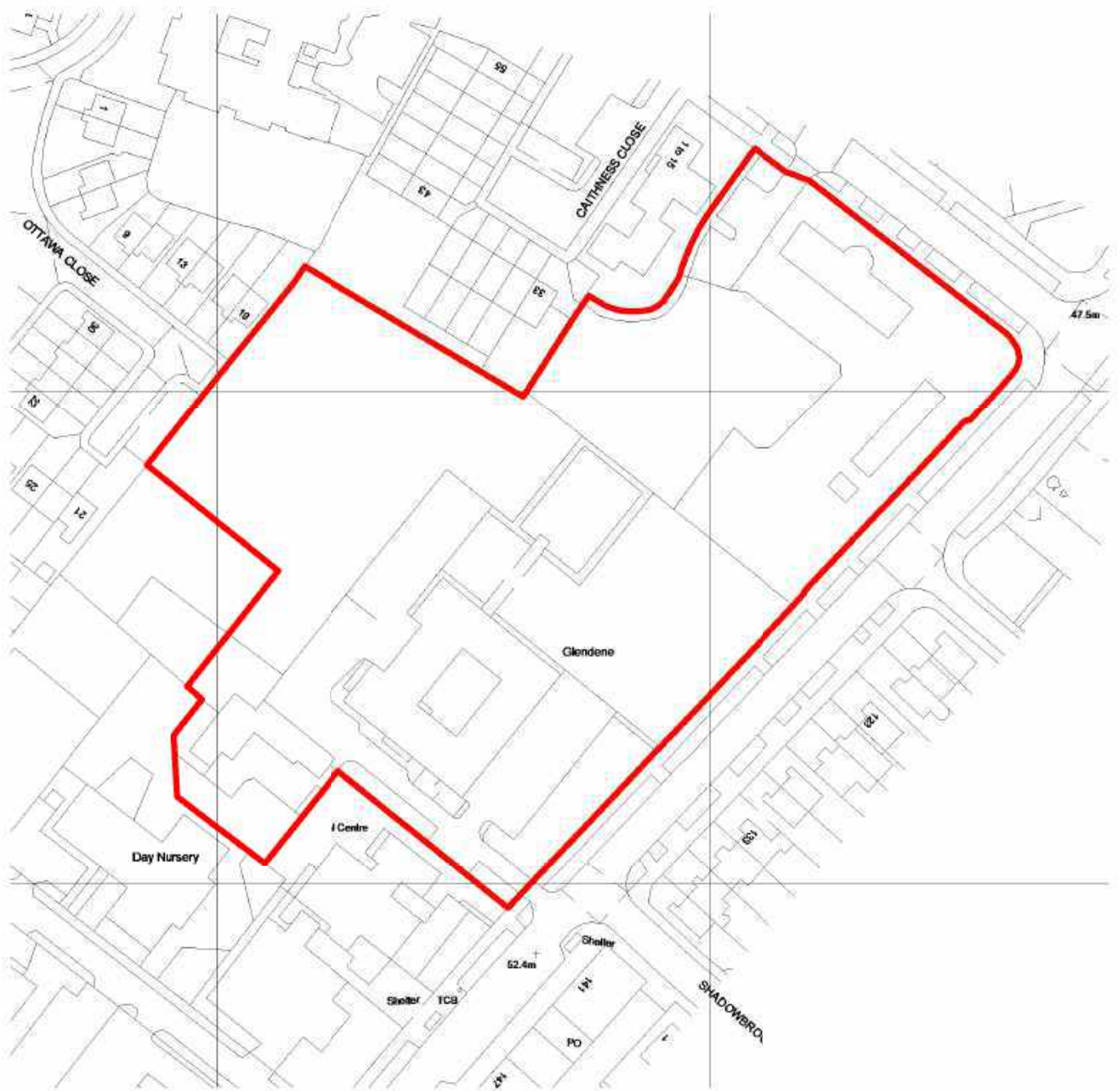
SUDs Review

32. 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 have been reviewed and are discussed below.
33. 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 store building however as the residential buildings are of lightweight construction and only comprise a small footprint, the implications of including a green or blue roof system would add significant embodied carbon to the supporting structure & building foundations whilst not providing any significant storage capacity and are therefore considered unsuitable for this development.
34. Further to the above, alternative water storage solutions were also considered for this development. The use of hard standing areas and car parking are not considered a good enough quality to be considered for water reuse schemes, however water butts located on rain water pipes could be used for ground keeping/domestic purposes. This should be discussed with the client at detailed design stage.
35. 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 communal soft landscaping/open space available across the site to implement such features they have been considered to be not a practical solution for this project.
36. A tanked (wrapped) permeable road construction was deliberated as a form of attenuation for surface water runoff prior to its disposal to the public sewerage system, however due to significant storage volume required to contain runoff water resulting from large storm events and the minimal void space available within the permeable sub base (30%) it was considered that permeable paving is not a suitable option for this development.
37. In addition to the above, the development proposals include for the adoption of a significant portion of the site's access roads & drainage and this type of SUDs system does not comply with adoption standards.
38. A tanked permeable paving construction was also considered for private driveways to each property, however the limited space available, void ratio (30%) and gradients concluded that this solution wasn't an effective solution for this site.

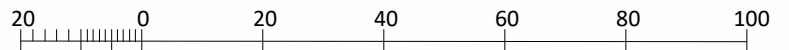
Maintenance Strategy

39. It is understood that a portion of the proposed site drainage is to be offered up for adoption by United Utilities as shown on WML Drawings 9003-WML-ZZ-XX-DR-C-1001 – 1005. The remaining drainage is understood to be the shared responsibility of the residents or an appointed person/company on their behalf.
40. The proposed drainage 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.
41. The proposed drainage design consists of traditional manholes, pipes, trapped gullies and drainage channels.
42. It is proposed to check the drainage system and lift manhole/inspection chamber covers to ensure that the pipework associated with each chamber is operating correctly twice yearly and ensure gullies/channels are free from debris.
43. Any problems encountered will be investigated by CCTV survey if required and any remedial works necessary carried out in a timely manner.
44. It has been necessary to incorporate 3No. Hydrobrake flow control devices as part of the proposed surface water design. It is recommended that the hydrobrake is inspected twice a year during the full site drainage as noted above.
45. The flow control manufacturer also provides a cleaning, maintenance and repair service for the hydrobrake that includes; scheduled cleaning, emergency breakdown assistance, on-site repairs, equipment strip-down, planned maintenance & planned spares replacements.
46. Two of the proposed Hydrobrake flow control units are located within the extent of adoptable drainage and therefore any maintenance requirement will be under the ownership and responsibility of United Utilities, however the third is located within the private drainage system and therefore details of the above maintenance services provided by the manufacturer including contact information should be included within the final site Operations & Maintenance (O&M) manual supplied by the contractor upon completion/handover of the site.

Location Plan



— Site Edged Red



2	03.05.18	LT	Red line boundary amended
1	02.05.18	LT	Red line boundary amended
Rev	Date	Int	Description

btp
ARCHITECTS

RIBA
Chartered Practice

Client:
WCHG
Project:
Glendene

Job No:
3375

Scale @ A4:
1 : 1250

Description:
Location Plan

Drawn By: LT Checked By: VJS Date: 02/05/18 Status Code: S0 Drawing No: **100** Rev: **2**

Purpose of Issue:
Feasibility

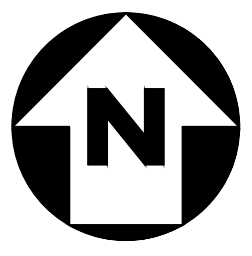
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CF-BTP-00-LP-DR-A-3333_100

DO NOT SCALE FROM THIS DRAWING
ALL DIMENSIONS MUST BE CHECKED ON SITE BY
CONTRACTOR PRIOR TO CONSTRUCTION

Elizabeth House, 486 Didsbury Road, Heaton Mersey, Stockport, SK4 3BS
t 0161 443 1221 e info@bernardtaylor.co.uk w
www.btparchitects.co.uk

WML Drainage Drawings

9003-WML-ZZ-XX-DR-C-1001 – 1005



SHEET 1

SHEET 3

LEGEND

- PROPOSED PRIVATE SURFACE WATER SEWER
- PROPOSED PROPOSED FOUL WATER SEWER
- PROPOSED ADOPTED SURFACE WATER SEWER
- PROPOSED ADOPTED FOUL WATER SEWER
- PROPOSED ADOPTED COMBINED WATER SEWER
- EXISTING ADOPTED COMBINED WATER SEWER
- EXISTING EXISTING UNITED UTILITIES EASEMENT
- DENOTES SITE BOUNDARY

SUBJECT TO APPROVAL FROM
LOCAL PLANNING AUTHORITY
AND UNITED UTILITIES

DESIGN ASSUMPTIONS

THE PROPOSED DRAINAGE DESIGN ON THIS DRAWING IS BASED ON THE FOLLOWING ASSUMPTIONS:

ALL DRAINAGE COVER LEVELS SHOWN ARE INDICATIVE AND ARE SUBJECT TO FINAL LEVEL DESIGN BY THE ARCHITECT.

RWPs AND SLAB PENETRATIONS ARE SHOWN INDICATIVE ONLY. FOR FINAL SETTING OUT REFER TO ARCHITECT DRAWINGS.

THE DRAINAGE DESIGN / INFORMATION SHOWN ON THIS DRAWING IS INDICATIVE ONLY AND IS SUBJECT TO CONFIRMATION OF THE EXISTING UNITED UTILITIES PUBLIC SEWER DEPTHS.

RAIN WATER PIPES AND SLAB PENETRATIONS ARE SHOWN INDICATIVE ONLY. ARCHITECT IS TO CONFIRM FINAL POSITIONS PRIOR TO DETAILED DESIGN.

PROPOSED FLOW RATES ARE AS OUTLINED IN THE DRAINAGE STRATEGY ASSUME THAT THE LOCAL PLANNING AUTHORITY & UNITED UTILITIES DO NOT IMPOSE FURTHER RESTRICTIONS TO DISCHARGE RATES.

GENERAL NOTES

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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 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 APPROXIMATE AND INDICATIVE ONLY ARCHITECT TO CONFIRM COVER LEVELS TO ALL MANHOLES AND GULLIES PRIOR TO CONSTRUCTION.

THE LAYOUT OF DRAINAGE ON THIS DRAWING IS INDICATIVE ONLY ARCHITECT TO CONFIRM EXACT LOCATION OF MANHOLES AND GULLIES.

U.N.Q. ALL DRAINAGE GOODS & FITTINGS TO BE:-

UPTO 3000 (AND INCLUDING) TO BE SUPERSLAVE VITRIFIED CLAY PIPES OR SIMILAR.

ABOVE 3000 TO BE CONCRETE BY STANTON BONNA OR SIMILAR.

ALL COVERS AND RODDING ACCESS POINTS TO BE SEALED AND SECURED TIGHT.

ALL INTERNAL MANHOLE COVERS TO BE DOUBLE SEALED, LOCKABLE 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, SIPS 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 150mm DIAMETER AT MINIMUM FALLS OF 1:80 UNLESS NOTED OTHERWISE.

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MANHOLE COVERS:

CARRIAGEWAYS GENERAL - EN124 CLASS D400
CARRIAGEWAYS WITHIN 0.5m OF KERB - EN124 CLASS C250
SLOW MOVING HGV [38] - EN 124 CLASS B125 SLOW MOVING
GLV [10] - 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.

TENDER DRAWING

T07	REVISED TO SUIT UI COMMENTS.	12.10.22	DB	LoG
T06	REVISED TO SUIT UI COMMENTS.	23.08.22	DB	LoG
T05	REVISED TO SUIT UI COMMENTS.	07.07.22	DB	LoG
T04	REVISED TO SUIT UPDATED SITE LAYOUT.	06.04.22	DB	LoG
T03	REVISED TO SUIT COORDINATION WITH S104 ADAPTABLE DRAINAGE ARRANGEMENT.	23.03.22	DB	LoG
T02	REVISED TO SUIT UPDATED SITE LAYOUT & PLANNING COMMENTS.	21.03.22	DB	LoG
T01	TENDER ISSUE.	17.09.21	DB	LoG
Rev.	Amendment	Date	By	Chkd

PROJECT

GLENDENE,
WYTHENSHAW

CLIENT

BTP ARCHITECTS

TITLE

PROPOSED DRAINAGE LAYOUT
OVERVIEW

Drawn

DB

Checked

LoG

Date

SEPT 21

Scale

1:200 @ A0

WML CONSULTING
Chartered Civil and Structural Engineers

No 8 Oak Green
East Road
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Fax 0161 442 0010
e-mail info@wmlconsulting.com
www.wmlconsulting.com

Project

Originator

Volume

Level

Type

Role

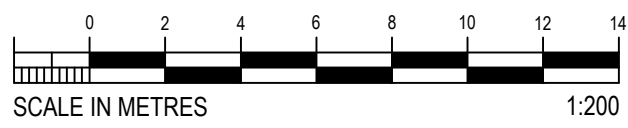
Number

Rev

9003

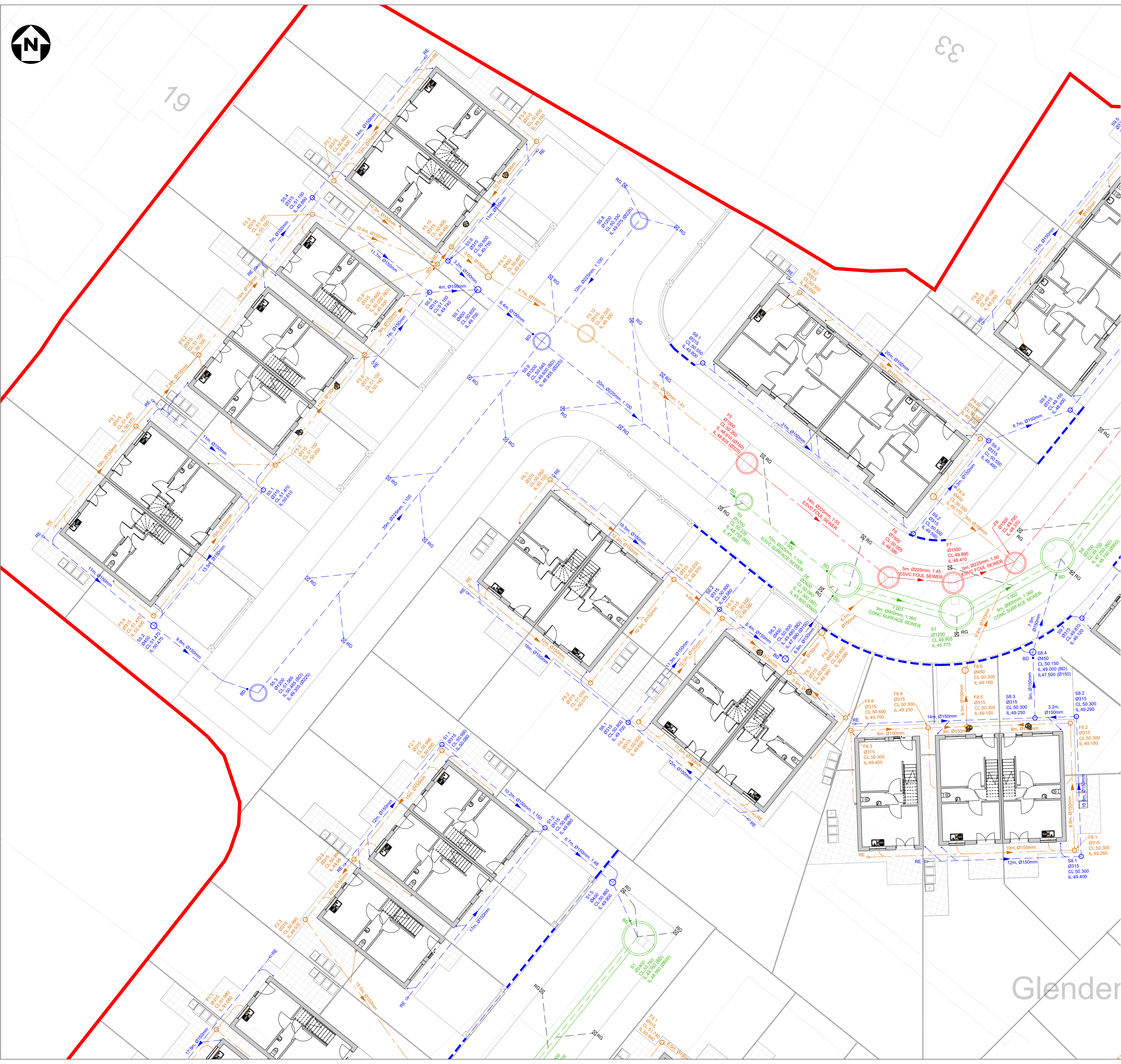
- WML - ZZ - XX - DR - C - 1001

T07



SHEET 2

SHEET 4



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- PROPOSED ADOPTED ROAD GULLY
- PROPOSED PRIVATE ROAD GULLY
- PROPOSED PRIVATE RODDING EYE
- PROPOSED CHANNEL DRAIN (ACO OR SIMILAR)

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Rev.	Amendment	Date	By	Chkd

Project: **Glenderne, Wythenshawe**

Client: **BTP ARCHITECTS**

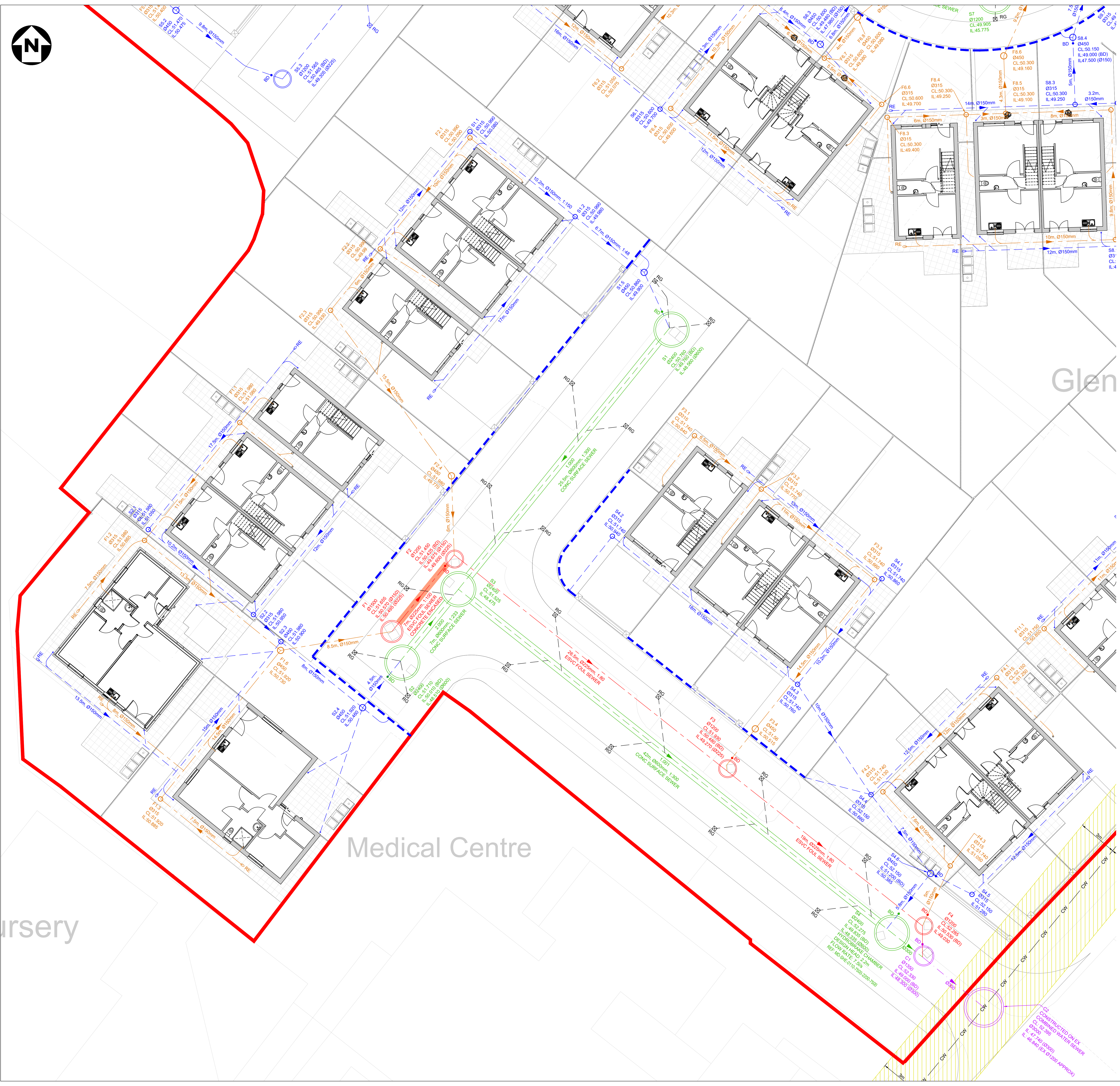
Title: **PROPOSED DRAINAGE LAYOUT SHEET 1**

Drawn	DB	Checked	LoG	Date	SEPT 21	Scale	1:100 @ A0
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WML CONSULTING
Chartered Civil and Structural Engineers

No 5 Oak Green
East Road
Barnley Green Business Park
Cheshire M60 2LQ
Tel: 0161 482 0000
Fax: 0161 482 0210
e-mail: info@wmlconsulting.com
www.wmlconsulting.com

Project	Originator	Volume	Level	Type	Role	Number	Rev
9003	- WML - ZZ	- XX	- DR	- C	-	1002	T07



Nursery

Medical Centre

Glen

LEGEND

PROPOSED PRIVATE SURFACE WATER SEWER

PROPOSED PROPOSED FOUL WATER SEWER

PROPOSED ADOPTED SURFACE WATER SEWER

PROPOSED ADOPTED FOUL WATER SEWER

PROPOSED ADOPTED COMBINED WATER SEWER

EXISTING ADOPTED COMBINED WATER SEWER

DENOTES EXISTING UNITED UTILITIES EASEMENT

DENOTES SITE BOUNDARY

PROPOSED ADOPTED ROAD GULLY

PROPOSED PRIVATE ROAD GULLY

PROPOSED PRIVATE RODDING EYE

PROPOSED CHANNEL DRAIN (ACO OR SIMILAR)

SUBJECT TO APPROVAL FROM
LOCAL PLANNING AUTHORITY
AND UNITED UTILITIES

DESIGN ASSUMPTIONS

THE PROPOSED DRAINAGE DESIGN ON THIS DRAWING IS BASED ON THE FOLLOWING ASSUMPTIONS:

ALL DRAINAGE COVER LEVELS SHOWN ARE INDICATIVE AND ARE SUBJECT TO FINAL LEVEL DESIGN BY THE ARCHITECT.

RWPS AND SLAB PENETRATIONS ARE SHOWN INDICATIVE ONLY. FOR FINAL SETTING OUT REFER TO ARCHITECT DRAWINGS.

THE DRAINAGE DESIGN / INFORMATION SHOWN ON THIS DRAWING IS INDICATIVE ONLY AND IS SUBJECT TO CONFIRMATION OF THE EXISTING UNITED UTILITIES PUBLIC SEWER DEPTHS.

RAIN WATER PIPES AND SLAB PENETRATIONS ARE SHOWN INDICATIVE ONLY. ARCHITECT IS TO CONFIRM FINAL POSITIONS PRIOR TO DETAILED DESIGN.

PROPOSED FLOW RATES ARE AS OUTLINED IN THE DRAINAGE STRATEGY ASSUME THAT THE LOCAL PLANNING AUTHORITY & UNITED UTILITIES DO NOT IMPOSE FURTHER RESTRICTIONS TO DISCHARGE RATES.

GENERAL NOTES

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ABOVE 3000 TO BE CONCRETE BY STANTON BONNA OR SIMILAR.

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CARRIAGEWAYS WITHIN 0.5m OF KERB - EN124 CLASS C250
SLOW MOVING HGV (38t) - EN 124 CLASS B125 SLOW MOVING GLV (10t) - EN 124 CLASS B125 SLOW MOVING PRIVATE CARS - EN124 CLASS B125.

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Rev.	Amendment	Date	By	Chkd

Project: **GLENDENE, WYTHENSHAW**

Client: **BTP ARCHITECTS**

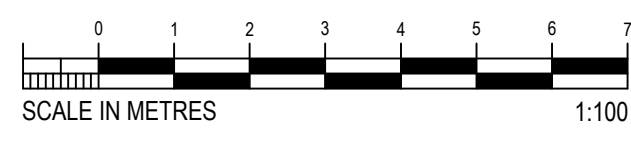
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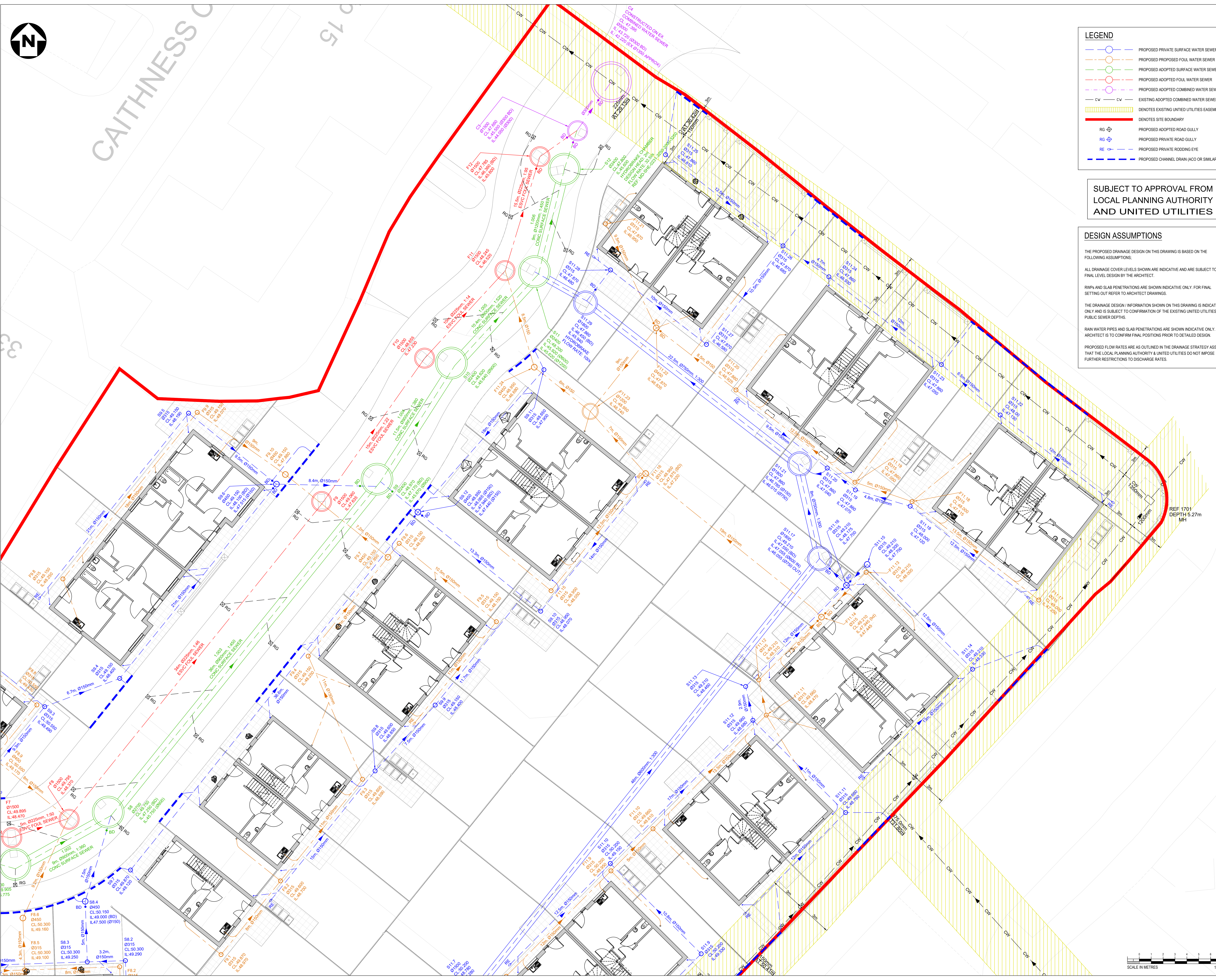
Drawn	DB	Checked	LoG	Date	SEPT 21	Scale	1:100 @ A0
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Chester M60 4QJ
Tel: 0161 482 9200
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e-mail: info@wmlconsulting.com
www.wmlconsulting.com

Project	Originator	Volume	Level	Type	Role	Number	Rev
9003	- WML -	- ZZ -	- XX -	- DR -	- C -	- 1003	T07





LEGEND

- PROPOSED PRIVATE SURFACE WATER SEWER
- PROPOSED PROPOSED FOUL WATER SEWER
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- PROPOSED ADOPTED FOUL WATER SEWER
- PROPOSED ADOPTED COMBINED WATER SEWER
- EXISTING ADOPTED COMBINED WATER SEWER
- EXISTING UNITED UTILITIES EASEMENT
- DENOTES SITE BOUNDARY
- PROPOSED ADOPTED ROAD GULLY
- PROPOSED PRIVATE ROAD GULLY
- PROPOSED PRIVATE ROODING EYE
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MANHOLE COVERS:

CARRIAGEWAYS GENERAL - EN124 CLASS D403

CARRIAGEWAYS WITHIN 0.5m OF KERB - EN124 CLASS C250

SLOW MOVING HGV (38) - EN 124 CLASS B125 SLOW MOVING

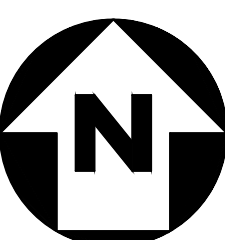
GLV (10) - EN 124 CLASS B125 SLOW MOVING PRIVATE CARS - EN124 CLASS B125.

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Rev.	Amendment	Date	By	Chkd
Project				
GLENDENE, WYTHENSHAW				
Client				
BTP ARCHITECTS				
Title				
PROPOSED DRAINAGE LAYOUT SHEET 3				
Drawn	DB	Checked	LoG	Date
				SEPT 21
				Scale
				1:100 @ A0
WML CONSULTING Chartered Civil and Structural Engineers				
No 5 Dale Green East Road Salford Greater Manchester M6 6PU Tel 0161 442 0000 Fax 0161 442 0010 e-mail info@wmlconsulting.com www.wmlconsulting.com				
Project	Originator	Volume	Level	Type
9003	-	WML - ZZ	- XX	- DR - C
				1004
				T07



	PROPOSED PRIVATE SURFACE WATER SEWER
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T01	TENDER ISSUE.	17.09.21	DB	LoG
Rev.	Amendment	Date	By	Chkd

Project **GLENDENE,
WYTHENSHAW**

CLIENT
BTP ARCHITECTS

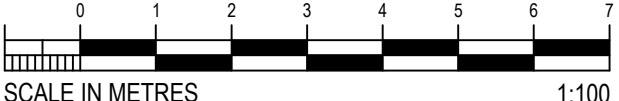
Title
PROPOSED DRAINAGE LAYOUT
SHEET 4

Drawn DB	Checked LoG	Date SEPT 21	Scale 1:100 @ A0
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WML CONSULTING
Chartered Civil and Structural Engineers

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Earl Road
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Cheadle Hulme
Cheshire SK8 6QL
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Fax 0161 486 9210
e-mail info@wmlcoconsulting.com
www.wmlcoconsulting.com

Project	Originator	Volume	Level	Type	Role	Number	Rev
9003	- WML	- ZZ	- XX	- DR	- C	1005	T07



WML Surface Water Calculations

9003-WML-00-XX-CA-C-0001

Surface Water Drainage Calculations

For a site referred to as

Glendene,
Wythenshawe

Undertaken on behalf of

Garden City Design & Build Ltd.

Job No: 9003

Document No: 9003-WML-00-XX-CA-C-0001

Date: October 2022

Project No. & Name:	9003 – Glendene, Wythenshawe	Status:	Prepared by:	Rev:	Date:
Document Ref:	9003-WML-00-XX-CA-C-0001	Preliminary	Daniel Baker	P04	October 2022

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. 9003-WML-ZZ-XX-DR-C-1001 - 1005 – Proposed Drainage GAs
 - b. 9003-WML-ZZ-XX-RP-C-1001 – Drainage Strategy Document

Summary of Results

3. 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 site.
4. The existing site comprises a combination of Greenfield and Brownfield areas as shown within appendix 01 below.
5. Greenfield Areas have been calculated using MicoDrainage Software version 2020 whilst the existing Brownfield flow rate has been calculated using a 50mm/Hr rainfall intensity as noted within the drainage strategy.

Existing		
Greenfield Runoff Rate (l/s)	Brownfield Runoff Rate (l/s)	Proposed Site Runoff Rate - Total (l/s)
Q1: 4.3 Q30: 8.3 Q100: 10.2	72.9 36.4 - Allowable (50% reduction)	4.3 + 36.4 = 40.7

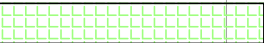
Proposed				
Proposed Site Runoff Rate - South (l/s)	Proposed Site Runoff Rate - North (l/s)	Actual Site Runoff Rate - South (l/s)	Actual Site Runoff Rate - North (l/s)	Actual Site Runoff Rate - Total (l/s)
7.5	32.5	7.6	32.4	<u>40.0</u>

6. The following calculations are associated with the adoptable drainage only and don't take into account the extensive private drainage network which will provide an additional storage volume and further reduce the risk of flooding.

Existing Site Area Plan



LEGEND

	EXISTING BROWNFIELD AREA: 5,249m ²
	EXISTING GREENFIELD AREA: 8,909m ²

Greenfield Runoff Assessment

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 06/04/2022 16:27 File	Designed by DBaker Checked by	
Innovyze		Source Control 2020.1.3
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.450 Area (ha) 0.891 Urban 0.000 SAAR (mm) 849 Region Number Region 10 Results l/s QBAR Rural 4.9 QBAR Urban 4.9 Q100 years 10.2 Q1 year 4.3 Q30 years 8.3 Q100 years 10.2		
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**Proposed Surface Water Network
(South)**

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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	50.760	2.200	Open Manhole	2400	S1.000	48.560	600				
S2	51.710	3.200	Open Manhole	2400	S2.000	48.510	600				
S3	51.510	3.035	Open Manhole	2400	S1.001	48.475	600	S1.000	48.475	600	
								S2.000	48.480	600	5
S4	52.230	3.895	Open Manhole	2400	S1.002	48.335	300	S1.001	48.335	600	
S-C1	52.330	4.030	Open Manhole	1350	S1.003	48.300	300	S1.002	48.300	300	
S	52.390	4.650	Open Manhole	0		OUTFALL		S1.003	47.740	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	381041.161	387651.001	381041.161	387651.001	Required	
S2	381020.730	387625.726	381020.730	387625.726	Required	
S3	381025.130	387631.170	381025.130	387631.170	Required	
S4	381058.049	387605.086	381058.049	387605.086	Required	
S-C1	381060.462	387603.335	381060.462	387603.335	Required	
S	381065.026	387599.426			No Entry	

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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)
S1.000	o	600	S1	50.760	48.560	1.600	Open Manhole	2400
S2.000	o	600	S2	51.710	48.510	2.600	Open Manhole	2400
S1.001	o	600	S3	51.510	48.475	2.435	Open Manhole	2400
S1.002	o	300	S4	52.230	48.335	3.595	Open Manhole	2400
S1.003	o	300	S-C1	52.330	48.300	3.730	Open Manhole	1350

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)
S1.000	25.500	300.0	S3	51.510	48.475	2.435	Open Manhole	2400
S2.000	7.000	233.3	S3	51.510	48.480	2.430	Open Manhole	2400
S1.001	42.000	300.0	S4	52.230	48.335	3.295	Open Manhole	2400
S1.002	2.981	85.2	S-C1	52.330	48.300	3.730	Open Manhole	1350
S1.003	6.009	10.7	S	52.390	47.740	4.350	Open Manhole	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

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.041	0.041	0.041
2.000	-	-	100	0.056	0.056	0.056
1.001	-	-	100	0.034	0.034	0.034
1.002	-	-	100	0.061	0.061	0.061
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.192	0.192	0.192

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S1.003	S	52.390	47.740	0.000	0	0

Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	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

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.002, Volume (m³): 28.8

Unit Reference	MD-SHE-0110-7500-2200-7500
Design Head (m)	2.200
Design Flow (l/s)	7.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	110
Invert Level (m)	48.335
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.200	7.5
Flush-Flo™	0.486	6.5
Kick-Flo®	0.988	5.2
Mean Flow over Head Range	-	6.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.8	1.200	5.6	3.000	8.7	7.000	13.0
0.200	5.7	1.400	6.1	3.500	9.3	7.500	13.4
0.300	6.2	1.600	6.5	4.000	9.9	8.000	13.8
0.400	6.4	1.800	6.8	4.500	10.5	8.500	14.2
0.500	6.5	2.000	7.2	5.000	11.1	9.000	14.6
0.600	6.4	2.200	7.5	5.500	11.6	9.500	15.0
0.800	6.1	2.400	7.8	6.000	12.1		
1.000	5.2	2.600	8.1	6.500	12.5		

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No. 8 Oak Green

Stanley Green Business Park

Earl Rd, Cheadle Hulme, SK8 6QL

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Network 2020.1.3

Micro Drainage

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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

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

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.360

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) 2, 30, 100

Climate Change (%) 0, 0, 40

Water

Level

PN

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Level (m)

S1.000

S1

30 Winter

2

+0%

100/15

Summer

48.686

S2.000

S2

30 Winter

2

+0%

100/15

Summer

48.686

S1.001

S3

30 Winter

2

+0%

100/15

Summer

48.685

S1.002

S4

30 Winter

2

+0%

2/15

Summer

48.684

S1.003

S-C1

30 Winter

2

+0%

48.336

Surcharged Flooded

Half Drain

Pipe

US/MH

Depth

Volume

Flow / Overflow

Time

Flow

Status

Level

PN

Name

(m)

(m³)

Cap.

(l/s)

(mins)

(l/s)

Exceeded

S1.000

S1

-0.474

0.000

0.01

4.6

OK

S2.000

S2

-0.424

0.000

0.02

5.8

OK

S1.001

S3

-0.390

0.000

0.03

10.5

OK

S1.002

S4

0.049

0.000

0.10

6.3

SURCHARGED

S1.003

S-C1

-0.264

0.000

0.03

6.3

OK

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Stanley Green Business Park
Earl Rd, Cheadle Hulme, SK8 6QL

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Micro
Drainage

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

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

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.360

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) 2, 30, 100

Climate Change (%) 0, 0, 40

Water

Level

PN

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

(m)

S1.000

S1

60 Winter

30

+0%

100/15

Summer

48.977

S2.000

S2

60 Winter

30

+0%

100/15

Summer

48.977

S1.001

S3

60 Winter

30

+0%

100/15

Summer

48.977

S1.002

S4

60 Winter

30

+0%

2/15

Summer

48.974

S1.003

S-C1

60 Winter

30

+0%

48.336

Surcharged Flooded

Half Drain Pipe

US/MH Name

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Time (mins)

Flow (l/s)

Status

Level Exceeded

S1.000

S1

-0.183

0.000

0.01

4.4

OK

S2.000

S2

-0.133

0.000

0.03

6.8

OK

S1.001

S3

-0.098

0.000

0.02

8.2

OK

S1.002

S4

0.339

0.000

0.11

6.5

SURCHARGED

S1.003

S-C1

-0.264

0.000

0.03

6.5

OK

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No. 8 Oak Green

Stanley Green Business Park

Earl Rd, Cheadle Hulme, SK8 6QL

Date 12/10/2022 10:09

File 9003 - SURFACE WATER - ...

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Network 2020.1.3

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

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

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.360

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) 2, 30, 100

Climate Change (%) 0, 0, 40

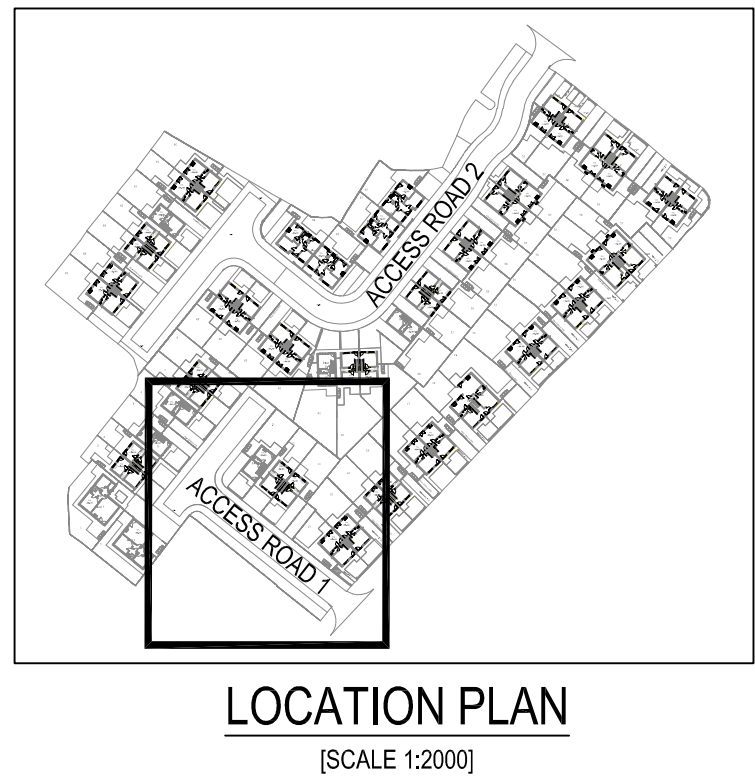
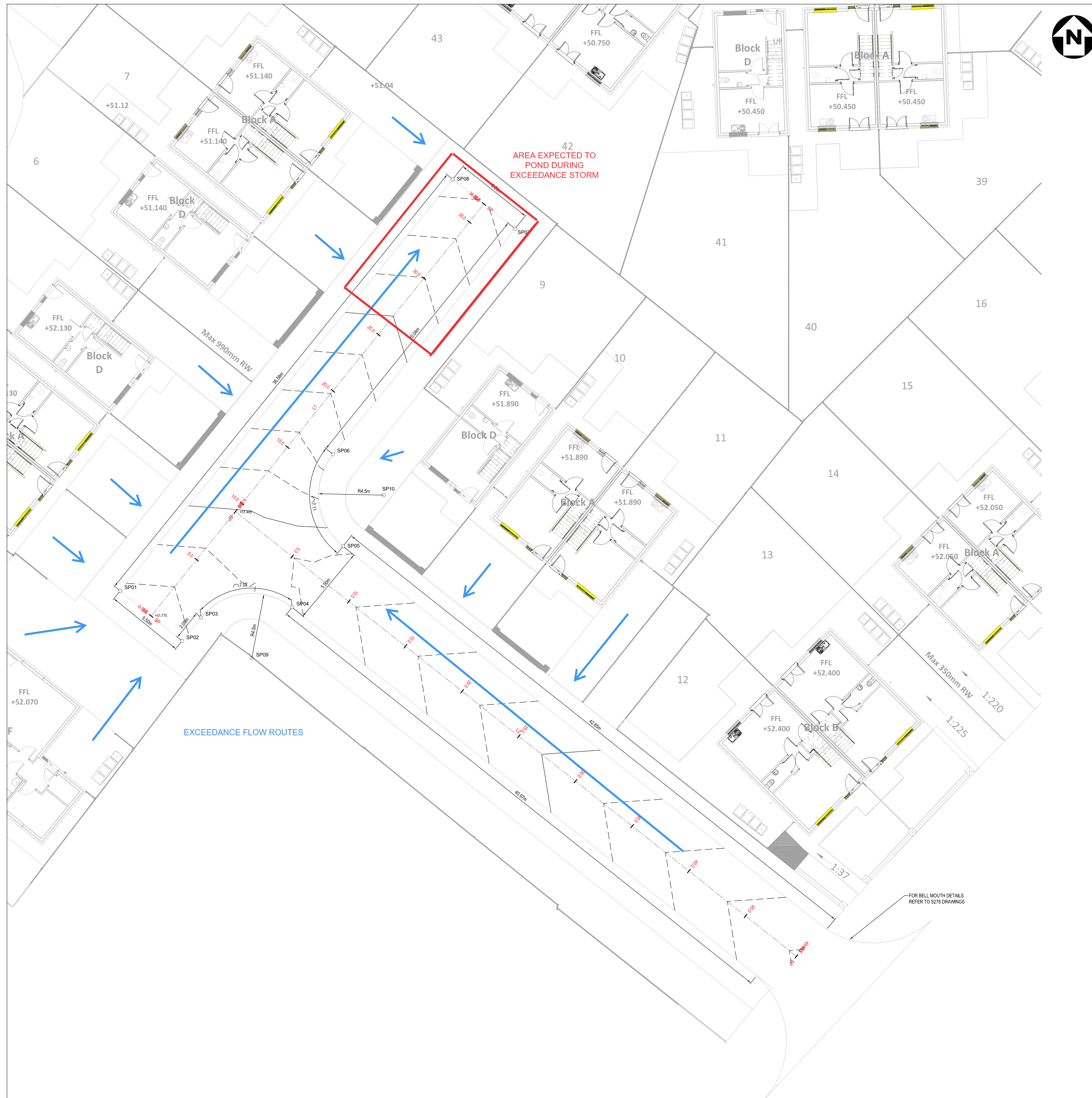
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
S1.000	S1	120 Winter	100	+40%	100/15	Summer			50.608
S2.000	S2	120 Winter	100	+40%	100/15	Summer			50.608
S1.001	S3	120 Winter	100	+40%	100/15	Summer			50.608
S1.002	S4	120 Winter	100	+40%	2/15	Summer			50.607
S1.003	S-C1	120 Winter	100	+40%					48.339

Surcharged Flooded

Half Drain Pipe

PN	US/MH	Depth	Volume	Flow /	Overflow	Time	Flow	Status	Level
	Name	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)		Exceeded
S1.000	S1	1.448	0.000	0.01			4.4	FLOOD RISK	
S2.000	S2	1.498	0.000	0.03			7.0	SURCHARGED	
S1.001	S3	1.533	0.000	0.02			7.6	SURCHARGED	
S1.002	S4	1.972	0.000	0.12			7.6	SURCHARGED	
S1.003	S-C1	-0.261	0.000	0.04			7.6	OK	

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**Proposed Surface Water Network
(North)**

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL																																																																																																																																																																																																																																																																																																
Date 12/10/2022 16:52 File 9003 - SURFACE WATER - ...						Designed by DBaker Checked by																																																																																																																																																																																																																																																																																										
Innovyze						Network 2020.1.3																																																																																																																																																																																																																																																																																										
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for Storm</u> Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>1</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>18.000</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.360</td><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>1.500</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits													Return Period (years)	1	PIMP (%)	100	M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0	Ratio R	0.360	Minimum Backdrop Height (m)	0.200	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500	Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200	Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00	Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																																																																																								
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Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																																																																																																																													
<u>Network Design Table for Storm</u> <table><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>I.Area (ha)</th><th>T.E. (mins)</th><th>Base Flow (l/s)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th><th>Section Type</th><th>Auto Design</th></tr><tr><td>S1.000</td><td>10.000</td><td>0.100</td><td>100.0</td><td>0.132</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>225</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.001</td><td>9.000</td><td>0.025</td><td>360.0</td><td>0.042</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.002</td><td>9.000</td><td>0.025</td><td>360.0</td><td>0.000</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.003</td><td>36.000</td><td>0.080</td><td>450.0</td><td>0.039</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.004</td><td>11.601</td><td>0.030</td><td>386.7</td><td>0.142</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.005</td><td>10.396</td><td>0.020</td><td>519.8</td><td>0.000</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S2.000</td><td>46.000</td><td>0.225</td><td>204.4</td><td>0.050</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>600</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S2.001</td><td>8.139</td><td>0.040</td><td>203.5</td><td>0.059</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>750</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S2.002</td><td>22.530</td><td>0.075</td><td>300.4</td><td>0.011</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>750</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S2.003</td><td>5.004</td><td>0.020</td><td>250.2</td><td>0.039</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>600</td><td>Pipe/Conduit</td><td></td></tr><tr><td>S1.006</td><td>8.991</td><td>0.020</td><td>449.6</td><td>0.028</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>900</td><td>Pipe/Conduit</td><td></td></tr></table> <u>Network Results Table</u> <table><tr><th>PN</th><th>Rain (mm/hr)</th><th>T.C. (mins)</th><th>US/IL (m)</th><th>Σ I.Area (ha)</th><th>Σ Base Flow (l/s)</th><th>Foul (l/s)</th><th>Add Flow (l/s)</th><th>Vel (m/s)</th><th>Cap (l/s)</th><th>Flow (l/s)</th></tr><tr><td>S1.000</td><td>46.31</td><td>5.13</td><td>47.400</td><td>0.132</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.31</td><td>52.0</td><td>16.6</td></tr><tr><td>S1.001</td><td>45.96</td><td>5.22</td><td>45.800</td><td>0.174</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.65</td><td>1046.8</td><td>21.7</td></tr><tr><td>S1.002</td><td>45.62</td><td>5.31</td><td>45.775</td><td>0.174</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.65</td><td>1046.8</td><td>21.7</td></tr><tr><td>S1.003</td><td>44.17</td><td>5.72</td><td>45.750</td><td>0.213</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.47</td><td>935.5</td><td>25.5</td></tr><tr><td>S1.004</td><td>43.76</td><td>5.84</td><td>45.670</td><td>0.355</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.59</td><td>1009.8</td><td>42.1</td></tr><tr><td>S1.005</td><td>43.34</td><td>5.97</td><td>45.640</td><td>0.355</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.37</td><td>869.9</td><td>42.1</td></tr><tr><td>S2.000</td><td>45.11</td><td>5.45</td><td>47.280</td><td>0.050</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.70</td><td>480.5</td><td>6.1</td></tr><tr><td>S2.001</td><td>44.86</td><td>5.52</td><td>46.055</td><td>0.109</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.96</td><td>865.1</td><td>13.2</td></tr><tr><td>S2.002</td><td>44.05</td><td>5.75</td><td>46.015</td><td>0.120</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.61</td><td>711.0</td><td>14.3</td></tr><tr><td>S2.003</td><td>43.86</td><td>5.81</td><td>45.940</td><td>0.159</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.53</td><td>434.0</td><td>18.9</td></tr><tr><td>S1.006</td><td>43.01</td><td>6.07</td><td>45.620</td><td>0.542</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.47</td><td>935.9</td><td>63.1</td></tr></table> ©1982-2020 Innovyze													PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design	S1.000	10.000	0.100	100.0	0.132	5.00	0.0	0.600	o	225	Pipe/Conduit		S1.001	9.000	0.025	360.0	0.042	0.00	0.0	0.600	o	900	Pipe/Conduit		S1.002	9.000	0.025	360.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit		S1.003	36.000	0.080	450.0	0.039	0.00	0.0	0.600	o	900	Pipe/Conduit		S1.004	11.601	0.030	386.7	0.142	0.00	0.0	0.600	o	900	Pipe/Conduit		S1.005	10.396	0.020	519.8	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit		S2.000	46.000	0.225	204.4	0.050	5.00	0.0	0.600	o	600	Pipe/Conduit		S2.001	8.139	0.040	203.5	0.059	0.00	0.0	0.600	o	750	Pipe/Conduit		S2.002	22.530	0.075	300.4	0.011	0.00	0.0	0.600	o	750	Pipe/Conduit		S2.003	5.004	0.020	250.2	0.039	0.00	0.0	0.600	o	600	Pipe/Conduit		S1.006	8.991	0.020	449.6	0.028	0.00	0.0	0.600	o	900	Pipe/Conduit		PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	S1.000	46.31	5.13	47.400	0.132	0.0	0.0	0.0	1.31	52.0	16.6	S1.001	45.96	5.22	45.800	0.174	0.0	0.0	0.0	1.65	1046.8	21.7	S1.002	45.62	5.31	45.775	0.174	0.0	0.0	0.0	1.65	1046.8	21.7	S1.003	44.17	5.72	45.750	0.213	0.0	0.0	0.0	1.47	935.5	25.5	S1.004	43.76	5.84	45.670	0.355	0.0	0.0	0.0	1.59	1009.8	42.1	S1.005	43.34	5.97	45.640	0.355	0.0	0.0	0.0	1.37	869.9	42.1	S2.000	45.11	5.45	47.280	0.050	0.0	0.0	0.0	1.70	480.5	6.1	S2.001	44.86	5.52	46.055	0.109	0.0	0.0	0.0	1.96	865.1	13.2	S2.002	44.05	5.75	46.015	0.120	0.0	0.0	0.0	1.61	711.0	14.3	S2.003	43.86	5.81	45.940	0.159	0.0	0.0	0.0	1.53	434.0	18.9	S1.006	43.01	6.07	45.620	0.542	0.0	0.0	0.0	1.47	935.9	63.1
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design																																																																																																																																																																																																																																																																																					
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PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)																																																																																																																																																																																																																																																																																						
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Innovyze	Network 2020.1.3	

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)
S5	50.235	2.835	Open Manhole	1200	S1.000	47.400	225				
S6	50.060	4.260	Open Manhole	2400	S1.001	45.800	900	S1.000	47.300	225	825
S7	49.905	4.130	Open Manhole	2400	S1.002	45.775	900	S1.001	45.775	900	
S8	49.750	4.000	Open Manhole	2400	S1.003	45.750	900	S1.002	45.750	900	
S9	48.970	3.300	Open Manhole	2400	S1.004	45.670	900	S1.003	45.670	900	
S10	48.620	2.980	Open Manhole	2400	S1.005	45.640	900	S1.004	45.640	900	
S11.7	50.200	2.920	Open Manhole	1500	S2.000	47.280	600				
S11.17	49.210	3.155	Open Manhole	1800	S2.001	46.055	750	S2.000	47.055	600	850
S11.21	47.860	1.845	Open Manhole	1800	S2.002	46.015	750	S2.001	46.015	750	
S11.29	47.860	1.920	Open Manhole	1800	S2.003	45.940	600	S2.002	45.940	750	
S11	48.200	2.580	Open Manhole	2400	S1.006	45.620	900	S1.005	45.620	900	
								S2.003	45.920	600	
S12	47.800	2.200	Open Manhole	2400	S1.007	45.600	300	S1.006	45.600	900	
S-C3	47.580	3.530	Open Manhole	1500	S1.008	44.050	300	S1.007	45.550	300	1500
S	47.395	3.675	Open Manhole	0		OUTFALL		S1.008	43.720	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	381049.420	387684.928	381049.420	387684.928	Required	
S6	381057.203	387678.650	381057.203	387678.650	Required	
S7	381065.859	387676.184	381065.859	387676.184	Required	
S8	381073.723	387680.560	381073.723	387680.560	Required	
S9	381096.322	387708.583	381096.322	387708.583	Required	
S10	381102.579	387718.352	381102.579	387718.352	Required	
S11.7	381104.901	387665.919	381104.901	387665.919	Required	

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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., (mm)	L*W	
S1.000	o	225	S5	50.235	47.400	2.610	Open Manhole		1200	
S1.001	o	900	S6	50.060	45.800	3.360	Open Manhole		2400	
S1.002	o	900	S7	49.905	45.775	3.230	Open Manhole		2400	
S1.003	o	900	S8	49.750	45.750	3.100	Open Manhole		2400	
S1.004	o	900	S9	48.970	45.670	2.400	Open Manhole		2400	
S1.005	o	900	S10	48.620	45.640	2.080	Open Manhole		2400	
S2.000	o	600	S11.7	50.200	47.280	2.320	Open Manhole		1500	
S2.001	o	750	S11.17	49.210	46.055	2.405	Open Manhole		1800	
S2.002	o	750	S11.21	47.860	46.015	1.095	Open Manhole		1800	
S2.003	o	600	S11.29	47.860	45.940	1.320	Open Manhole		1800	
S1.006	o	900	S11	48.200	45.620	1.680	Open Manhole		2400	
S1.007	o	300	S12	47.800	45.600	1.900	Open Manhole		2400	
S1.008	o	300	S-C3	47.580	44.050	3.230	Open Manhole		1500	
Downstream Manhole										
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W	
S1.000	10.000	100.0	S6	50.060	47.300	2.535	Open Manhole		2400	
S1.001	9.000	360.0	S7	49.905	45.775	3.230	Open Manhole		2400	
S1.002	9.000	360.0	S8	49.750	45.750	3.100	Open Manhole		2400	
S1.003	36.000	450.0	S9	48.970	45.670	2.400	Open Manhole		2400	
S1.004	11.601	386.7	S10	48.620	45.640	2.080	Open Manhole		2400	
S1.005	10.396	519.8	S11	48.200	45.620	1.680	Open Manhole		2400	
S2.000	46.000	204.4	S11.17	49.210	47.055	1.555	Open Manhole		1800	
S2.001	8.139	203.5	S11.21	47.860	46.015	1.095	Open Manhole		1800	
S2.002	22.530	300.4	S11.29	47.860	45.940	1.170	Open Manhole		1800	
S2.003	5.004	250.2	S11	48.200	45.920	1.680	Open Manhole		2400	
S1.006	8.991	449.6	S12	47.800	45.600	1.300	Open Manhole		2400	
S1.007	3.417	68.3	S-C3	47.580	45.550	1.730	Open Manhole		1500	
S1.008	4.992	15.1	S	47.395	43.720	3.375	Open Manhole		0	
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S11.29, DS/PN: S2.003, Volume (m³): 14.0

Unit Reference	MD-SHE-0134-1000-1800-1000
Design Head (m)	1.800
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	134
Invert Level (m)	45.940
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	10.0
Flush-Flo™	0.525	10.0
Kick-Flo®	1.089	7.9
Mean Flow over Head Range	-	8.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	8.3	3.000	12.7	7.000	19.1
0.200	8.6	1.400	8.9	3.500	13.7	7.500	19.7
0.300	9.5	1.600	9.5	4.000	14.6	8.000	20.3
0.400	9.8	1.800	10.0	4.500	15.4	8.500	20.9
0.500	10.0	2.000	10.5	5.000	16.2	9.000	21.5
0.600	9.9	2.200	11.0	5.500	17.0	9.500	22.1
0.800	9.6	2.400	11.5	6.000	17.7		
1.000	8.7	2.600	11.9	6.500	18.4		

Hydro-Brake® Optimum Manhole: S12, DS/PN: S1.007, Volume (m³): 14.1

Unit Reference	MD-SHE-0231-3250-2000-3250
Design Head (m)	2.000
Design Flow (l/s)	32.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	231
Invert Level (m)	45.600
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL																																																																										
Date 12/10/2022 16:52	Designed by DBaker																																																																									
File 9003 - SURFACE WATER - ...	Checked by																																																																									
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<u>Hydro-Brake® Optimum Manhole: S12, DS/PN: S1.007, Volume (m³): 14.1</u>																																																																										
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>2.000</td><td>32.5</td></tr><tr><td>Flush-Flo™</td><td>0.589</td><td>32.4</td></tr><tr><td>Kick-Flo®</td><td>1.275</td><td>26.2</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>28.1</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	2.000	32.5	Flush-Flo™	0.589	32.4	Kick-Flo®	1.275	26.2	Mean Flow over Head Range	-	28.1																																																									
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Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																			
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Date 12/10/2022 16:52 File 9003 - SURFACE WATER - ...	Designed by DBaker Checked by								
Innovyze Network 2020.1.3									
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
<u>Simulation Criteria</u>									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000									
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000									
Hot Start Level (mm) 0 Inlet Coefficient 0.800									
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000									
Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 0									
Number of Online Controls 2 Number of Time/Area Diagrams 0									
Number of Offline Controls 0 Number of Real Time Controls 0									
<u>Synthetic Rainfall Details</u>									
Rainfall Model FSR Ratio R 0.360									
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									
<u>Water Level</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S5	15 Winter	1	+0%	100/15 Summer				47.495
S1.001	S6	15 Winter	1	+0%	100/15 Winter				45.927
S1.002	S7	15 Winter	1	+0%	100/15 Winter				45.912
S1.003	S8	15 Winter	1	+0%	100/15 Winter				45.908
S1.004	S9	15 Winter	1	+0%	100/15 Winter				45.903
S1.005	S10	15 Winter	1	+0%	100/15 Winter				45.901
S2.000	S11.7	15 Winter	1	+0%					47.322
S2.001	S11.17	15 Winter	1	+0%	100/15 Summer				46.194
S2.002	S11.21	15 Winter	1	+0%	100/15 Summer				46.194
S2.003	S11.29	15 Winter	1	+0%	30/15 Winter				46.193
S1.006	S11	15 Winter	1	+0%	100/15 Winter				45.898
S1.007	S12	15 Winter	1	+0%	30/15 Summer				45.894
S1.008	S-C3	15 Winter	1	+0%					44.142
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Micro
Drainage

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

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

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.360

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S5	15 Winter	30	+0%	100/15	Summer			47.568
S1.001	S6	30 Winter	30	+0%	100/15	Winter			46.257
S1.002	S7	30 Winter	30	+0%	100/15	Winter			46.256
S1.003	S8	30 Winter	30	+0%	100/15	Winter			46.255
S1.004	S9	30 Winter	30	+0%	100/15	Winter			46.249
S1.005	S10	30 Winter	30	+0%	100/15	Winter			46.242
S2.000	S11.7	15 Winter	30	+0%					47.353
S2.001	S11.17	30 Winter	30	+0%	100/15	Summer			46.647
S2.002	S11.21	30 Winter	30	+0%	100/15	Summer			46.646
S2.003	S11.29	30 Winter	30	+0%	30/15	Winter			46.642
S1.006	S11	30 Winter	30	+0%	100/15	Winter			46.240
S1.007	S12	30 Winter	30	+0%	30/15	Summer			46.235
S1.008	S-C3	30 Winter	30	+0%					44.146

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Innovyze					Network 2020.1.3				
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) <u>for Storm</u>									
		Surcharged Flooded			Half Drain Pipe				
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
S1.000	S5	-0.057	0.000	0.90			38.8	OK	
S1.001	S6	-0.443	0.000	0.08			37.2	OK	
S1.002	S7	-0.419	0.000	0.06			29.8	OK	
S1.003	S8	-0.395	0.000	0.04			31.2	OK	
S1.004	S9	-0.321	0.000	0.08			40.3	OK	
S1.005	S10	-0.298	0.000	0.09			30.9	OK	
S2.000	S11.7	-0.527	0.000	0.03			14.5	OK	
S2.001	S11.17	-0.158	0.000	0.05			22.6	OK	
S2.002	S11.21	-0.119	0.000	0.04			18.1	OK	
S2.003	S11.29	0.102	0.000	0.05			9.8	SURCHARGED	
S1.006	S11	-0.280	0.000	0.10			37.5	OK	
S1.007	S12	0.335	0.000	0.53			32.4	SURCHARGED	
S1.008	S-C3	-0.204	0.000	0.23			32.4	OK	
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File 9003 - SURFACE WATER - ...

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Micro Drainage

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Network 2020.1.3

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

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

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.360

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S5	15 Winter	100	+40%	100/15 Summer				47.788
S1.001	S6	60 Winter	100	+40%	100/15 Winter				47.439
S1.002	S7	60 Winter	100	+40%	100/15 Winter				47.439
S1.003	S8	60 Winter	100	+40%	100/15 Winter				47.438
S1.004	S9	60 Winter	100	+40%	100/15 Winter				47.437
S1.005	S10	60 Winter	100	+40%	100/15 Winter				47.436
S2.000	S11.7	60 Winter	100	+40%					47.711
S2.001	S11.17	60 Winter	100	+40%	100/15 Summer				47.709
S2.002	S11.21	60 Winter	100	+40%	100/15 Summer				47.708
S2.003	S11.29	60 Winter	100	+40%	30/15 Winter				47.709
S1.006	S11	60 Winter	100	+40%	100/15 Winter				47.435
S1.007	S12	60 Winter	100	+40%	30/15 Summer				47.433
S1.008	S-C3	60 Winter	100	+40%					44.146

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Innovyze			Network 2020.1.3						
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
	Surcharged Flooded Half Drain Pipe								
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
S1.000	S5	0.163	0.000	1.61			69.7	SURCHARGED	
S1.001	S6	0.739	0.000	0.09			45.5	SURCHARGED	
S1.002	S7	0.764	0.000	0.07			36.3	SURCHARGED	
S1.003	S8	0.788	0.000	0.06			42.7	SURCHARGED	
S1.004	S9	0.867	0.000	0.10			49.8	SURCHARGED	
S1.005	S10	0.896	0.000	0.10			37.4	SURCHARGED	
S2.000	S11.7	-0.169	0.000	0.03			14.5	OK	
S2.001	S11.17	0.904	0.000	0.05			25.3	SURCHARGED	
S2.002	S11.21	0.943	0.000	0.04			18.7	FLOOD RISK	
S2.003	S11.29	1.169	0.000	0.05			10.0	FLOOD RISK	
S1.006	S11	0.915	0.000	0.11			42.1	SURCHARGED	
S1.007	S12	1.533	0.000	0.53			32.4	SURCHARGED	
S1.008	S-C3	-0.204	0.000	0.23			32.4	OK	
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4. THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH & SAFETY PLAN.
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 - 9003-WML-ZZ-XX-DR-C-1054
 - 9003-WML-ZZ-XX-DR-C-1055
 - 9003-WML-ZZ-XX-DR-C-1056



Phase 2 Geo-Environmental Investigation & Assessment Executive Summary

Extracted from 9003G-WML-00-XX-RP-G-000

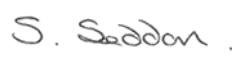
Phase 2 Geo-Environmental Investigation & Assessment

For

Glendene, Wythenshawe

Undertaken on behalf of

Garden City Design and Build Ltd

Report Title:	Glendene, Wythenshawe Phase 2 Geo-environmental Investigation and Assessment
Report Reference:	9003G-WML-00-XX RP-G-0002
Client:	Garden City Design and Build Ltd
Issue Date:	24th January 2020
Drafted By:	T P Booth 
Reviewed By:	S C Seddon 
Authorised By:	P G Davies 

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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
-	24/01/2020	Final	TPB	SCS	PGD

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Executive Summary

Site Location	The site comprises the land off Greenbrow Road, Wythenshawe, Manchester. It is centred on approximate Ordnance Survey National Grid Reference 381050E, 387672N with an indicative postcode of M23 2RE.
Development Proposals	The site of a former children's care home is being considered for the development of 56 no low rise residential houses. External areas will comprise access roads, hardstanding for parking and private gardens.
Ground Conditions	Ground conditions encountered during the intrusive investigation comprised topsoil or made ground to depths of between 0.25m and 1.50 meters below ground level (mbgl), these being underlain by glacial till and completely weathered Bollin Mudstone strata to depths of between 1.40m and 3.10mbgl, where more intact mudstone bedrock was encountered.
Site Preparation and Earthworks	No demolition of the existing building will proceed until an asbestos survey has been undertaken with any Asbestos Containing Material (ACM) so encountered being removed by an appropriately licensed specialist. Following demolition, all existing basement walls, foundations and other buried structures should be removed to facilitate construction of new foundations and drainage. All existing asphalt/concrete hardstanding and below ground foundations removed as part of the clearance work, subject to appropriate screening, crushing and confirmatory testing, will be suitable for re-use as bulk fill at the site. In consideration of the proposed development plan and current site topography, it is considered that there will be a requirement for localised site re-profiling to provide a level development platform. Earthworks should be carried out in accordance with recommendations and guidance provided in BS6031:2009, Code of Practice for Earthworks. Topsoil stripped from the area of redevelopment should be stockpiled and protected from inclement weather for future use in garden / landscaped areas subject to confirmatory chemical analysis.
Foundations and Floor Slabs	Over the majority of the site, new structures can be supported on shallow spread foundations within the firm/stiff glacial till or weathered Bollin Mudstone at anticipated depths of between 1.00m and 1.50mbgl and designed on a net allowable bearing pressure not exceeding 100kN/m² to reduce differential settlements to tolerable limits. This is provided that all formations are carefully inspected to confirm the anticipated soil strength with any soft/loose or otherwise incompetent soils so encountered being excavated and replaced with foundation concrete. Assessment as to the soil shrinkage/heave potential should then be undertaken for each structure at design stage in consideration of a medium volume change potential for the clay with foundations designed to appropriate depths and possibly incorporating compressible lining where such effects are envisaged. In areas of foundations would need to be designed on a net allowable bearing pressure of no more than 50kN/m² on well compacted fill to the basement or natural strata and would need to be adequately reinforced to take account of potential differential settlements. It is therefore recommended that further ground investigations are undertaken to determine the foundation requirements for specific plot. This is particularly relevant in the north-east of the site, where an in-filled pond is suspected. In consideration of the thickness of made ground and the potential for clay shrinkage/heave due to existing/removed trees, it is recommended that new floor slabs are suspended.
Excavations and Groundwater	Excavations at the site will be feasible using conventional hydraulic plant. All excavations at the site requiring man-entry will need adequate lateral support, or will need to be battering back to a safe angle to ensure their stability. Perched groundwater inflows should be anticipated within excavations although conventional 'sump and pump' dewatering measures will likely be adequate to keep excavations dry.
Pavements	New road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3% for glacial till sub-grade.

Concrete Classification	The typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.
Soakaways	In consideration of the site being underlain by primarily cohesive soils, it is considered that soakaways would provide a suitable drainage option for the site.
Ground Gas	In consideration of the conceptual model and preliminary results it is anticipated that the localised peak concentrations of carbon dioxide at 5%, may not be representative of the gas regime and as such no specific ground gas protection measures would be required. However, due to the limited information at this time, the requirement for ground gas protection measures will need to be confirmed on completion of further ground gas monitoring and risk assessment. The final results will also need to be confirmed with the local authorities Environmental Health / Building Control Officer prior to any building design being finalised.
Contamination Assessment	Chemical analysis has confirmed that the site does not contain significant sources of ground contamination with the only exceedance relating to the PAH compound dibenz[a,h]anthracene being slightly elevated above its respective SL. However, 2no samples of made ground were found to contain fibres / clumps of chrysotile asbestos. As such, it cannot be wholly discounted that Asbestos Containing Material (ACM) and/or free fibres together with other unidentified contamination could occur on and beneath other areas of the site. Therefore without undertaking further plot specific ground investigation, a direct contact pollution linkage is plausible in proposed garden areas where made ground is exposed at the surface. The long-term risk from exposure to contaminants will be mitigated by removing the made ground from garden areas or alternatively covering it with a 600mm thickness of clean soil, comprising 450mm of sub-soil and 150mm of topsoil. Notwithstanding the above, all groundworks should therefore be undertaken under a watching brief by an asbestos specialist with any ACM so encountered being segregated for removal to landfill. Such operations may also need to incorporate specific control measures such as dust suppression, perimeter air monitoring and appropriate Personal Protective Equipment (PPE), as determined by the specialist. Based on the preliminary risk assessment and the results of the investigations and analyses risk to controlled waters from the site are considered low with no environmental remediation considered necessary.
Potable Water Supplies	The relevant water supply provider will need to be consulted with regards the selection of suitable water supply pipe materials for the development. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination is not envisaged. However, consideration may need to be given to the provision of lined service trenches and clean in-fill.
Waste Soils	On the basis of current information, it is likely that excavated made ground would be classified as Non-hazardous with natural strata classifies as 'Inert'. The disposal of topsoil would need to be considered separately due to its inherently high organic content. Final classification of soil for disposal would need to be confirmed by further analysis of bulk soils destined for landfill under consultation with the landfill operator.

United Utilities Sewer Records

WML Consulting Ltd

No. 8
Oak Green, Earl Road, Stanley Green Business Park
Cheadle Hulme, Cheshire
SK8 6QL

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: 9003G
Our Ref: UUPS-ORD-159769
Date: 31/03/2020**

Dear Sirs

Location: Glendene

I acknowledge with thanks your request dated 31/03/2020 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



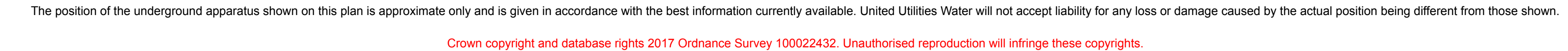
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



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