

**SURFACE WATER AND FOUL WATER DRAINAGE STRATEGY
INCORPORATING AN ASSESSMENT OF FLOOD RISK**

for

CITYSIDE UK Ltd.

PROPOSED RESIDENTIAL APARTMENTS

at

SPARTH HOUSE, MANCHESTER ROAD, ROCHDALE, OL11 3QY

JULY 2025

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1. INTRODUCTION

- 1.1 This surface water and foul water drainage strategy, including an assessment of flood risk, has been prepared on behalf of Cityside UK Ltd in support of a planning application for a proposed residential care home development at Sparth House, 185 Manchester Road, Rochdale, OL11 3QY. A location plan is provided in Appendix A.
- 1.2 This drainage strategy outlines the existing site conditions and details the proposed development. It assesses the potential impacts on the current drainage infrastructure and sets out a strategy for the design and implementation of new drainage systems to serve the development.

2. BASE INFORMATION

Existing site

- 2.1 The proposal concerns a roughly rectangular parcel of land, approximately 1,868 m² in area, located within Rochdale in the vicinity of The Highfield Hospital. The site is currently a domestic property with a large rear garden.
- 2.2 The site is bounded by Manchester Road to the west, domestic properties to the north and south and a private road / land to the east, which in turn is bordered by Castleton Bowling Club.

Understanding of existing drainage local to the site

- 2.3 The nearest Main River is the River Roch that is located approx. 1km to the west of the site.
- 2.4 The nearest off-site surface water feature is an unnamed ordinary watercourse located 118m to the northwest of the site within third party land.
- 2.5 Sewer records obtained from United Utilities, included in Appendix B, indicate the presence of a 300mm diameter public combined sewer located within Manchester Road. The sewer flows southward beneath Manchester Road and conveys both foul water and surface water runoff from the surrounding urban area.

Site geology

- 2.6 The Soilscales online viewer identifies the geology of the site as freely draining slightly acidic sandy soils.

Flood risk

- 2.7 The Flood Map for Planning identifies the site lying within Flood Zone 1, the lowest risk, and is identified as land assessed as having a less than 0.1% annual probability of river or sea flooding.

- 2.8 The Long Term Flood Risk map on the GOV.uk website shows the site is at a very low risk of surface water flooding. A very low risk means that each year, this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
- 2.9 The Rochdale Canal lies approx. 750m to the southeast of the site.
- 2.10 The Environment Agency risk of flooding from reservoirs map identifies the site is not at risk.
- 2.11 United Utilities sewer mapping indicates the presence of a 300mm diameter public combined sewer located within Manchester Road flowing to the south. If the sewer were to surcharge, then it would flow along Manchester Road and not affect the site.
- 2.12 Groundwater flooding is not considered to be a significant flood risk factor.
- 2.13 Surface water runoff from the development will be controlled prior to discharge from the developed site and attenuation provided. As such there will be no change to the flood risk upstream or downstream of this location.

Proposed development

- 2.14 The proposal involves the development of a low-rise residential care home on a site that is currently in use as a private domestic property.

3. PROPOSED DRAINAGE STRATEGY

3.1 The proposed drainage layout is included within Appendix C.

Surface water drainage

3.2 In accordance with the National Standards for Sustainable Drainage, the drainage strategy should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):

- (i) a controlled discharge to a local waterbody or watercourse, or
- (ii) a controlled discharge into the public sewer network (depending on availability and capacity).

3.3 The rates and volume of discharge should be restricted to the pre-development values as far as practicable.

3.4 The online Soilscales viewer identifies the geology of this site as freely draining slightly acidic sandy soils. The ground conditions may be suitable for discharging surface water runoff via infiltration. However, due to the size of the soakaway that will be needed to drain a development of this size, it will not be possible to install soakaways within the development site area as there is insufficient available space within the site in order to comply with Building Regulations.

3.5 The nearest off-site surface water feature is an unnamed ordinary watercourse located 118m to the northwest of the site within third party land, and it will not be possible to make a connection for a discharge of surface water runoff from the site to be made.

3.6 United Utilities sewer records indicate a 300mm diameter public combined sewer located within Manchester Road flowing southward. This sewer conveys both foul water and surface water runoff from the surrounding urban area.

- 3.7 It is therefore intended that new surface water drainage will be constructed, appropriately sized to take all surface water runoff from the new roofs and hardstanding areas, be controlled to the existing pre-development Greenfield runoff rate, Qbar, or 2.0 l/s whichever is the greater, allowing surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 45% on stored volumes to discharge into the public combined sewer located within Manchester Road. The additional 45% is to allow for climate change and has been included in the surface water volume.
- 3.8 To determine the restricted surface water discharge rate from the developed site, the pre-development Greenfield runoff rates have been calculated using the 'Causeway Flow' programme. The calculations are based upon the area of the development site and this has been measured as 0.187ha. The existing pre-development Greenfield runoff rates have been calculated as below:

Pre-development discharge

Site Makeup	Brownfield ▼
Brownfield Method	Greenfield ▼
Greenfield Method	IH124 ▼
Positively Drained Area (ha)	0.187
SAAR (mm)	1129
Soil Index	5 ▼
SPR	0.53
Region	10 ▼
Betterment (%)	0
	Calc
QBar (l/s)	2.1

Return Period (years)	Growth Factor	Q (l/s)
1	0.85	
30	1.95	
100	2.48	

- 3.9 As the existing pre-development Greenfield runoff rate, Q_{bar} , has been calculated as 2.1 l/s, it is intended that new surface water drainage will therefore be constructed, appropriately sized to take surface water runoff from the proposed development and be attenuated to 2.1 l/s prior to a controlled discharge into the public combined sewer located within Manchester Road.
- 3.10 The proposed surface water drainage for the development will take runoff from the building roofs and hardstanding areas.
- 3.11 A surface water drainage design has been carried out for the proposed development for all events up to the 100 year critical rain storm plus 45% for climate change on stored volumes. Attenuation is provided within underground storage located beneath hardstanding areas. The surface water drainage design is included within Appendix D.

Foul Water Drainage

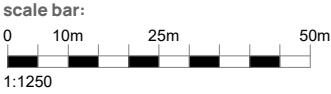
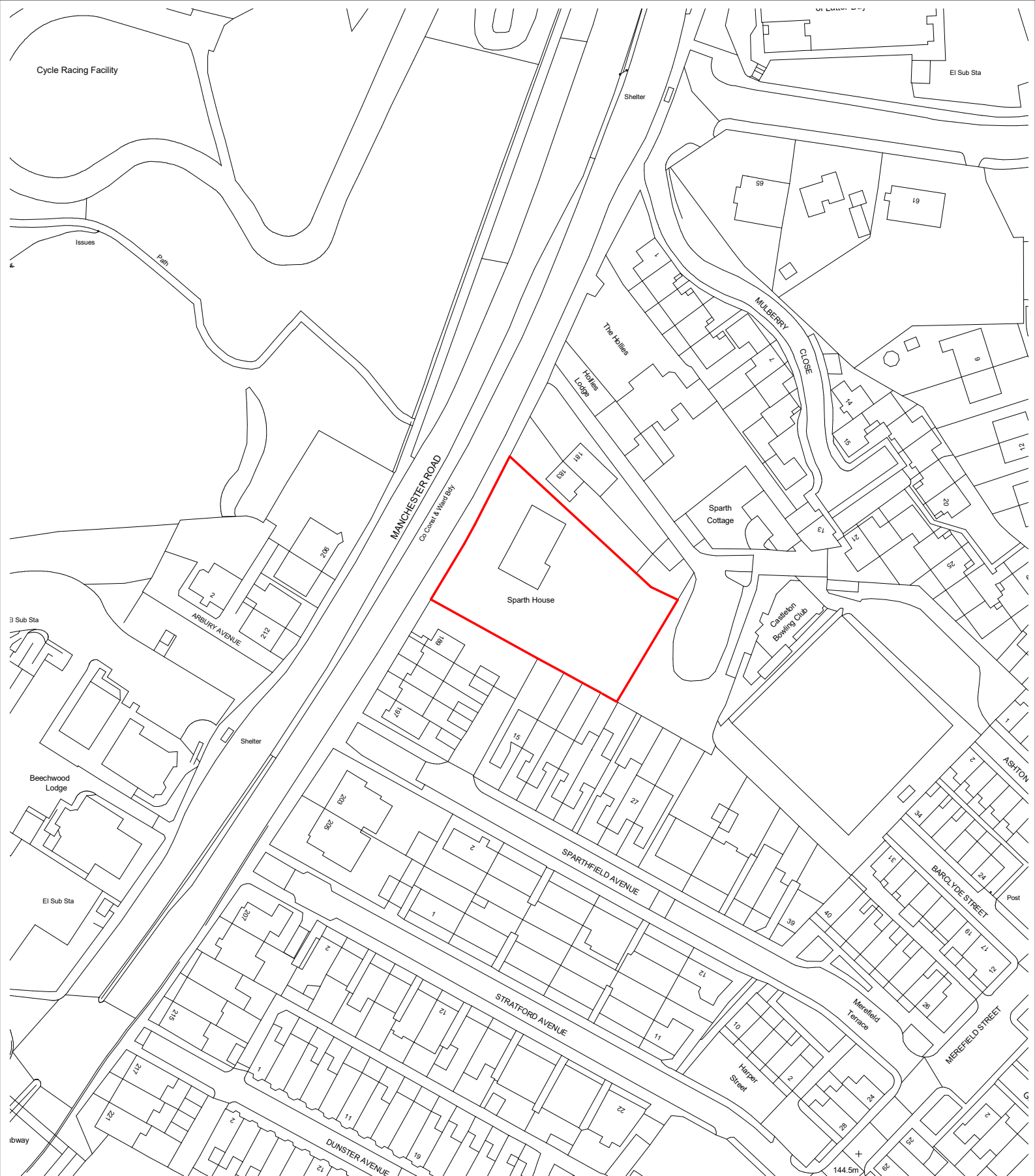
- 3.12 United Utilities sewer records indicate a 300mm diameter public combined sewer located within Manchester Road flowing southward. This sewer conveys both foul water and surface water runoff from the surrounding urban area.
- 3.13 Foul water from the developed site is to discharge into the public combined sewer within Manchester Road.

4. SUMMARY AND CONCLUSIONS

- 4.1 This surface water and foul water drainage strategy, along with an assessment of flood risk, has been prepared on behalf of Cityside UK Ltd in support of a planning application for a proposed residential care home development at Sparth House, 185 Manchester Road, Rochdale, OL11 3QY.
- 4.2 The risk of flooding to the development site is low.
- 4.3 New surface water drainage will be constructed, appropriately sized, to take surface water runoff from the proposed building roofs and hardstanding areas and be attenuated to 2.1 l/s prior to a controlled discharge being made into the public combined sewer located within Manchester Road.
- 4.4 Foul water from the developed site is to discharge into the public combined sewer within Manchester Road.

APPENDIX A

LOCATION PLAN

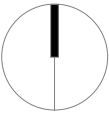


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ALL DIMENSIONS TO BE CHECKED ON SITE

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Architects.

client:

CitySide

project:

**185 Manchester Road -
Dementia Care Scheme**

stage:

Planning

revision:

A

title:

Location Plan

drawn by:

Author

approved by:

Approver

date:

05/05/25

job no:

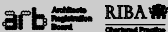
57.22

scale:

1 : 1250@A4

drawing no.

PRELIMINARY
E00



APPENDIX B

UNITED UTILITIES SEWER RECORDS

Kaye Harrison

6
Longbrook,
Shevington,
WN6 8DB

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: Sparth House
Our Ref: UUPS-ORD-527886
Date: 31/10/2023**

Dear Sirs

Location: 185 MANCHESTER ROAD, ROCHDALE, OL11 3QY

I acknowledge with thanks your request dated 30/10/2023 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,



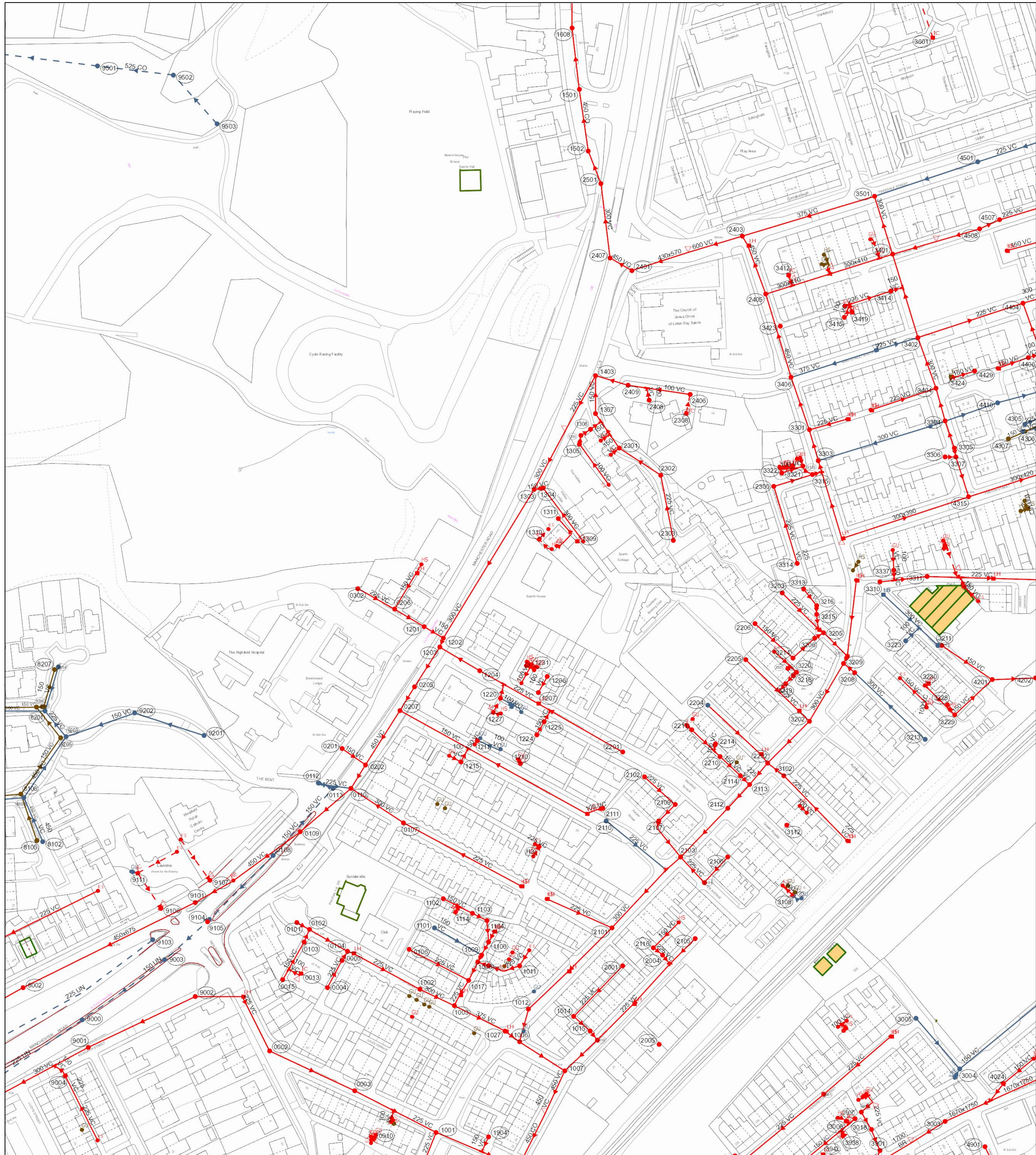
Karen McCormack
Property Searches Manager

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.



Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
2303	145.39	CO	143.77	225	225	VC	28.23427	1 in 25	
1501	141.09	CO	135.4	450	450	CO	34.23449	1 in 73	
2201	144.09	CO	141.05	225	225	VC	90.91844	1 in 62	
3005	141.47	SW	138.97	150	150	VC	36.87818	1 in 184	
1009	141.99	CO	140.2	225	225	VC	4.472136		
2105	143.62	SW	0	450	450	VC	15.78859		
0202	142.41	CO	0	450	450	VC	15.26434		
2316	142.03	SW	140.92	150	150	VC	5.385165		
0113	142.03	SW	140.92	150	150	VC	42.53801	1 in 6	
2110	142.44	CO	140.88	225	225	VC	19.10407	1 in 74	
0002	140.66	CO	137.13	225	225	VC	51.80412	1 in 88	
8002	140.83	CO	138.49	225	225	VC	65.36097	1 in 20	
3337	144.74	CO	141.8	150	150	VC	5.53101		
2113	142.23	CO	140.71	150	150	VC	7.071068		
2305	142.23	CO	140.71	150	150	VC	17.69181	1 in 106	
3221	137.01	CO	135.75	450	450	VC	22.35625		
3307	137.01	CO	135.75	450	450	VC	7.791801		
0109	145.07	CO	141.95	225	225	VC	23.06079		
2206	145.07	CO	141.95	225	225	VC	46.3596		
4404	145.07	CO	141.95	225	225	VC	28.3196		
8002	136.82	CO	133.34	450	450	VC	69.20304		
2403	142.51	CO	138.49	600	600	VC	67.60178	1 in 33	
9104	140.42	SW	138.86	150	150	VC	31.32052	1 in 44	
4507	145.01	CO	141.95	225	225	VC	34.68042	1 in 60	
1305	145.01	CO	141.95	225	225	VC	98.5225	1 in 81	
0302	145.01	CO	141.95	225	225	VC	4.811172		
1231	145.01	CO	141.95	225	225	VC	10.38524		
1027	145.01	CO	141.95	225	225	VC	23.18636		
2301	145.01	CO	141.95	225	225	VC	10		
3406	144.04	CO	141.22	450	450	VC	23.02173		
9103	138.73	CO	135.44	300	300	VC	48.08326		
3415	138.73	CO	135.44	300	300	VC	208.4164		
9001	138.73	CO	135.44	300	300	VC	8.379149		
1201	138.73	CO	135.44	300	300	VC	82.10553	1 in 24	
1201	138.73	CO	135.44	300	300	VC	6.403124		
1201	138.73	CO	135.44	300	300	VC	12.32476		
3303	145.11	CO	141.25	225	225	VC	10.38532		
3305	145.11	CO	141.25	225	225	VC	5.09902		
0201	141.88	CO	137.78	150	150	VC	15.81139		
1015	142.44	CO	141.25	225	225	VC	6.403124		
1202	145.25	CO	140.05	150	150	VC	6		
2214	142.61	CO	141.16	225	225	VC	5.385165		
3314	142.61	CO	141.16	225	225	VC	44.52811	1 in 99	
1007	141.59	CO	136.62	450	450	VC	3.782918		
2001	143.78	CO	142.5	225	225	VC	26.40076	1 in 20	
4202	143.33	CO	139.46	150	150	VC	38.8973	1 in 53	
8207	145.11	CO	142.33	300	300	VC	52.80151	1 in 32	
1120	143.72	CO	139.15	300	300	VC	21.34323		
2101	143.72	CO	139.15	300	300	VC	2.896286	1 in 132	
2103	144.48	CO	140.21	300	300	VC	64.35403	1 in 50	
0104	144.48	CO	140.21	300	300	VC	54.49357	1 in 53	
2211	144.48	CO	140.21	300	300	VC	45.22176		
1001	139.22	CO	135.89	225	225	VC	21.50841		
0003	140.32	CO	136.54	225	225	VC	12.43055		
8102	140.32	CO	136.54	225	225	VC	64.07809	1 in 41	
4901	140.17	CO	138.18	225	225	VC	50.50711	1 in 80	
1004	140.17	CO	138.18	225	225	VC	26.45106		
1106	141.79	CO	138.18	225	225	VC	24.96975	1 in 26	
1101	141.79	CO	138.18	225	225	VC	8.062258		
3205	141.79	CO	138.18	225	225	VC	30.01666	1 in 73	
3402	144.56	CO	141.81	225	225	VC	18.38478		
3209	144.56	CO	141.81	225	225	VC	61.02778	1 in 139	
1204	141.75	CO	138.56	225	225	VC	37.21559		
3206	142.27	CO	142.84	150	150	VC	25.53387		
1012	142.49	CO	137.84	300	300	VC	5.830502		
0103	141.36	CO	138.89	150	150	VC	19.68154	1 in 98	
2407	141.36	CO	138.89	150	150	VC	7.815773		
3307	144.57	CO	141.67	375	375	VC	41.30375		
3307	144.57	CO	141.67	375	375	VC	43.67972	1 in 79	
8205	142.11	CO	140.5	150	150	VC	43.56815		
3315	142.11	CO	140.5	150	150	VC	21.48727		
1308	141.22	CO	136.53	450	450	VC	5.252078		
2001	141.22	CO	136.53	450	450	VC	7.10235	1 in 97	
1014	142.87	CO	141.75	225	225	VC	19.31321	1 in 27	
1220	140.61	CO	137.93	150	150	VC	12.04159		
1304	140.61	CO	137.93	150	150	VC	7.843607	1 in 11	
4306	145.27	SW	144.27	225	225	VC	5.107324	1 in 11	
2303	145.04	CO	141.91	225	225	VC	15.2417	1 in 29	
3311	145.04	CO	141.91	225	225	VC	36.87424		
3313	145.04	CO	141.91	225	225	VC	89.02904		
3219	141.33	CO	138.62	150	150	VC	0		
3218	141.33	CO	138.62	150	150	VC	5.789088		
1008	141.33	CO	138.62	150	150	VC	8.962258		
8201	141.33	CO	138.62	150	150	VC	5.985033		
1008	141.33	CO	138.62	150	150	VC	11.8034		
8201	141.33	CO	138.62	150	150	VC	40.18146		
4329	141.47	CO	137.22	150	150	VC	5.173666		
3212	144.6	CO	141.13	150	150	VC	13.89244	1 in 52	
4508	144.91	CO	142.07	225	225	VC	33.87855		
1211	144.91	CO	142.07	225	225	VC	8.062258	1 in 151	
9003	138.28	UN	56.37	150	150	VC	2.715405		
1103	142.69	CO	141.04	150	150	VC	56.37	1 in 31	
2405	142.69	CO	141.04	150	150	VC	8.94272	1 in 64	
3001	139.28	CO	136.9	225	225	VC	34.62331		
2401	140.24	CO	136.9	225	225	VC	59.66574	1 in 30	
8201	140.24	CO	136.9	225	225	VC	105.9906	1 in 63	
3012	140.24	CO	136.9	225	225	VC	51.39		
3012	140.24	CO	136.9	225	225	VC	11.15581		
3202	145.09	CO	141.53	300	300	VC	32.52691	1 in 163	
2202	144.87	CO	141.28	300	300	VC	15.6205		
2409	144.87	CO	141.28	300	300	VC	18.61581		
3102	144.87	CO	141.89	225	225	VC	11.40175	1 in 52	
0207	144.87	CO	141.89	225	225	VC	35.51066		
1016	144.87	CO	141.89	225	225	VC	24.75884		
4024	144.87	CO	141.89	225	225	VC	12.14024		
1225	144.87	CO	141.89	225	225	VC	7.108787		
0102	144.87	CO	141.89	225	225	VC	24.18677		
1003	144.87	CO	141.89	225	225	VC	31.34065	1 in 144	
3304	145	CO	142.19	300	300	VC	18.68154		
2406	145	CO	142.19	300	300	VC	34.66432		
1306	145	CO	142.19	300	300	VC	6.451639		
2408	145	CO	142.19	300	300	VC	6.83573		
3004	141	SW	139.76	150	150	VC	132.1363	1 in 200	
2116	141.75	SW	139.76	150	150	VC	6.403124		
9203	141.75	SW	139.76	150	150	VC	18.30528		
1017	141.75	SW	139.76	150	150	VC	18.14219		
1104	142.67	CO	140.88	150	150	VC	12.94159		
2112	144.83	CO	140.86	300	300	VC	37.48333	1 in 59	
1107	144.83	CO	140.86	300	300	VC	4.123106		
4315	145.38	CO	141.85	300	300	VC	61.88387	1 in 132	
0005	141.13	CO	138.99	225	225	VC	5.830502		
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1203	145.32	SW	143.95	150	150	VC	26.70881		
8103	145.32	SW	143.95	150	150	VC	40.85668		
0106	141.61	CO	137.78	150	150	VC	21.0238	1 in 102	
1002	141.58	CO	137.78	150	150	VC	37.12142		
0110	142.11	CO	135.98	450	450	VC	36.87818	1 in 168	
1102	142.4	CO	140.78	150	150	VC	17.88854	1 in 66	
3322	142.4	CO	140.78	150	150	VC	12.22518		
2302	142.4	CO	140.78	150	150	VC	27.43936		
1403	141.09	CO	138.19	225	225	VC	35.35334	1 in 74	
3501	143.8	CO	140.17	375	375	VC	76.24303	1 in 52	
0108	141.5	SW	140.98	150	150	VC	49.57622	1 in 190	
0206	141.34	CO	138.38	225	225	VC	19.05995		
3006	145.29	CO	142.34	300	300	VC	7.41025		
4508	144.91	CO	142.09	225	225	VC	25	1 in 50	
2204	144.97	CO	142.39	225	225	VC	46.02635	1 in 38	
3401	144.08	CO	141.37	300	300	VC	33.52811	1 in 80	
3108	144.08	CO	141.37	300	300	VC	0.641524		
1206	144.08	CO	141.37	300	300	VC	10.07279		
2205	145.01	CO	143.03	225	225	VC	48.79657	1 in 42	
9502	133.14	SW	111.56	525	525	VC	42.2960		

APPENDIX C

PROPOSED DRAINAGE LAYOUT

DRAINAGE NOTES

1. UN-ADOPTED FW & SW DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH CURRENT BUILDING REGULATIONS, INCLUDING APPROVED DOCUMENT H (UPDATED 2015); BS EN 752:2008 AND OTHER RELEVANT STANDARDS AND CERTIFICATES.

2. THE LOCATION AND LEVELS OF EXISTING DRAINAGE PIPES AND CULVERTS MUST BE CHECKED ON-SITE PRIOR TO CONSTRUCTION.

3. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO THE COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORKS.

4. DRAINS ARE TO BE CONSTRUCTED USING FLEXIBLY JOINTED VITRIFIED CLAY PIPES TO BS 65 (1991) AND BS EN 295 (2012 / 2013); OR UPVC BUILDING DRAINAGE SYSTEM PIPEWORK TO BS 4660 (2000), BS EN 13589-1 (2010) * BS EN 1401-1 (2009); BEDDED & BACKFILLED IN ACCORDANCE WITH THE MANUFACTURERS' INSTRUCTIONS.

5. BACKFILLING OF DRAIN TRENCHES ADJACENT TO DWELLINGS OR OTHER STRUCTURES TO BE IN ACCORDANCE WITH BS EN 1610 (1998) AND APPROVED DOCUMENT H.

6. ACCESS FITTINGS & INSPECTION CHAMBERS <1.2m DEEP ARE TO BE CLAYWARE OR PRE-FORMED POLYPROPYLENE AS APPROPRIATE TO THE NUMBER OF CONNECTIONS. POLYPROPYLENE CHAMBERS CAN BE USED UP TO 3m DEEP BUT REQUIRE A MAX 350mm DIAMETER RESTRICTOR RING TO PREVENT MAN ENTRY. INSPECTION CHAMBER SIZES ARE TO BE CONSTRUCTED IN ACCORDANCE WITH BS EN 752 (2008).

7. MANHOLE CHAMBERS ARE TO BE OF PRECAST CONCRETE CONSTRUCTION WITH 150mm INSITU CONCRETE SURROUND WITH A MINIMUM CLEAR OPENING OF 600mm.

8. POLYPROPYLENE INSPECTION CHAMBERS ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

9. COVER LEVELS INDICATED ON THE DRAWINGS ARE NOMINAL AND MAY BE ADJUSTED TO SUIT FINISHED LEVELS AS NECESSARY. INSPECTION CHAMBER COVERS SHOULD BE GRADE A15 FOR PEDESTRIAN AREAS ONLY, C250 FOR LIGHTLY TRAFFICKED ROADS AND SMALL PRIVATE CAR PARKS, AND D400 WITHIN THE ACCESS ROAD.

10. WHERE DRAINS PASS THROUGH FOUNDATIONS OR OTHER RIGID STRUCTURES, A LINTEL OR SLEEVE IS TO BE USED & PROVISION FOR FLEXIBILITY IS TO BE MADE WITH ROCKER PIPES.

11. ANY EXISTING LAND DRAINS SEVERED BY SITE OPERATIONS SHOULD BE DIVERTED AROUND ANY PROPERTIES/BUILDINGS AND RECONNECTED TO THE EXISTING LAND DRAINAGE SYSTEM VIA A SILT TRAP.

12. CONCRETE PROTECTION REQUIRED TO PIPES WHERE DEPTH OF PIPE FROM GROUND LEVEL TO BARREL IS <0.6m WITHIN NON-TRAFFICKED AREAS; <0.9m WITHIN DOMESTIC DRIVEWAYS AND LIGHT ROADS; AND <1.2 m WITHIN THE PUBLIC HIGHWAY, OTHERWISE PIPES TO BE LAID IN CLASS S BEDDING (150mm GRANULAR BED & SURROUND).

13. WHERE PIPES RUN UNDER BUILDINGS AND WHERE COVER TO UNDERSIDE OF SLAB IS LESS THAN 300mm, PROVIDE A CONCRETE BED AND SURROUND.

14. UNLESS NOTED OTHERWISE, ALL FOUL DRAINS ARE 150mm DIA. AND SURFACE WATER DRAINS ARE 150mm DIA. SURFACE WATER CONNECTIONS FROM RWPs TO BE 100mm DIA.

15. MINIMUM GRADIENTS (UNLESS NOTED OTHERWISE):

FOUL
IN ACCORDANCE WITH BUILDING REGS DOC H TABLE 6.
100 DIA FROM OUTLETS WITHIN BUILDING TO INSPECTION CHAMBER 1:40,
THEREAFTER 1:80
150 DIA IN ACCORDANCE WITH BUILDING REGS DOC H TABLE 6.
SURFACE WATER
100 DIA 1:100, 150 DIA 1:150

16. ALL REDUNDANT DRAINS AND CHAMBERS TO BE REMOVED AS FAR AS PRACTICABLE OR ELSE GROUTED AND SEALED.

17. BEDDING AND BACKFILL TO CONFORM TO THE REQUIREMENT OF THE WATER INDUSTRY SPECIFICATION 4-08-02 (TABLE A2).

18. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTORS AND BENDS.

19. THE POSITIONS OF SVP'S, STUB-STACKS, WC OUTLETS AND RAINWATER DOWNPIPES ARE TO BE ACCURATELY LOCATED FROM THE ARCHITECT'S DRAWINGS.

20. CATCHPIT CHAMBERS ARE REQUIRED TO HAVE A MINIMUM 300mm SUMP.

21. COVER TO ATTENUATION TANKS BELOW CAR PARK ASSUMED TO BE MINIMUM 650MM IN LINE WITH POLYPIPE POLYSTORM DETAILS FOR VEHICLES <9000KG.

LEGEND

- EXISTING COMBINED DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL DRAIN
- PROPOSED COMBINED DRAIN
- MH
- EXISTING COMBINED MANHOLE
- PROPOSED COMBINED MANHOLE
- PROPOSED FOUL INSPECTION CHAMBER/ MANHOLE
- PROPOSED SURFACE WATER INSPECTION CHAMBER/ MANHOLE
- RWP
- SVP
- G
- PROPOSED RAINWATER PIPE
- PROPOSED SOIL VENT PIPE
- PROPOSED GULLY
- PROPOSED RODDING EYE
- PROPOSED GEOCELLULAR ATTENUATION WRAPPED IN GEOTEXTILE MEMBRANE, SEE DETAIL

Rev	Details	Drawn By	Chk/App By	Date
P4	SCHEME REVISED	KLH	TF	04.07.25
P3	DETAILS ADDED	SHR	KLH	05.02.24
P2	SOAKAWAY REMOVED DRAINAGE RUN AMENDED	SHR	KLH	19.01.24
P1	ISSUED FOR INFORMATION	SHR	KLH	17.11.23

Client:
CS MANCHESTER ROAD LTD

Project:
**72 BED NURSING HOME
SPARTH HOUSE
ROCHDALE**

Title:
**PROPOSED DRAINAGE
GENERAL ARRANGEMENT**

Issued For:
INFORMATION

Reid Jones partnership

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Scale:	1:100	@	(A1)
Project No:	11610	Drawing No:	400
Issue:	P4		

DO NOT SCALE - USE FIGURED DIMENSIONS ONLY.
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PROPOSED DRAINAGE
GENERAL ARRANGEMENT

1:100

NOTE
GULLY POSITIONS TO BE
CONFIRMED BY ARCHITECT
SVP POSITIONS TO BE CONFIRMED
BY ARCHITECT

PRELIMINARY DRAWING.
NOT FOR CONSTRUCTION.

APPENDIX D

SURFACE WATER DRAINAGE DESIGN

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.280	Preferred Cover Depth (m)	0.800
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.021	5.00	141.700	450	0.950
2	0.009	5.00	141.700	450	1.287
3	0.004	5.00	141.700	450	1.388
4	0.031	5.00	141.700	450	1.641
5			141.600	450	1.608
6	0.015	5.00	141.700	450	1.000
att 1	0.019	5.00	141.500	450	1.800
7	0.016	5.00	141.700	450	0.950
8	0.016	5.00	141.700	450	1.000
9	0.004	5.00	141.700	450	1.337
10			141.600	450	1.540
11	0.014	5.00	141.700	450	1.000
att 2	0.019	5.00	141.500	450	1.800
12			141.300	1200	1.620
13			141.300	1200	1.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	20.000	0.600	140.750	140.413	0.337	59.3	150	5.25	54.5
1.001	2	3	6.000	0.600	140.413	140.312	0.101	59.4	150	5.33	54.2
1.002	3	4	15.000	0.600	140.312	140.059	0.253	59.3	150	5.52	53.5
1.003	4	5	4.000	0.600	140.059	139.992	0.067	59.7	150	5.57	53.3
1.004	5	att 1	1.000	0.600	139.992	139.952	0.040	25.0	150	5.58	53.3
2.000	6	att 1	1.000	0.600	140.700	140.400	0.300	3.3	100	5.00	55.5
1.005	att 1	12	1.000	0.600	139.700	139.680	0.020	50.0	150	5.59	53.2
3.000	7	9	23.000	0.600	140.750	140.363	0.387	59.4	150	5.29	54.4
4.000	8	9	6.000	0.600	140.700	140.413	0.287	20.9	100	5.06	55.3
3.001	9	10	18.000	0.600	140.363	140.060	0.303	59.4	150	5.52	53.5
3.002	10	att 2	1.000	0.600	140.060	140.020	0.040	25.0	150	5.53	53.5
5.000	11	att 2	1.000	0.600	140.700	140.400	0.300	3.3	100	5.00	55.5
3.003	att 2	12	1.000	0.600	139.700	139.680	0.020	50.0	150	5.54	53.4
1.006	12	13	3.000	0.600	139.680	139.600	0.080	37.5	150	5.62	53.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.308	23.1	4.1	0.800	1.137	0.021	0.0
1.001	1.307	23.1	5.9	1.137	1.238	0.030	0.0
1.002	1.308	23.1	6.6	1.238	1.491	0.034	0.0
1.003	1.304	23.0	12.5	1.491	1.458	0.065	0.0
1.004	2.022	35.7	12.5	1.458	1.398	0.065	0.0
2.000	4.267	33.5	3.0	0.900	1.000	0.015	0.0
1.005	1.426	25.2	19.0	1.650	1.470	0.099	0.0
3.000	1.307	23.1	3.1	0.800	1.187	0.016	0.0
4.000	1.696	13.3	3.2	0.900	1.187	0.016	0.0
3.001	1.307	23.1	7.0	1.187	1.390	0.036	0.0
3.002	2.022	35.7	7.0	1.390	1.330	0.036	0.0
5.000	4.267	33.5	2.8	0.900	1.000	0.014	0.0
3.003	1.426	25.2	13.3	1.650	1.470	0.069	0.0
1.006	1.648	29.1	32.2	1.470	1.550	0.168	0.0

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	141.700	0.950	450					
				0	1.000	140.750	150	
2	141.700	1.287	450		1	1.000	140.413	150
				0	1.001	140.413	150	
3	141.700	1.388	450		1	1.001	140.312	150
				0	1.002	140.312	150	
4	141.700	1.641	450		1	1.002	140.059	150
				0	1.003	140.059	150	
5	141.600	1.608	450		1	1.003	139.992	150
				0	1.004	139.992	150	
6	141.700	1.000	450					
				0	2.000	140.700	100	
att 1	141.500	1.800	450		1	2.000	140.400	100
				2	1.004	139.952	150	
				0	1.005	139.700	150	
7	141.700	0.950	450					
				0	3.000	140.750	150	

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
8	141.700	1.000	450		0	4.000	140.700	100
9	141.700	1.337	450		1	4.000	140.413	100
					2	3.000	140.363	150
					0	3.001	140.363	150
10	141.600	1.540	450		1	3.001	140.060	150
					0	3.002	140.060	150
11	141.700	1.000	450					
					0	5.000	140.700	100
att 2	141.500	1.800	450		1	5.000	140.400	100
					2	3.002	140.020	150
				0	3.003	139.700	150	
12	141.300	1.620	1200		1	3.003	139.680	150
					2	1.005	139.680	150
				0	1.006	139.680	150	
13	141.300	1.700	1200		1	1.006	139.600	150

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Additional Storage (m ³ /ha)	20.0
Rainfall Events	Singular	Winter CV	1.000	Starting Level (m)	
FSR Region	England and Wales	Analysis Speed	Normal	Check Discharge Rate(s)	x
M5-60 (mm)	19.000	Skip Steady State	x	Check Discharge Volume	x
Ratio-R	0.280	Drain Down Time (mins)	240		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	40	0	0	100	45	0	0

Node 12 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	139.680	Product Number	CTL-SHE-0062-2100-1600-2100
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.1	Min Node Diameter (mm)	1200

Node att 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	139.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	86.0	0.0	0.800	86.0	0.0	0.801	0.0	0.0

Node att 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	139.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	86.0	0.0	0.800	86.0	0.0	0.801	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	140.793	0.043	4.1	0.0256	0.0000	OK
15 minute summer	2	10	140.468	0.055	5.9	0.0165	0.0000	OK
15 minute summer	3	10	140.366	0.054	6.6	0.0118	0.0000	OK
15 minute summer	4	11	140.151	0.092	12.5	0.0492	0.0000	OK
15 minute summer	5	11	140.076	0.084	12.4	0.0134	0.0000	OK
15 minute summer	6	10	140.723	0.023	2.9	0.0107	0.0000	OK
480 minute summer	att 1	328	139.883	0.183	4.3	15.0292	0.0000	SURCHARGED
15 minute summer	7	10	140.787	0.037	3.1	0.0183	0.0000	OK
15 minute summer	8	10	140.735	0.035	3.1	0.0166	0.0000	OK
15 minute summer	9	10	140.421	0.058	7.0	0.0126	0.0000	OK
15 minute summer	10	11	140.118	0.058	6.9	0.0093	0.0000	OK
15 minute summer	11	10	140.722	0.022	2.7	0.0099	0.0000	OK
480 minute summer	att 2	328	139.883	0.183	3.0	15.0066	0.0000	SURCHARGED
480 minute summer	12	328	139.884	0.204	2.6	0.2309	0.0000	SURCHARGED
15 minute summer	13	1	139.600	0.000	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	4.1	0.816	0.176	0.0997	
15 minute summer	2	1.001	3	5.8	0.995	0.250	0.0348	
15 minute summer	3	1.002	4	6.5	0.763	0.280	0.1276	
15 minute summer	4	1.003	5	12.4	1.154	0.537	0.0429	
15 minute summer	5	1.004	att 1	12.4	1.468	0.347	0.0085	
15 minute summer	6	2.000	att 1	2.9	2.334	0.086	0.0012	
480 minute summer	att 1	1.005	12	1.7	0.310	0.066	0.0176	
15 minute summer	7	3.000	9	3.1	0.646	0.133	0.1104	
15 minute summer	8	4.000	9	3.1	1.331	0.232	0.0139	
15 minute summer	9	3.001	10	6.9	1.098	0.297	0.1126	
15 minute summer	10	3.002	att 2	6.9	1.286	0.192	0.0054	
15 minute summer	11	5.000	att 2	2.7	2.295	0.080	0.0012	
480 minute summer	att 2	3.003	12	1.7	0.315	0.066	0.0176	
480 minute summer	12	Hydro-Brake®	13	1.6				50.3

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	140.822	0.072	10.8	0.0431	0.0000	OK
15 minute summer	2	11	140.573	0.160	15.3	0.0479	0.0000	SURCHARGED
15 minute summer	3	11	140.519	0.207	15.7	0.0449	0.0000	SURCHARGED
15 minute summer	4	11	140.380	0.321	30.5	0.1724	0.0000	SURCHARGED
600 minute winter	5	570	140.321	0.329	3.9	0.0523	0.0000	SURCHARGED
15 minute summer	6	10	140.743	0.043	7.7	0.0197	0.0000	OK
600 minute winter	att 1	570	140.319	0.619	6.0	50.7949	0.0000	SURCHARGED
15 minute summer	7	10	140.812	0.062	8.3	0.0306	0.0000	OK
15 minute summer	8	10	140.763	0.063	8.3	0.0302	0.0000	OK
15 minute summer	9	10	140.470	0.107	18.6	0.0235	0.0000	OK
600 minute winter	10	570	140.319	0.259	2.2	0.0411	0.0000	SURCHARGED
15 minute summer	11	10	140.741	0.041	7.2	0.0180	0.0000	OK
600 minute winter	att 2	570	140.319	0.619	5.2	50.7797	0.0000	SURCHARGED
600 minute winter	12	570	140.320	0.640	3.5	0.7239	0.0000	SURCHARGED
15 minute summer	13	1	139.600	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	10.7	1.010	0.464	0.2571	
15 minute summer	2	1.001	3	13.8	1.151	0.597	0.1056	
15 minute summer	3	1.002	4	17.1	0.985	0.741	0.2641	
15 minute summer	4	1.003	5	30.3	1.724	1.317	0.0704	
600 minute winter	5	1.004	att 1	3.9	1.116	0.108	0.0176	
15 minute summer	6	2.000	att 1	7.7	2.851	0.229	0.0027	
600 minute winter	att 1	1.005	12	1.8	0.311	0.072	0.0176	
15 minute summer	7	3.000	9	8.2	0.806	0.356	0.2336	
15 minute summer	8	4.000	9	8.2	1.676	0.619	0.0295	
15 minute summer	9	3.001	10	18.3	1.347	0.791	0.2443	
600 minute winter	10	3.002	att 2	3.4	0.987	0.095	0.0176	
15 minute summer	11	5.000	att 2	7.2	2.817	0.214	0.0026	
600 minute winter	att 2	3.003	12	1.7	0.331	0.069	0.0176	
600 minute winter	12	Hydro-Brake®	13	1.6				62.4

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	140.819	0.069	10.0	0.0412	0.0000	OK
15 minute summer	2	11	140.514	0.100	14.2	0.0300	0.0000	OK
15 minute summer	3	11	140.479	0.167	15.7	0.0363	0.0000	SURCHARGED
15 minute summer	4	11	140.346	0.287	29.1	0.1543	0.0000	SURCHARGED
480 minute winter	5	448	140.247	0.255	4.6	0.0406	0.0000	SURCHARGED
15 minute summer	6	10	140.741	0.041	7.1	0.0187	0.0000	OK
480 minute winter	att 1	464	140.246	0.546	6.5	44.7982	0.0000	SURCHARGED
15 minute summer	7	10	140.809	0.059	7.6	0.0292	0.0000	OK
15 minute summer	8	10	140.759	0.059	7.6	0.0284	0.0000	OK
15 minute summer	9	10	140.463	0.100	17.0	0.0220	0.0000	OK
480 minute winter	10	464	140.246	0.186	2.3	0.0295	0.0000	SURCHARGED
15 minute summer	11	10	140.739	0.039	6.7	0.0172	0.0000	OK
480 minute winter	att 2	464	140.246	0.546	4.8	44.7885	0.0000	SURCHARGED
600 minute summer	12	555	140.246	0.566	3.5	0.6400	0.0000	SURCHARGED
15 minute summer	13	1	139.600	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	9.9	0.994	0.429	0.2018	
15 minute summer	2	1.001	3	13.8	1.186	0.596	0.0904	
15 minute summer	3	1.002	4	15.4	0.877	0.668	0.2641	
15 minute summer	4	1.003	5	28.8	1.637	1.251	0.0704	
480 minute winter	5	1.004	att 1	4.3	1.155	0.120	0.0176	
15 minute summer	6	2.000	att 1	7.1	2.809	0.211	0.0025	
480 minute winter	att 1	1.005	12	2.1	0.344	0.083	0.0176	
15 minute summer	7	3.000	9	7.5	0.795	0.327	0.2177	
15 minute summer	8	4.000	9	7.6	1.649	0.567	0.0275	
15 minute summer	9	3.001	10	16.8	1.326	0.727	0.2280	
480 minute winter	10	3.002	att 2	3.2	0.998	0.089	0.0176	
15 minute summer	11	5.000	att 2	6.7	2.779	0.199	0.0024	
480 minute winter	att 2	3.003	12	1.9	0.310	0.076	0.0176	
600 minute summer	12	Hydro-Brake®	13	1.6				61.5

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	1	675	141.099	0.349	2.3	0.2099	0.0000	SURCHARGED
720 minute winter	2	675	141.099	0.686	2.1	0.2051	0.0000	SURCHARGED
720 minute winter	3	675	141.095	0.783	2.4	0.1700	0.0000	SURCHARGED
960 minute winter	4	750	141.098	1.039	5.9	0.5578	0.0000	SURCHARGED
480 minute winter	5	448	141.107	1.115	28.1	0.1772	0.0000	SURCHARGED
960 minute winter	6	735	141.105	0.405	14.4	0.1861	0.0000	SURCHARGED
480 minute winter	att 1	456	141.154	1.454	66.5	65.9387	0.0000	SURCHARGED
720 minute winter	7	645	141.093	0.343	1.1	0.1702	0.0000	SURCHARGED
960 minute winter	8	735	141.091	0.391	1.1	0.1873	0.0000	SURCHARGED
720 minute winter	9	630	141.091	0.728	3.0	0.1594	0.0000	SURCHARGED
960 minute winter	10	810	141.112	1.051	23.7	0.1672	0.0000	SURCHARGED
720 minute winter	11	585	141.099	0.399	3.9	0.1751	0.0000	SURCHARGED
480 minute winter	att 2	456	141.283	1.583	66.6	65.9865	0.0000	FLOOD RISK
960 minute winter	12	735	141.104	1.424	63.5	1.6105	0.0000	FLOOD RISK
15 minute summer	13	1	139.600	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	1	1.000	2	-2.0	0.635	-0.086	0.3521	
720 minute winter	2	1.001	3	2.2	0.760	0.095	0.1056	
720 minute winter	3	1.002	4	5.3	0.625	0.227	0.2641	
960 minute winter	4	1.003	5	3.8	0.874	0.164	0.0704	
480 minute winter	5	1.004	att 1	28.7	1.628	0.802	0.0176	
960 minute winter	6	2.000	att 1	-14.2	-1.810	-0.423	0.0078	
480 minute winter	att 1	1.005	12	39.1	2.222	1.552	0.0176	
720 minute winter	7	3.000	9	1.6	0.490	0.067	0.4049	
960 minute winter	8	4.000	9	1.0	0.949	0.076	0.0469	
720 minute winter	9	3.001	10	2.5	0.847	0.108	0.3169	
960 minute winter	10	3.002	att 2	-16.0	0.941	-0.446	0.0176	
720 minute winter	11	5.000	att 2	8.3	1.792	0.249	0.0078	
480 minute winter	att 2	3.003	12	50.2	2.853	1.993	0.0176	
960 minute winter	12	Hydro-Brake®	13	2.0				103.6