



Stopes Road, Little Lever Drainage Strategy

For Harworth Estates Investments Ltd

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1. INTRODUCTION

This report has been prepared by Hydrock Consultants Limited on behalf of Harworth Estates Investments Ltd in support of an Outline Planning Application to be submitted to Bolton Council for a proposed commercial/industrial development at Stopes Road, Little Lever.

The surface water drainage strategy has been produced in accordance with the Bolton Council Sustainable Drainage Systems Local Guidance requirements.

A Flood Risk Assessment (FRA) report has been produced by Hydrock, reference 15220-HYD-XX-XX-RP-FR-0001_GG and should be read in conjunction with this drainage strategy.

A Phase 2 DRAFT Interpretative report has been produced by Hydrock, reference 15220-HYD-XX-XX-RP-GE-0003 and should be read in conjunction with this drainage strategy.

This report should be read in conjunction with the following drawings:

- C16417-HYD-XX-XX-DR-C-0005_Existing Drainage Plan
- C16417-HYD-XX-XX-DR-C-0500_Proposed Drainage Strategy
- Existing Microdrainage Calculations
- Proposed Microdrainage Calculations

2. SITE INFORMATION

2.1 Location and Setting

The site is located in Little Lever which is between Bolton (approximately 4km to the west) and Bury which is approximately 4km to the east. Whilst the site is immediately bound by undeveloped grassed fields to the west, north, and east it is predominantly within a developed residential area.

The site itself is currently occupied by an industrial development and comprises an existing building, along with areas of hardstanding storage/working yards, internal access roads and parking.

Vehicular access is via the south eastern site boundary off Stopes Road.

The site location is shown in Figure 1, with the full address and Ordnance Survey grid reference provided in Table 1.

Table 1: Site Referencing Information

Site Referencing Information	
Site Address	Land off Stopes Road, Little Lever, Radcliffe Bolton BL3 1NP
Grid Reference	376301, 407552 SD763075

Figure 1: Site Location



2.2 Topography

A copy of the topographical survey has been included within the planning submission.

The survey indicates that the site generally falls in a south/south-westerly direction with levels decreasing from a high of around 107m AOD at the north eastern boundary to a low of around 100m AOD at the south western boundary. The topographical survey also highlights a drop-in elevation of between 2-4m in this from east to west across the site.

2.3 Proposed Development

Planning approval is being sought for up to 140 residential units and will include internal access roads, driveways/parking and areas of public open space.

Details of the proposed development layout have been included within the Planning Application submission.

3. SURFACE WATER STRATEGY

3.1 Existing Site Drainage

United Utilities sewer records have been obtained (see Appendix A) which indicate existing combined sewers within Stopes Road to the East and South of the development. There are two no. combined chambers located nearby that are assumed to serve the development, 2301 and 3501. The cover and invert levels provided are below.

Table 2: Existing Combined Manhole Information

	2301 (UU Manhole Reference)	3501 (UU Manhole Reference)
Cover Level	95.690m	102.560m
Invert Level	92.680m	100.380m
Depth	3.010m	2.180m
Outfall Pipe Diameter	900mm	375mm

Anecdotal evidence has been provided that suggests the presence of an existing drainage culvert that runs underneath the site. A CCTV survey has been undertaken which confirms an existing positive connection to the existing sewer. During the survey a 450mm diameter pipe was identified running through the site, out falling to the southwest where it connects to United Utilities chamber 2301. This pipe serves the proposed development surface water discharge. An Existing Drainage Layout can be found in Appendix A. The CCTV report can be found within Appendix E

3.2 Existing Discharge Rates

In accordance with Bolton Council Sustainable Drainage Systems Local Guidance;

On brownfield sites where proposals are for 5 or more residential units, or 500m² or greater nonresidential units; the rate of run-off should be 50% less than conditions before development. This is a requirement of our Core Strategy 5 .

A hydraulic model of the existing drainage has been constructed to determine the existing site runoff based upon a hard landscaping catchment area of 3.35 Hectares. Microdrainage calculations can be found in Appendix C

Table 3: Existing Run Off Rates

Return Period (Years)	Existing Run Off Rate (l/s)
1	311.0
30	697.4
100	860.3

An additional review of the brownfield run off from the site has been calculated below using the modified rational method in order to comply with the non-statutory technical standards for sustainable drainage systems.

The following parameters were used to calculate the brownfield run-off from the site:

Peak Discharge $Q_p = 2.78 \times C_v \times C_r \times I \times A$ (Modified rational method as recommended by the Wallingford procedure)

Impermeable Area (A) = 3.35

Average Rainfall Intensity (i) = Based upon figures obtained from Microdrainage

Routing coefficient (dimensionless) (Cr) = 1.3 (as recommended by the Wallingford procedure)

Volumetric Runoff Coefficient (Cv) = 0.9 (catchment high in hardstanding areas)

Table 4 below summarises the calculated brownfield run-off rates for the 1 year, 2 year, 30 year and 100 year events.

Table 4: Modified Rational Method Flow rates

Storm Event (Years)	Rainfall Intensity mm/hr (15min tc)	Brownfield Discharge Rate (ls)
1	27.318	297.7
2	35.348	385.2
30	66.853	728.4
100	86.368	941.1

3.3 Proposed Site Discharge

To satisfy the requirements within Bolton Council Sustainable Drainage Systems Local Guidance, the proposed surface water discharge should achieve a 50% betterment on the existing run off rates as described above. The table below summarises the proposed run off rates that are to be achieved within the varying storm events and the betterments this achieves;

Table5: Proposed Discharge Rates

Storm Event	Brownfield Discharge Rate (l/s)	Proposed Discharge Rate (l/s)	Actual Discharge Rate Achieved (l/s)	Betterment Achieved (%)
1 Yr Event	297.7	148.85	136.1	54
30 Yr Event	728.4	364.2	259.7	64
100 Yr Event	941.1			
100 Yr Event + CC		470.55	317.5	67

For the purpose of determining cover levels for this drainage exercise a plateau level has been determined as 102.175m, based on achieving an approximate cut and fill earthworks balance. The proposed site layout allows for a landscaped area to the north of the development. In order to utilise this space for a surface water attenuation pond it is proposed that the surface water drainage is split into two networks.

The north area of the site has a catchment area of 0.847 Hectares, will be collected via rainwater pipes, channels and road gullies and will utilise this attenuation pond before out falling to the wider drainage network. In order to limit discharge from the site to the discharge rates specified in Table 6, an attenuation pond storing a total of 250m³ storage has been provided to serve the northern catchment, as calculated using MicroDrainage.

The southern area of the site has an impermeable area of 1.903 Hectares. Due to the site levels, available space and the distance this network would need to travel it would be unable to outfall into this attenuation pond whilst still maintaining a gravity outfall to the existing pipe. As such it is proposed run off from this catchment area will be stored in oversized pipework.

A connection into the existing chamber will be made, before discharging towards Existing United Utilities manhole 2301 within Stopes Road to the South of the site. As the proposed drainage network is likely to be put forwards for adoption, the existing pipe outfalling from the development will also require adoption for a connection to be undertaken. Further investigation into the requirement of easements will be undertaken during detailed design.

The surface water drainage attenuation has been modelled using Microdrainage for a range of events including the 1 in 1year, 1 in 30year and 1 in 100year + 40% climate change event.

The model has allowed flooding during a 1 in 100 year event and above, with the model showing flooding of approximately 17m³ occurs within the northern area of the surface water network and 60m³ occurs within the southern surface water network. Following detailed design of the proposed levels and drainage, surface water flooding can be directed away from developments and kept within highway areas against kerb upstands and landscaping. The flood waters shall be stored temporarily in this location where property is not affected until the storm subsides, at which point it shall re-enter the network.

The proposed drainage Microdrainage calculations can be found within Appendix D

3.4 Hierarchy of Drainage Discharge

A hierarchy for the preferred discharge of surface water states that surface water runoff should be disposed of as has been stated within Bolton Council Sustainable Drainage Systems Local Guidance as the following:

Surface water runoff not collected for use must be discharged to one or more of the following in the order of priority shown:

1. into the ground (infiltration).
2. to a surface water body.
3. to a surface water sewer, highway drain or other drain.
4. to combined sewer:

The feasibility of each discharge method is outlined below:

1. From early ground investigation studies, the use of soakaways are considered unsuitable for the site based on the low permeability of the natural soils and the potential for inundation and collapse settlement of the infilled ground. During these initial ground investigations high levels of clay material were uncovered on site. It is therefore taken that infiltration is not feasible for discharge of surface water drainage.
2. The closest watercourse to the site is the River Irwell which is located around 600m to the south east of the proposed development site. At this location, the River Irwell is within a well-defined channel that is shown as being incised and at an approximate elevation of between 65-75m AOD and a minimum of 25m below lowest site levels. The watercourse follows the general site topography and flows in a westerly direction. It is not considered possible to discharge surface water to this location due to the distance and the requirement for third party agreements.

A further open section of watercourse is shown a short distance to the west of the site and extends between 100-150m. The source and route of this watercourse is currently unknown but it is expected to follow the general topography and drain from east to west. From a review of the general surrounding area, the upstream catchment to this watercourse is considered as being small (<3km²) and therefore has not been included within the EA's assessments to inform the flood map. Given this, it is considered that this feature is a localised drainage ditch rather than a watercourse and therefore is not suitable to discharge surface water runoff.
3. Anecdotal evidence has been provided that suggests the presence of an existing drainage culvert that runs underneath the site. During a CCTV survey of the existing private drainage on site a 450mm diameter pipe was located which runs from the East of the development, out-falling to the West, from which it connects to an existing combined sewer located in Stopes Road to the South of the site. As the existing pipe currently serves the surface water discharge from the site it is proposed to maintain this existing connection. A CCTV has been undertaken to confirm a positive connection of the existing development, and determine the exact location of the existing sewer connection points and its condition is suitable for reuse.

While final outfall locations will be determined in the detailed design stage, a Pre-Development Enquiry will be submitted to United Utilities to commence discussions.

The Proposed Drainage Layout can be found in Appendix B.

3.5 Suitability for Infiltration

Soakaways are considered unsuitable for the site based on the low permeability of the natural soils and the potential for inundation and collapse settlement of the infilled ground. Please refer to the Ground Investigation Report.

3.6 Suitability of SuDS Features

The following SuDS features have been considered during the design process, the table states which features have been incorporated and which have been excluded and reasons for their exclusion.

Table 6: Suitability of SuDS Features

SuDS Feature	Incorporated within design	Reasoning
Green Roofs / BluRoofs	No	Greenroof/BluRoof systems have been excluded from this scheme due to the residential housing nature of the development and roof space available
Attenuation Pond (Above Ground)	Yes	An attenuation pond has been indicated within the northern greenbelt strip to provide storage to the northern surface water network. The feasibility of installing an attenuation pond within this greenbelt strip is to be explored during detailed design. Attenuation ponds have been excluded for the remainder of the site due to lack of available space within the development proposals and existing site topography.
Rainwater Harvesting	No	Rainwater harvesting is not effective for this type of development where there are a limited number of toilets/ uses for harvested water
Infiltration Methods	No	Infiltration was ruled out due to ground conditions. Ground investigation is currently being undertaken to provide further information on the suitability for infiltration
Raingardens/Bio-retention areas	No	Excluded due to the residential nature of the development and ground conditions
Filter strips and swales	No	Excluded due to lack of space, level constraints and ground conditions
Permeable Paving	No	Excluded, given the nature of the development
Below ground attenuation systems / Oversized Pipework	Yes	Below ground attenuation will be achieved through the use of oversized pipe work. Below ground attenuation crates are deemed unsuitable due to space available

3.7 Whole Life Maintenance of the Network

To enable the water treatment process to occur as intended the drainage network shall require maintenance. The maintenance strategy and responsibilities are as set out in the table below.

Component to be maintained	Actions	Frequency	Responsibility of:
Site wide external areas	Site to be generally kept free from litter and debris which may enter the drainage system.	On-going	Management Company
Attenuation Pond	Remove litter/ debris	As required	Management Company
	Cut grass/remove unwanted plants	Monthly	
	Inspect inlet/ outlet/ structures	Monthly	
	Inspect silt accumulation within catch pit chambers	Annually	
	Inspect for poor water quality Inspect for silt build up throughout pond and remove if necessary	Monthly As required	
	Repair erosion/ replant/ repair inlets, outlets	As required	
General network inc. pipes/ manholes/ catchpits	Manholes covers to be lifted and inspected for sediment build up, remove as required	Yearly	United Utilities

4. FOUL WATER DRAINAGE

An initial review of the existing drainage has been undertaken on site by Hydrock on 06/08/2020 through lifting manhole covers to identify the route of flow. During this survey it was identified that foul drainage from the office block near the entrance of the site outfalls to the east of the site where it is assumed it connects to United Utilities chamber 3501.

Due to the shallow nature of the existing drainage and connection it is proposed that a new connection is to be made into existing United Utilities combined manhole 4402 to avoid the requirement for the proposed development to be pumped. Details of these chambers are in the table below:

Table 5: Existing Combined Manhole Details

	3501 (UU Manhole Reference)	4402 (UU Manhole Reference)
Cover Level	102.560m	100.770m
Invert Level	100.380m	97.890m
Depth	2.180m	2.880m
Outfall Pipe Diameter	375mm	300mm

An application to United Utilities will be required to discharge to the existing combined sewer within Stopes Road.

Sewers for adoption 7th Edition, Section B5.1 states that the peak design flow rates for dwellings should be designed for "4000 litres per dwelling per day."

It is understood that the development planning approval is being sought for up to 140 residential units.

$140 \text{ units} = 140 \times 4,000 \text{ l/day} \div 86,400 = 6.48 \text{ l/s}.$

A 150mm Dia foul pipe laid at a gradient of 1 in 150 (self cleansing), with a roughness coefficient of 1.5mm (Ks) has a capacity of 12.61 l/s, and can therefore accommodate the development proposals.

5. CONCLUSIONS

In summary the surface water drainage is proposed to follow the existing drainage regime for the site, with surface water connecting to the existing pipe outfalling from the development, ultimately discharging to an existing public combined sewer within Stopes Road to the South of the site, and foul water connecting to an existing combined manhole within Stopes Road to the East.

An attenuation pond has been provided for the north of the site to ensure the discharge from the site is limited to the proposed discharge rates providing a minimum 50% betterment to existing brownfield runoff rates.

Hydrock Consultants Limited

Appendix A - Existing Drainage Strategy

Reference	Title
179857-03-08-2020-11-18-51.pdf	United Utilities Sewer Records
C16416-HYD-XX-XX-DR-C-0005_P01	Existing Drainage Layout

Luke Pilsbury

**3
Bleatarn Road, Offerton
Stockport,
SK14NP**

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: C-16417
Our Ref: UUPS-ORD-179857
Date: 03/08/2020**

Dear Sirs

Location: Stopes Road Little Lever

I acknowledge with thanks your request dated 29/07/2020 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

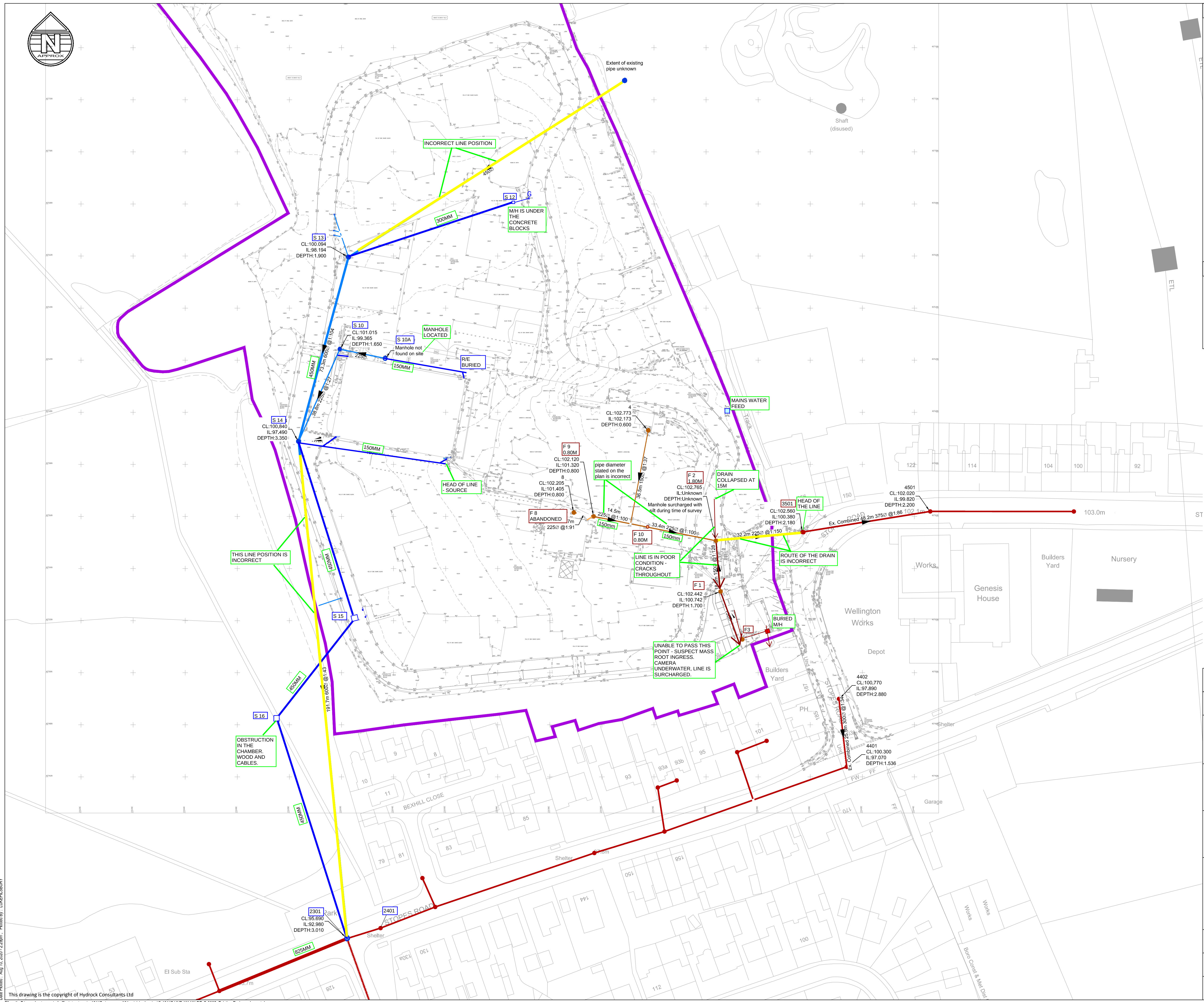
These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus)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



Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
9513	CO	0	0	100	100	VC	8.515682	0	1 in 100
9513	CO	0	0	100	100	VC	8.515682	0	1 in 100
0003	CO	0	0	225	225	VC	28.28427	0	1 in 100
0001	CO	0	0	117	117	VC	48.50773	0	1 in 100
0102	94.57	SW	91.83	150	150	VC	119.708	0	1 in 100
4102	93.29	CO	91.08	225	225	VC	63.00346	0	1 in 100
0009	CO	0	0	150	150	VC	5.391213	0	1 in 100
2901	88.95	CO	85.98	825	825	VC	40.4475	1 in 506	1 in 506
1303	95.34	CO	94.04	225	225	VC	40.8534	1 in 132	1 in 132
2301	95.89	CO	92.68	800	800	VC	52.5447	1 in 139	1 in 139
1301	95.55	CO	92.22	900	900	VC	75.76939	1 in 154	1 in 154
3902	90.09	CO	87.37	375	375	VC	48.16638	1 in 172	1 in 172
3102	93.18	CO	91.27	150	150	VC	67	1 in 2233	1 in 2233
2002	92.27	CO	88.14	600	600	VC	50	1 in 43	1 in 43
2904	89.58	CO	85.9	825	825	VC	69.0476	1 in 348	1 in 348
1101	94.5	CO	92.79	225	225	VC	46.04346	1 in 121	1 in 121
0007	CO	0	0	150	150	VC	15.05179	0	1 in 141
0204	95.87	CO	91.34	900	900	VC	19.41649	1 in 114	1 in 114
0006	CO	0	0	150	150	VC	5.46801	0	1 in 114
8005	CO	0	0	100	100	VC	5.986263	0	1 in 114
4002	92.85	CO	91.66	150	150	VC	40.5216	1 in 70	1 in 70
0203	95.86	CO	91.24	225	225	VC	26.1725	0	1 in 70
4504	CO	0	0	150	150	VC	11.99828	0	1 in 70
0012	CO	0	0	150	150	VC	13.94422	0	1 in 70
2412	101.22	FO	99.72	225	225	VC	35.73514	1 in 44	1 in 44
2412	101.22	FO	99.72	225	225	VC	35.73514	1 in 44	1 in 44
2303	86.05	CO	83.71	225	225	VC	79.71188	1 in 77	1 in 77
1004	92.68	CO	90.39	225	225	VC	67.26812	1 in 96	1 in 96
2104	94.54	CO	91.24	225	225	VC	16	1 in 15	1 in 15
1205	94.99	CO	0	225	225	VC	58.03447	0	1 in 15
0307	CO	0	0	100	100	VC	22.38649	0	1 in 15
0103	84.51	CO	83.03	225	225	VC	29.41088	1 in 123	1 in 123
0101	84.46	CO	83.76	150	150	VC	117.5346	0	1 in 123
3101	95.83	CO	93.44	225	225	VC	81.22192	1 in 50	1 in 50
3501	102.56	CO	100.38	375	375	VC	49.64877	1 in 103	1 in 103
3501	102.56	CO	100.38	375	375	VC	49.64877	1 in 103	1 in 103
0302	96.25	CO	91.83	900	900	VC	26.87006	1 in 182	1 in 182
5501	102.61	CO	100.47	375	375	VC	61.0082	1 in 43	1 in 43
5501	102.61	CO	100.47	375	375	VC	61.0082	1 in 43	1 in 43
1201	95.7	CO	93.48	225	225	VC	35.54078	0	1 in 43
1006	95.7	CO	93.48	100	100	VC	4.375217	1 in 53	1 in 53
1203	95.71	CO	94.53	225	225	VC	26	1 in 53	1 in 53
1003	92.83	CO	89.69	225	225	VC	53.23532	1 in 109	1 in 109
8203	95.97	CO	93.09	225	225	VC	42.0119	1 in 212	1 in 212
2402	100.13	FO	98.62	225	225	VC	4.24064	0	1 in 212
0305	CO	0	0	939	939	VC	28.79236	1 in 35.642854	1 in 35.642854
2401	97.93	CO	94.51357	0	375	VC	64.51357	0	1 in 35.642854
0025	CO	0	0	150	150	VC	28.27632	0	1 in 35.642854
9903	90.96	CO	85.09	825	825	VC	65.74192	1 in 60	1 in 60
2432	CO	0	0	150	150	VC	5.819034	0	1 in 60
8206	CO	0	0	900	900	VC	67.15223	0	1 in 60
9306	CO	0	0	100	100	VC	2.743417	0	1 in 60
5504	102.62	CO	100.12	300	300	VC	62.46211	0	1 in 60
5504	102.62	CO	100.12	300	300	VC	62.46211	0	1 in 60
4101	CO	0	0	300	300	VC	90.24999	0	1 in 60
0905	91.11	CO	85.35	825	825	VC	91.66242	1 in 353	1 in 353
1204	95.03	CO	0	225	225	VC	26.01922	0	1 in 353
2304	CO	0	0	150	150	VC	5.218084	0	1 in 353
0001	92.71	CO	88.93	225	225	VC	2.687374	0	1 in 353
2401	95.8	CO	93.72	375	375	VC	13.60147	1 in 13	1 in 13
2001	93.98	CO	92.34	225	225	VC	29.69	1 in 42	1 in 42
8003	91.54	CO	88.09	225	225	VC	33.24154	1 in 208	1 in 208
2004	95.1	CO	88.69	600	600	VC	15.0333	1 in 27	1 in 27
4501	102.02	CO	99.82	375	375	VC	55.03666	1 in 85	1 in 85
4501	102.02	CO	99.82	375	375	VC	55.03666	1 in 85	1 in 85
2102	94.63	CO	91.3	300	300	VC	42.4759	1 in 40	1 in 40
0301	96.34	CO	91.69	900	900	VC	54.74486	1 in 155	1 in 155
3801	90.57	CO	88.01	375	375	VC	46.48147	1 in 77	1 in 77
4401	100.3	CO	97.07	375	375	VC	74.33035	1 in 81	1 in 81
4401	100.3	CO	97.07	375	375	VC	74.33035	1 in 81	1 in 81
1001	94.09	CO	93.07	225	225	VC	53.84844	1 in 73	1 in 73
0904	89.31	CO	85.6	225	225	VC	36.22154	1 in 362	1 in 362
8204	CO	0	0	225	225	VC	10	0	1 in 362
2902	89.88	CO	86.91	675	675	VC	33.01515	1 in 45	1 in 45
2403	100.07	CO	98.04	375	375	VC	22.47669	1 in 5	1 in 5
3405	CO	0	0	100	100	VC	19.36462	0	1 in 5
3405	CO	0	0	100	100	VC	19.36462	0	1 in 5
3103	CO	0	0	150	150	VC	26.2885	0	1 in 5
2405	100.13	CO	98.6	225	225	VC	12.08305	1 in 0.12481196	1 in 0.12481196
1002	93.71	CO	92.34	225	225	VC	100.08	1 in 38	1 in 38
9302	96.44	CO	94.1	225	225	VC	55.03635	1 in 59	1 in 59
9002	91.57	CO	87.93	300	300	VC	24.51531	1 in 51	1 in 51
1202	95.27	CO	93.73	225	225	VC	35.35334	1 in 141	1 in 141
4103	96.12	CO	94.22	225	225	VC	50.38872	1 in 97	1 in 97
2406	100.3	SW	98.9	225	225	VC	29.12044	1 in 97	1 in 97
2406	100.3	SW	98.9	225	225	VC	29.12044	1 in 97	1 in 97
9105	94.54	CO	90.9	300	300	VC	70.34913	1 in 167	1 in 167
0903	89.1	CO	85.68	225	225	VC	10.04888	1 in 126	1 in 126
2003	92.81	CO	90.81	225	225	VC	65.48046	1 in 126	1 in 126
9303	96	CO	93.17	225	225	VC	16.03122	1 in 200	1 in 200
1304	95.5	CO	92.74	325	325	VC	10.77033	1 in 24	1 in 24
2411	100.3	FO	98.9	225	225	VC	25	1 in 89	1 in 89
2411	100.3	FO	98.9	225	225	VC	25	1 in 89	1 in 89
1302	95.57	CO	92.3	900	900	VC	23.76973	1 in 297	1 in 297
1904	CO	0	0	100	100	VC	6.164478	0	1 in 297
0004	CO	0	0	225	225	VC	54.32465	0	1 in 297
0002	92.69	CO	89.2	225	225	VC	19.10497	1 in 71	1 in 71
1102	94.72	CO	92.41	225	225	VC	90.09125	1 in 126	1 in 126
1901	90.82	CO	85.7	825	825	VC	90.93404	1 in 267	1 in 267
0906	89.35	CO	87.15	225	225	VC	40.31129	1 in 112	1 in 112
9404	CO	0	0	100	100	VC	25.23409	0	1 in 112
4402	100.77	CO	97.89	300	300	VC	26.1725	1 in 32	1 in 32
4402	100.77	CO	97.89	300	300	VC	26.1725	1 in 32	1 in 32
4003	CO	0	0	100	100	VC	55.03023	0	1 in 32
3302	98.34	CO	96.96	150	150	VC	44.92515	0	1 in 32
0013	93.18	CO	91.39	375	375	VC	5.329553	1 in 30	1 in 30
4001	92.2	CO	89.61	300	300	VC	108.2405	1 in 74	1 in 74
0908	CO	0	0	150	150	VC	14.14214	0	1 in 74
3301	99.15	CO	97.14	225	225	VC	119.2657	1 in 17	1 in 17
3402	98.82	CO	0	375	375	VC	28.16026	0	1 in 17
3402	98.82	CO	0	375	375	VC	28.16026	0	1 in 17
2404	96.05	SW	93.61	375	375	VC	9.219544	1 in 0.10066103	1 in 0.10066103
0303	CO	0	0	900	900	VC	29.14476	0	1 in 0.10066103
2305	FO	0	0	150	150	VC	21.97835	0	1 in 0.10066103
2106	CO	0	0	150	150	VC	10.851	0	1 in 0.10066103
1005	CO	0	0	150	150	VC	22.88482	0	1 in 0.10066103
4201	96.47	CO	95.15	225	225	VC	69.42622	1 in 75	1 in 75
2103	94.3	CO	90.24	600	600	VC	21	1 in 38	1 in 38
0202	95.51	CO	0	375	375	VC	13.0384	0	1 in 38
2407	101.22	SW	99.72	225	225	VC	35.73514	1 in 44	1 in 44
2407	101.22	SW	99.72	225	225	VC	35.73514	1 in 44	1 in 44
2302	95.8	CO	94.55	225	225	VC	43.46263	1 in 85	1 in 85
3202	96.72	CO	0	225	225	VC	55.57877	0	1 in 85
1103	94.64	CO	92.1	225	225	VC	61.03276	1 in 76	1 in 76
4104	95.32	CO	0	225	225	VC	88.35883	0	1 in 76
0907	89.52	CO	87.42	225	225	VC	16.96297	1 in 26	1 in 26
3403	CO	0	0	150	150	VC	16.96297	0	1 in 26
3403	CO	0	0	150	150	VC	16.96297	0	1 in 26
4302	99.88	CO	0	225	225	VC	14.72617	0	1 in 26
6207	95.11	CO	92.68	300	300	VC	53.46027	0	1 in 26
3104	CO	0	0	100	100	VC	4.46231	0	1 in 26
2101	94.79	CO	91.8	525	525	VC	22.09072	1 in 44	1 in 44
0010	CO	0	0	150	150	VC	2.326899	0	1 in 44
3201	92.32	CO	90.1	225	225	VC	60.00833	0	1 in 44
9103									



NOTES

1. THIS DRAWING IS NOT TO BE SCALED.

2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT AND ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS.

4. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE

5. EXISTING GROUND INFORMATION SHOWN ON THIS DRAWING IS ARE BASED MALCOLM HUGHES LAND SURVEYORS TOPOGRAPHICAL SURVEY "55335_02" DATED MARCH 2020.

6. PROPOSED PLATEAU LEVELS AND DRAINAGE LAYOUT BASED UPON APD MASTERPLAN DRAWING "HAW001-FW01" REV - DATED 05.05.20.

7. EXISTING PUBLIC DRAINAGE BASED UPON UNITED UTILITIES RECORDS DRAWING "179857-03-08-2020-11-18-51.PDF" DATED 03/08/20.

8. EXISTING PRIVATE DRAINAGE IS APPROXIMATE ONLY, BASED UPON SITE VISIT UNDERTAKEN BY HYDROCK ON 06/08/20. EXACT LOCATION OF EXISTING DRAINAGE TO BE DETERMINED THROUGH CCTV SURVEY

LEGEND

Site Boundary

Existing United Utilities Combined Sewer

Existing Private Surface Water Drainage

Existing Private Foul Drainage

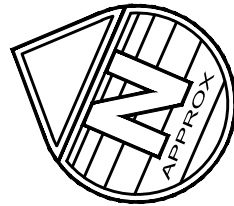
P01	PRELIMINARY ISSUE					
	L. W. Pilsbury	10.08.20	R. Henshall	10.08.20	R. Henshall	10.08.20
REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
North Assurance Buildings 9-21 Princess Street, St Alberts Square Manchester M2 4DN t: +44(0)161 804 5550 e: manchester@hydrock.com						
CLIENT						
HARWORTH						
PROJECT						
STOPES ROAD, LITTLE LEVER						
TITLE						
EXISTING DRAINAGE LAYOUT						
HYDROCK PROJECT NO.			SCALE @ A1			
C-16417			NTS			
STATUS DESCRIPTION					STATUS	
INFORMATION						
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)					REVISION	
C16417-HYD-XX-XX-DR-C-0005					P01	

Appendix B - Proposed Drainage Strategy

Reference	Title
C16417-HYD-XX-XX-DR-C-0500_P01	Proposed Drainage Layout

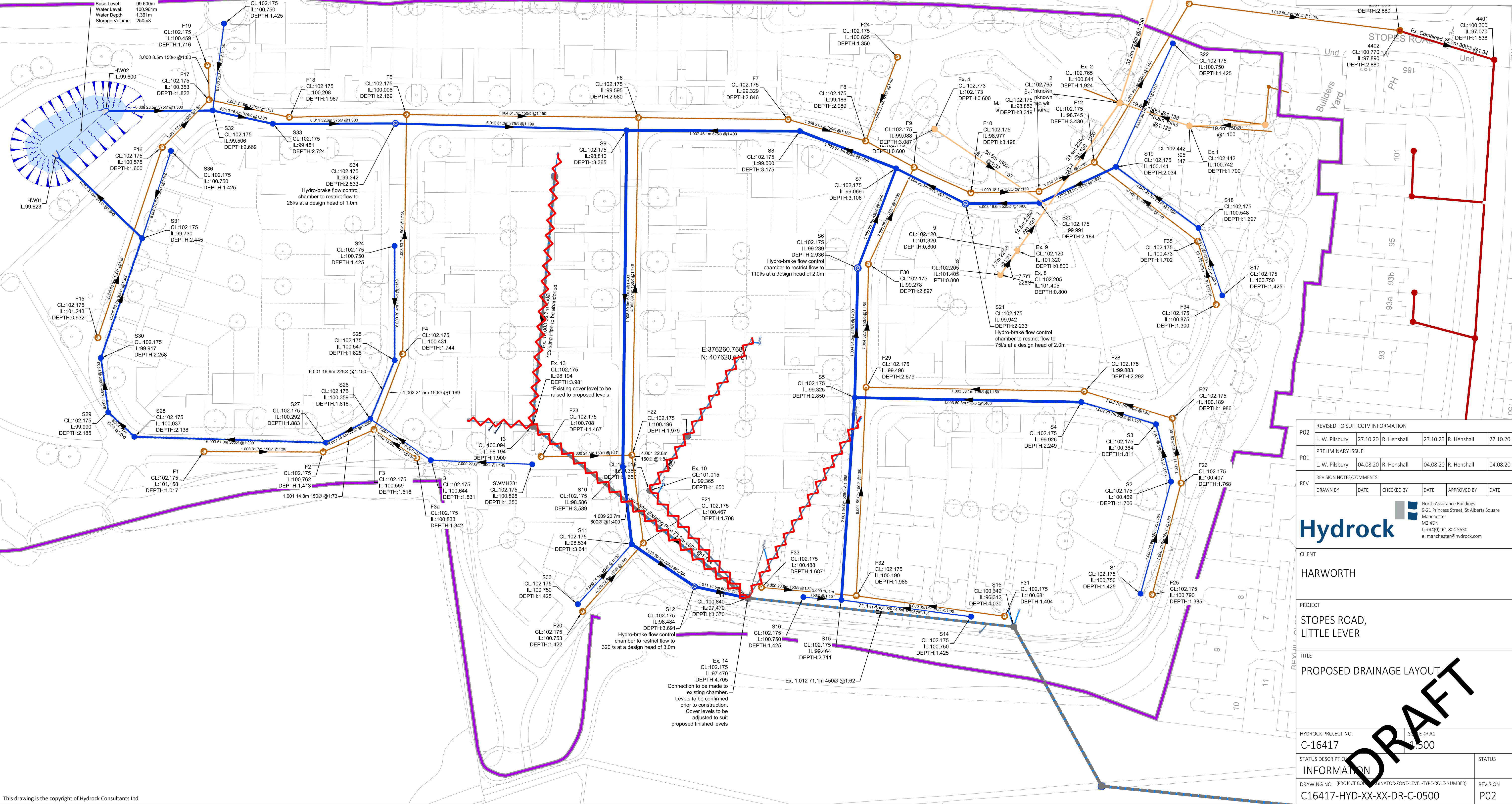
LEGEND

- Site Boundary
- Existing United Utilities Combined Sewer
- Existing Private Surface Water Drainage
- Existing Private Foul Drainage
- Proposed Surface Water Drainage
- Proposed Flow Control Chamber
- Proposed Foul Drainage
- Existing Surface Water to be abandoned and grouted up



NOTES

- THIS DRAWING IS NOT TO BE SCALED.
- ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT AND ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS.
- ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE
- EXISTING GROUND INFORMATION SHOWN ON THIS DRAWING IS BASED MALCOLM HUGHES LAND SURVEYORS TOPOGRAPHICAL SURVEY "55335_02" DATED MARCH 2020.
- PROPOSED PLATAUE LEVELS AND DRAINAGE LAYOUT BASED UPON APD MASTERPLAN DRAWING "HAW001-FW01" REV - DATED 05.05.20.
- EXISTING PUBLIC DRAINAGE BASED UPON UNITED UTILITIES RECORDS DRAWING "179857-03-08-2020-11-18-51.PDF" DATED 03/08/20.
- EXISTING PRIVATE DRAINAGE IS BASED UPON SITE VISIT UNDERTAKEN BY HYDROCK ON 06/08/20 AND CCTV SURVEY UNDERTAKEN BY JOHN ROBINSON ASSOCIATES DATED 08-SEPT-20.



P02	REVISED TO SUIT CCTV INFORMATION	L. W. Pilbury	27.10.20	R. Henshall	27.10.20	R. Henshall	27.10.20
P01	PRELIMINARY ISSUE	L. W. Pilbury	04.08.20	R. Henshall	04.08.20	R. Henshall	04.08.20

REV	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
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e: manchester@hydrock.com

Hydrock

CLIENT	HARWORTH
PROJECT	STOPES ROAD, LITTLE LEVER
TITLE	PROPOSED DRAINAGE LAYOUT
HYDROCK PROJECT NO.	C-16417
STATUS DESCRIPTION	INFORMATION
DRAWING NO. (PROJECT CO-ORDINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	C16417-HYD-XX-XX-DR-C-0500
STATUS	P02

DRAFT

Appendix C - Existing Drainage Calculations

Reference	Title
C16417-HYD-XX-XX-CA-C-0005_P01	Existing Surface Water Drainage Calculations

Hydrock Consultants Ltd		Page 1
.	Stopes Road	
.	Little Lever	
.	Existing Surface Water	
Date 10/08/2020	Designed by Luke Pilsbury	
File Stopes Road Existing Dr...	Checked by	
Innovyze	Network 2018.1.1	

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
S1.000	126.144	1.259	100.2	0.000	5.00	0.0	0.600	o	450	Pipe/Conduit
S1.001	73.372	0.704	104.2	1.974	0.00	0.0	0.600	o	450	Pipe/Conduit
S2.000	17.733	0.170	104.3	0.072	5.00	0.0	0.600	o	225	Pipe/Conduit
S2.001	38.956	1.425	27.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
S1.002	191.606	4.510	42.5	1.263	0.00	0.0	0.600	o	600	Pipe/Conduit
S1.003	53.554	0.680	78.8	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	99.603	0.000	0.0	2.03	323.0
S1.001	98.194	1.974	0.0	1.99	316.7
S2.000	99.535	0.072	0.0	1.28	50.9
S2.001	99.365	0.072	0.0	2.51	99.9
S1.002	97.490	3.309	0.0	3.74	1058.4
S1.003	92.980	3.309	0.0	3.53	2247.4

Appendix D - Proposed Drainage Calculations

Reference	Title
C16417-HYD-XX-XX-CA-C-0500_P01	Proposed Surface Water Calculations

Hydrock Consultants Ltd		Page 0
. . .	Stopes Road Little Lever Proposed Surface Water	
Date 27/10/2020 File C-16417-HYD-XX-XX-DR-C-...	Designed by Luke Pilsbury Checked by	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

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
1.000	30.861	0.206	149.8	0.047	5.00	0.0	0.600	o	300	Pipe/Conduit		
1.001	15.803	0.105	150.5	0.007	0.00	0.0	0.600	o	600	Pipe/Conduit		
1.002	20.709	0.138	150.0	0.060	0.00	0.0	0.600	o	600	Pipe/Conduit		
1.003	60.289	0.151	399.3	0.161	0.00	0.0	0.600	o	600	Pipe/Conduit		
2.000	38.944	0.260	149.8	0.087	5.00	0.0	0.600	o	300	Pipe/Conduit		
3.000	10.046	0.067	149.9	0.058	5.00	0.0	0.600	o	300	Pipe/Conduit		
2.001	55.619	0.139	400.1	0.124	0.00	0.0	0.600	o	600	Pipe/Conduit		
1.004	34.479	0.086	400.0	0.107	0.00	0.0	0.600	o	600	Pipe/Conduit		
1.005	28.419	0.095	299.1	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit		

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	57.52	5.40	100.675	0.047	0.0	0.0	0.0	1.28	90.6	7.3
1.001	56.96	5.53	100.169	0.054	0.0	0.0	0.0	1.98	560.6	8.3
1.002	56.24	5.71	100.064	0.114	0.0	0.0	0.0	1.99	561.6	17.4
1.003	53.11	6.54	99.926	0.275	0.0	0.0	0.0	1.21	342.8	39.6
2.000	57.08	5.51	100.675	0.087	0.0	0.0	0.0	1.28	90.6	13.4
3.000	58.71	5.13	100.675	0.058	0.0	0.0	0.0	1.28	90.6	9.2
2.001	54.06	6.27	99.914	0.269	0.0	0.0	0.0	1.21	342.5	39.4
1.004	51.49	7.01	99.775	0.651	0.0	0.0	0.0	1.21	342.5	90.8
1.005	50.21	7.42	99.689	0.726	0.0	0.0	0.0	1.17	186.1	98.7

Hydrock Consultants Ltd										Page 1		
Stopes Road Little Lever Proposed Surface Water					Designed by Luke Pilsbury Checked by					Micro Drainage		
Date 27/10/2020												
File C-16417-HYD-XX-XX-DR-C-...												
Innovyze					Network 2018.1.1							
Network Design Table for Surface Water Drainage												
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
4.000	19.047	0.127	150.0	0.056	5.00	0.0	0.600	o	150	Pipe/Conduit		
4.001	27.300	0.182	150.0	0.099	0.00	0.0	0.600	o	600	Pipe/Conduit		
5.000	36.163	0.241	150.1	0.076	5.00	0.0	0.600	o	150	Pipe/Conduit		
4.002	22.527	0.075	300.4	0.048	0.00	0.0	0.600	o	600	Pipe/Conduit		
4.003	19.634	0.049	400.7	0.071	0.00	0.0	0.600	o	600	Pipe/Conduit		
4.004	20.715	0.069	300.2	0.041	0.00	0.0	0.600	o	450	Pipe/Conduit		
1.006	27.440	0.069	400.0	0.099	0.00	0.0	0.600	o	525	Pipe/Conduit		
1.007	46.101	0.115	400.0	0.120	0.00	0.0	0.600	o	525	Pipe/Conduit		
6.000	30.465	0.203	150.0	0.157	5.00	0.0	0.600	o	225	Pipe/Conduit		
6.001	16.874	0.112	150.7	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit		
7.000	27.072	0.180	150.4	0.070	5.00	0.0	0.600	o	150	Pipe/Conduit		
7.001	19.382	0.129	150.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
6.002	13.414	0.067	200.2	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit		
6.003	51.004	0.255	200.0	0.121	0.00	0.0	0.600	o	300	Pipe/Conduit		
6.004	9.458	0.047	201.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit		
Network Results Table												
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)		
4.000	57.58	5.39	100.750	0.056	0.0	0.0	0.0	0.82	14.5	8.7		
4.001	56.61	5.62	100.173	0.155	0.0	0.0	0.0	1.99	561.6	23.8		
5.000	56.13	5.74	100.750	0.076	0.0	0.0	0.0	0.82	14.5	11.6		
4.002	55.07	6.00	99.991	0.279	0.0	0.0	0.0	1.40	395.8	41.6		
4.003	54.05	6.28	99.916	0.350	0.0	0.0	0.0	1.21	342.2	51.2		
4.004	52.99	6.57	99.867	0.391	0.0	0.0	0.0	1.17	185.8	56.1		
1.006	48.98	7.83	99.519	1.216	0.0	0.0	0.0	1.11	241.1	161.3		
1.007	47.07	8.52	99.450	1.336	0.0	0.0	0.0	1.11	241.1	170.3		
6.000	57.20	5.48	100.750	0.157	0.0	0.0	0.0	1.07	42.4	24.3		
6.001	56.11	5.74	100.547	0.189	0.0	0.0	0.0	1.06	42.3	28.7		
7.000	56.88	5.55	100.825	0.070	0.0	0.0	0.0	0.82	14.4	10.8		
7.001	55.29	5.95	100.645	0.070	0.0	0.0	0.0	0.82	14.4	10.8		
6.002	54.52	6.15	100.360	0.298	0.0	0.0	0.0	1.11	78.3	44.0		
6.003	51.81	6.92	100.293	0.419	0.0	0.0	0.0	1.11	78.3	58.8		
6.004	51.34	7.06	100.038	0.419	0.0	0.0	0.0	1.10	78.1	58.8		
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Stopes Road
Little Lever
Proposed Surface Water



Date	27/10/2020
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Designed by Luke Pilsbury

File C-16417-HYD-XX-XX-DR-C-...

Checked by

Innovyze

Network 2018.1.1

Network Design Table for Surface Water Drainage

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
1.012	191.579	4.511	42.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.012	37.04	13.66	98.387	2.750	0.0	0.0	0.0	3.74	1058.6	286.8

Hydrock Consultants Ltd		Page 4
.	Stopes Road	
.	Little Lever	
.	Proposed Surface Water	
Date 27/10/2020	Designed by Luke Pilsbury	
File C-16417-HYD-XX-XX-DR-C-...	Checked by	
Innovyze	Network 2018.1.1	

Online Controls for Surface Water Drainage

Hydro-Brake® Optimum Manhole: S6, DS/PN: 1.005, Volume (m³): 13.7

Unit Reference	MD-SHE-0399-1100-2000-1100
Design Head (m)	2.000
Design Flow (l/s)	110.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	399
Invert Level (m)	99.689
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	110.0
Flush-Flo™	0.687	109.9
Kick-Flo®	1.431	93.5
Mean Flow over Head Range	-	92.7

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	11.0	1.200	103.8	3.000	134.0	7.000	202.7
0.200	39.3	1.400	95.7	3.500	144.4	7.500	209.6
0.300	75.8	1.600	98.7	4.000	154.1	8.000	216.4
0.400	104.6	1.800	104.5	4.500	163.3	8.500	222.9
0.500	107.9	2.000	110.0	5.000	171.9	9.000	229.2
0.600	109.5	2.200	115.2	5.500	180.1	9.500	235.4
0.800	109.4	2.400	120.2	6.000	187.9		
1.000	107.4	2.600	124.9	6.500	195.4		

Hydro-Brake® Optimum Manhole: S20, DS/PN: 4.004, Volume (m³): 9.2

Unit Reference	MD-SHE-0337-7500-2000-7500
Design Head (m)	2.000
Design Flow (l/s)	75.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	337
Invert Level (m)	99.867
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

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.	Stopes Road	
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Hydro-Brake® Optimum Manhole: S20, DS/PN: 4.004, Volume (m³): 9.2

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	74.9
Flush-Flo™	0.638	74.7
Kick-Flo®	1.377	62.5
Mean Flow over Head Range	-	63.8

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	9.9	1.200	69.2	3.000	91.2	7.000	137.8
0.200	34.3	1.400	63.0	3.500	98.3	7.500	142.5
0.300	61.9	1.600	67.2	4.000	104.9	8.000	147.1
0.400	72.0	1.800	71.2	4.500	111.1	8.500	151.5
0.500	73.9	2.000	74.9	5.000	116.9	9.000	155.8
0.600	74.6	2.200	78.4	5.500	122.5	9.500	160.0
0.800	74.1	2.400	81.8	6.000	127.8		
1.000	72.4	2.600	85.1	6.500	132.9		

Hydro-Brake® Optimum Manhole: 31, DS/PN: 6.012, Volume (m³): 7.5

Unit Reference	MD-SHE-0230-2800-1000-2800
Design Head (m)	1.000
Design Flow (l/s)	28.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	230
Invert Level (m)	99.342
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	28.0
Flush-Flo™	0.370	28.0
Kick-Flo®	0.740	24.2
Mean Flow over Head Range	-	23.2

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	7.6	0.300	27.8	0.500	27.5	0.800	25.2
0.200	23.0	0.400	28.0	0.600	26.8	1.000	28.0

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<u>Hydro-Brake® Optimum Manhole: 31, DS/PN: 6.012, Volume (m³): 7.5</u>							
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	30.6	2.400	42.6	5.000	60.8	8.000	76.4
1.400	32.9	2.600	44.3	5.500	63.7	8.500	78.7
1.600	35.1	3.000	47.5	6.000	66.5	9.000	81.0
1.800	37.1	3.500	51.2	6.500	69.1	9.500	83.1
2.000	39.0	4.000	54.6	7.000	71.6		
2.200	40.9	4.500	57.8	7.500	74.1		
<u>Hydro-Brake® Optimum Manhole: S12, DS/PN: 1.011, Volume (m³): 11.8</u>							
Unit Reference		MD-CHE-0572-3200-3000-3200					
Design Head (m)		3.000					
Design Flow (l/s)		320.0					
Flush-Flo™		Calculated					
Objective		Minimise upstream storage					
Application		Surface					
Sump Available		Yes					
Diameter (mm)		572					
Invert Level (m)		98.484					
Minimum Outlet Pipe Diameter (mm)		Site Specific Design (Contact Hydro International)					
Suggested Manhole Diameter (mm)		Site Specific Design (Contact Hydro International)					
Control Points		Head (m)		Flow (l/s)			
Design Point (Calculated)		3.000		319.9			
Flush-Flo™		0.993		319.8			
Kick-Flo®		1.306		216.0			
Mean Flow over Head Range		-		236.0			
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	11.0	1.200	230.7	3.000	319.9	7.000	485.3
0.200	41.1	1.400	219.9	3.500	345.1	7.500	502.1
0.300	84.9	1.600	234.8	4.000	368.5	8.000	518.3
0.400	135.8	1.800	248.8	4.500	390.5	8.500	534.0
0.500	184.8	2.000	262.0	5.000	411.2	9.000	549.2
0.600	223.9	2.200	274.6	5.500	431.0	9.500	564.0
0.800	286.5	2.400	286.6	6.000	449.9		
1.000	319.7	2.600	298.1	6.500	467.9		
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<u>Storage Structures for Surface Water Drainage</u> <u>Tank or Pond Manhole: 28, DS/PN: 6.009</u> Invert Level (m) 99.600 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>75.0</td><td>2.575</td><td>640.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	75.0	2.575	640.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)							
0.000	75.0	2.575	640.0							
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Surface Water Drainage

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)		
1.000	S1	100.727	-0.248	0.000	0.07		5.7	OK	5
1.001	S2	100.222	-0.547	0.000	0.02		6.5	OK	5
1.002	S3	100.136	-0.528	0.000	0.03		12.6	OK	5
1.003	S4	100.068	-0.457	0.000	0.09		27.0	OK	5
2.000	S14	100.746	-0.229	0.000	0.13		10.6	OK	5
3.000	S15	100.741	-0.234	0.000	0.11		7.1	OK	5
2.001	A64	100.061	-0.453	0.000	0.10		29.2	OK	5
1.004	S5	100.034	-0.341	0.000	0.16		45.7	OK	5
1.005	S6	100.008	-0.131	0.000	0.30		48.4	OK	2
4.000	S16	100.826	-0.074	0.000	0.50		6.8	OK	2
4.001	S17	100.250	-0.523	0.000	0.04		17.1	OK	1
5.000	S21	100.840	-0.060	0.000	0.67		9.3	OK	5
4.002	S18	100.141	-0.450	0.000	0.10		29.7	OK	1
4.003	S19	100.108	-0.408	0.000	0.14		35.5	OK	1
4.004	S20	100.083	-0.234	0.000	0.26		38.7	OK	
1.006	S7	99.779	-0.264	0.000	0.45		90.4	OK	
1.007	S8	99.701	-0.274	0.000	0.46		98.2	OK	
6.000	19	100.861	-0.114	0.000	0.48		18.9	OK	6
6.001	20	100.671	-0.101	0.000	0.59		22.1	OK	1

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Innovyze			Network 2018.1.1						
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Surface Water Drainage</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	
7.000	21 15	Winter	30	+0%	30/15 Summer	100/15 Summer			
7.001	22 15	Winter	30	+0%	30/15 Summer	100/15 Winter			
6.002	21 15	Winter	30	+0%	30/15 Summer				
6.003	22 15	Winter	30	+0%	30/15 Summer				
6.004	23 60	Winter	30	+0%	30/15 Summer				
6.005	24 60	Winter	30	+0%	30/15 Summer				
6.006	25 60	Winter	30	+0%	30/15 Summer				
8.000	28 15	Winter	30	+0%	100/30 Summer				
6.007	26 60	Winter	30	+0%	30/15 Summer				
6.008	27 60	Winter	30	+0%	30/15 Summer				
6.009	28 60	Winter	30	+0%	30/15 Summer				
9.000	32 15	Winter	30	+0%	100/15 Summer				
6.010	29 60	Winter	30	+0%	30/15 Summer				
6.011	30 60	Winter	30	+0%	30/15 Summer				
6.012	31 60	Winter	30	+0%	1/30 Winter				
1.008	S9 30	Winter	30	+0%	30/15 Winter				
1.009	S10 30	Winter	30	+0%	30/15 Summer				
10.000	S33 15	Winter	30	+0%	100/15 Summer				
1.010	S11 30	Winter	30	+0%	30/15 Summer				
1.011	S12 30	Winter	30	+0%	30/15 Summer				
1.012	34 30	Winter	30	+0%					
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
7.000	21	101.409	0.434	0.000	1.18		16.3	SURCHARGED	6
7.001	22	101.205	0.410	0.000	1.10		14.9	SURCHARGED	
6.002	21	101.071	0.411	0.000	0.97		62.3	SURCHARGED	
6.003	22	100.985	0.392	0.000	1.16		85.6	SURCHARGED	
6.004	23	100.763	0.425	0.000	0.88		53.3	SURCHARGED	
6.005	24	100.688	0.398	0.000	0.80		52.6	SURCHARGED	
6.006	25	100.607	0.389	0.000	1.01		58.8	SURCHARGED	
8.000	28	100.828	-0.072	0.000	0.52		7.2	OK	
6.007	26	100.536	0.430	0.000	0.66		67.1	SURCHARGED	
6.008	27	100.459	0.459	0.000	1.61		69.7	SURCHARGED	
6.009	28	100.445	0.470	0.000	0.65		65.2	SURCHARGED	
9.000	32	100.886	-0.014	0.000	1.00		13.7	OK	
6.010	29	100.572	0.692	0.000	0.60		55.6	SURCHARGED	
6.011	30	100.640	0.814	0.000	0.41		42.5	SURCHARGED	
6.012	31	100.662	0.945	0.000	0.22		29.4	SURCHARGED	
1.008	S9	99.554	0.144	0.000	0.77		243.7	SURCHARGED	
1.009	S10	99.421	0.235	0.000	0.95		248.3	SURCHARGED	
10.000	S33	100.878	-0.022	0.000	1.00		13.7	OK	
1.010	S11	99.372	0.238	0.000	1.00		259.7	SURCHARGED	
1.011	S12	99.321	0.237	0.000	0.75		259.8	SURCHARGED	
1.012	34	98.592	-0.395	0.000	0.25		258.7	OK	
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