



Drainage Strategy Report

Prepared for Sulby Street, Manchester

05/04/2022

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1. INTRODUCTION

1.1. *General*

1.1.1. This report has been prepared on instruction received from The Challenger Group and relates to the new residential two storey buildings situated on Sulby Street, Manchester.

1.1.2. The report outlines the initial drainage design philosophy in relation to the proposed development.

1.1.3. This report is prepared solely for the benefit of the Client. This report may not be assigned without prior written permission from Clancy Consulting.

1.1.4. This report is for Planning Application purposes only and does not constitute a construction-ready design.

1.2. *Report Structure*

1.2.1. The report has been structured to follow the general principles set out by Manchester City Council Local Flood Risk Management Strategy.

1.2.2. The drainage strategy will provide justification of the discharge method considering the following (in order of preference);

1. Discharge by Infiltration
2. Discharge to Watercourse
3. Discharge to Surface Water Sewer
4. Discharge to Combined Sewer

1.2.3. The drainage strategy will discuss proposed SUDs techniques and comply with the 'Non-Statutory Technical Standards for Sustainable Drainage Systems'

1.2.4. Sources of information:

- Manchester City Council Local Flood Risk Management Strategy.
- United Utilities Public Sewer Records
- Non-statutory technical standards for sustainable drainage systems.
- Architectural drawings provided by NSA
- Maps by Google and Streetmap
- Historical Maps by National Library of Scotland
- Lead local Flood Authority Critical Drainage Area Maps

2. LOCAL POLICY

LLFA SURFACE WATER MANAGEMENT GUIDANCE FOR PLANNING APPLICATIONS

Full details are found in the LLFA's surface water management guidance report and supporting information. In summary this indicates:

Consideration of the site area should be made together with EA flood maps to determine the flood zone and whether a Flood Risk Assessment is required.

Drainage Strategy should follow SUDS hierarchy – i.e. in preferential order – Use on Site*, Infiltration, Watercourse, Surface Water Sewer, Combined Sewer. Infiltration tests are required to demonstrate whether a soakaway is feasible. It should be noted that Utilities companies also apply this strictly and detailed consideration of the hierarchy will need to be demonstrated in supporting documentation.

Appropriate discharge rates should be calculated for the 30 and 100 year flood events for use in drainage design. In line with NPPF this should be attenuated to greenfield rates for greenfield sites/ site area and as close as possible to greenfield rates for brownfield areas (50% betterment on existing). Climate change should be considered appropriately.

A conceptual drainage layout should be prepared indicating runoff areas and calculations provided including attenuation. Interceptors/ filtration may also be deemed appropriate in accordance with SUDS hierarchy/ guidance.

Calculations should show no flooding during the 1 in 30 year storm events and flooding in the 1 in 100 year storm event (plus climate change) is held on the development and without being detrimental to property.

3. SITE CHARACTERISTICS

3.1. *Location*

3.1.1. The site is located as detailed as below:

OS X (Eastings)	387420
OS Y (Northings)	401609
Nat Grid	SD874016/SD8742001609
Nearest Post Code	M40 5HY
Lat (WGS84)	N53:30:40 (53.51101084012923)
Long (WGS84)	W2:11:28 (-2.1911636441388875)

Table 1 - Site Characteristics (Streetmap)

3.2. *Site Description*



Figure 1 - Site Location (Google Maps)

3.2.1. The new proposed dwelling is located on Sulby Street (boundary highlighted in Figure 1) and represents approximately 0.296 hectares in area.

3.2.2. The current site is a previously developed piece of land, bounded by trees and neighbouring buildings with a large area of hard standing adjacent to a large single storey buildings formerly St Lukes Social Club.

3.2.3. The development is bounded along the north and west boundary by St Duncan's RC Primary School. The grounds of Moston Care Home back onto the southern boundary of the site. Private dwellings along Lightbrowne Road form the eastern boundary of the site.

3.2.4. Topographical information has not been provided at the time of writing this report.

3.2.5. A review of historic maps indicates that the current site has had a 'hall' since at least 1933.

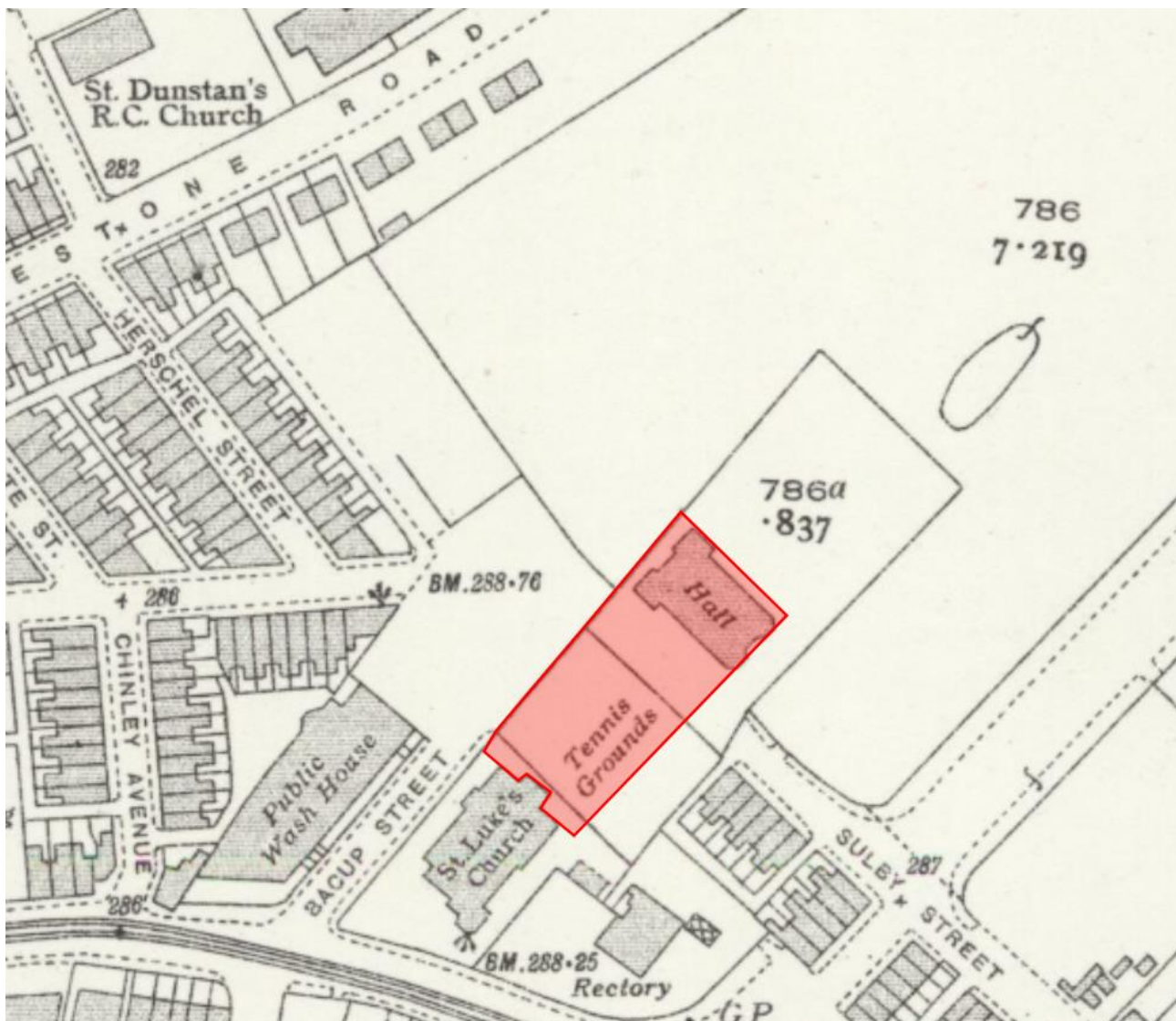


Figure 2 - Historic Map from 1933 (National Library of Scotland)

3.2.6. The development is approximately 275m from an open brook within Broadhurst Park. 680m North West from Moston Brook.

3.2.7. Following review of Flood Maps, the development is within Flood Zone 1 and considered as low probability of flooding.

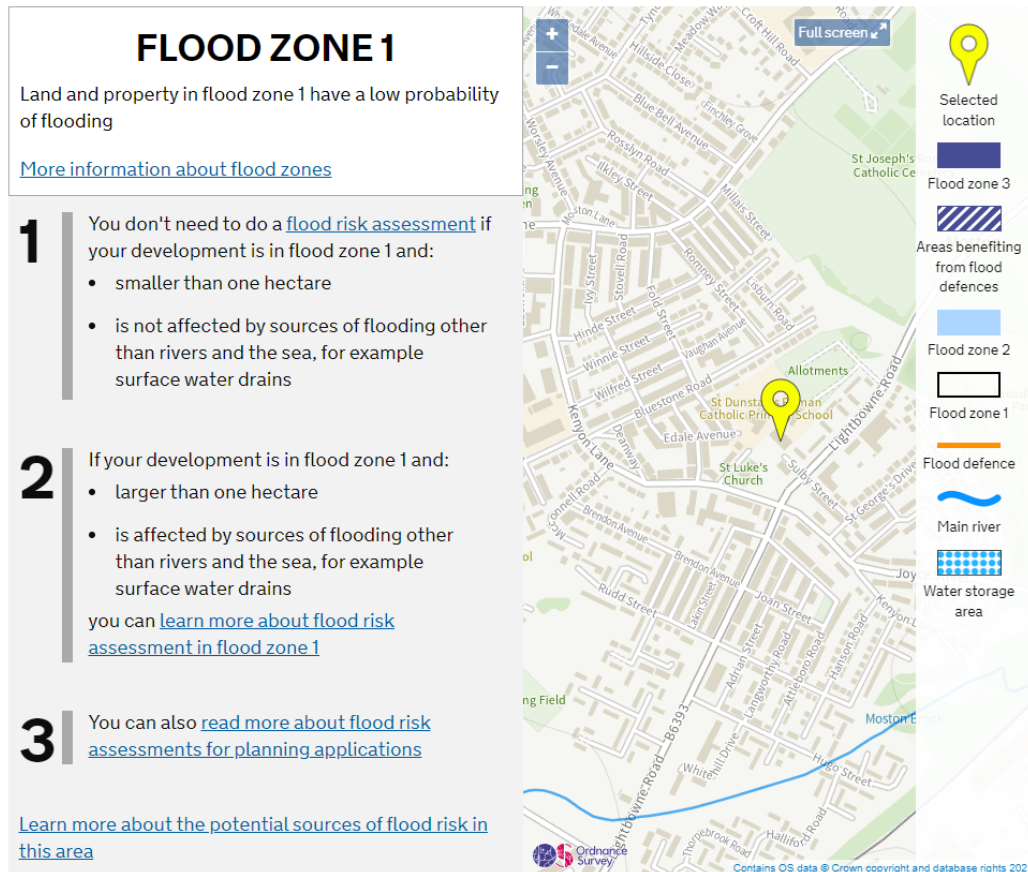


Figure 3 - Flood Risk Mapping (GOV.uk)

3.3. Development Proposals

3.3.1. The current site will host 8No Townhouses and 12No 1 bed apartments. Both blocks of buildings will be situated over two floors.

3.3.2. A private drive will access the properties from the southern boundary off Sulby Street.

3.3.3. An area comparison pre and post development is shown below:

Site Region	Pre-Development (m2)	Post Development (m2)
Building	774	890
Hardstand/ Car Parking	767	1169
Soft Landscaping/ Garden	1419	901
Impermeable	1541	2059
Permeable	1419	901

Table 2- Pre and Post Development Detailed Figures

4. SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Any new drainage for the development should be designed in accordance with the non-statutory technical guidance for the design of sustainable drainage systems.

4.1. *Surface Water Disposal Hierarchy*

4.1.1. The disposal of surface water should be considered in the following order of priority;

1. Discharge to be used on site.
2. Infiltration into the subsoil via soakaways or permeable paving.
3. Discharge to a water course or the sea.
4. Discharge to a surface water sewer.
5. Discharge to a combined sewer.

4.1.2. If it is not possible to use discharge on site or discharge to a soakaway, then surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		
Least Sustainable				

Table 3 - SuDS Hierarchy (Environment Agency)

4.2. *Disposal Strategy*

4.2.1. Use on Site

Under the new Design and Construction Guidance document introduced at the end of May 2021, Use of Surface Water generated on site is now the preferred first option in the SUDS hierarchy.

This may well be a feasible option during detailed design as further guidance will be required from the Services Consultant as to how extraction is achievable (and cost effective) using greywater to flush toilets is.

The position of any greywater tanks for water extraction for irrigation need to be positioned to avoid a site covered with other services (electric. drainage, telecommunications and as proposed for use on this site – piping for ground sourced heating).

At this stage, and given the site size, layout and use, this would have to be used in conjunction with other options on the SUDS hierarchy as opposed to being the sole option and may only offer a small overall reduction into the existing infrastructure.

4.2.2. Infiltration

There is no potential room for a permeable attenuation tank to be located within the landscaped areas while still maintaining a minimum 5m away from foundations or the site boundary and avoiding tree root protection areas.

4.2.3. Discharge to a Water Course

The nearest watercourse/body of water is Moston Brook however, accessing this would entail crossing third party land.

4.2.4. Discharge to a Surface Water Sewer

There is no evidence of surface water sewers adjacent to the development.

4.2.5. Combined Sewer

Discharging into the combined sewer at a controlled rate is currently the most feasible option to be considered. A combined sewer passes below Sulby Street and it is likely there is an active connection to the sewer.

A CCTV drainage survey will also be required to establish if there are existing live connections up stream which may result in a localised diversion when a new connection is made.

4.3. **SuDS Strategy**

4.3.1. Living Roof

A significant area of the site receiving surface water is roof area. A sustainable solution to control run-off at its source is to provide green or brown roof areas. These roof areas retain part of the rainwater, slow down the speed of run-off and also help to reduce water pollution whilst providing a habitat for nature.

Any green or brown roof system would impose additional weight onto the roof structure which would need to be designed accordingly to accommodate the additional weight.

4.3.2. Ponds/Basins and Swales

There is no area within the development that would be feasible to accommodate a feature like this.

4.3.3. Infiltration/ Permeable Surfaces

All soakaways must be situated at least 5m away from the building footprint and boundary line as per building regulations. This in conjunction with the tree root protection areas limit the location of such soakaways. Site Investigations are required to be carried out in order to determine the infiltration rate or the soil.

Areas of hard landscaping have the potential to be utilised as subbase reservoirs with either full or partial filtration options to consider subject to testing or use purely as attenuation.

4.3.4. Landscaped Areas

The most sustainable solution to control run-off at its source would be to utilise areas of landscaping (grass and planting). There is an opportunity to make the external areas around the buildings heavily landscaped with tree pits, areas of feature planting to assist with this option. This may need to be used in conjunction with a primary means of surface water discharge.

A 10% allowance for urban creep has been considered within the design calculations of the surface water drainage strategy. This factor allows for the future possibility of landscape permeable area changes to individual dwellings.

4.3.5. Tanked System

Typically, a tanked system would be considered as a means to provide additional attenuation storage to control rainfall up to 1 in 100 year change events with an allowance for climate change for existing sites undergoing complete redevelopment.

In this instance, an attenuation tank with a flow control downstream may be the primary SUDS option to be utilised.

4.3.6. Pollution

The development does not contain 50 spaces or an area for parking greater than 800m² therefore a petrol interceptor is not required.

5. **DRAINAGE STRATEGY**

5.1. ***Surface Water Drainage***

- 5.1.1. In accordance with LLFA requirements, the development will be treated as a greenfield site as it has been derelict in excess of 12 months.
- 5.1.2. This has limited the flow to 5l/s and will be maintained using flow control systems such as a Hydro-Brake.
- 5.1.3. The peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 2 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.
- 5.1.4. Site investigations are required to determine the geology of the soil and whether the corresponding infiltration rates are feasible. Until confirmed, conservative design assumes it is not feasible.
- 5.1.5. Following preliminary assessment by calculation using initial layouts and assumed rainwater pipe locations, the development will require an approximate total of 64 cubic metres of storage, 49m³ of which is the attenuation tank with the remainder provided by the manholes and pipes. Storage is provided for storm events up to and including 1 in 100 year plus climate change. An additional allowance of 10% has been considered to allow for urban creep on the development.
- 5.1.6. This is currently a theoretical design based on the information we have been provided to date and will require confirmation of assumptions made (including invert level of the outfall of the existing sewer) – which will be undertaken during detailed design.
- 5.1.7. Outline proposals are shown on the Drainage Strategy drawing located in Appendix A.
- 5.1.8. Preliminary calculations have been included in the Appendix B.

5.2. ***Development Foul Water Drainage***

- 5.2.1. Foul water will be collected in a separate system to surface water. This will be collected via pipes & inspection chambers.
- 5.2.2. All proposed below ground foul water drainage will comply with Building Regulations Part H:2010, BS EN 12056-2:2000 and BS EN 752:2008.
- 5.2.3. Based upon the above, the peak foul flow rate from site is estimated to be 8.4l/s.
- 5.2.4. The proposed foul sewer system has been designed to handle this flow rate.
- 5.2.5. United Utilities approval for the flow rate entering the public sewer will be required to proceed with detailed design.

SUMMARY	Discharge Unit	Totals	Total DU
<i>Shower</i>	0.6	0	0
<i>Bath</i>	1.3	20	26
<i>Washbasin</i>	0.6	28	16.8
<i>WCs (4l-9l cistern)</i>	2.5	2	70
<i>Kitchen Sink</i>	1.3	20	26
<i>Dishwasher</i>	0.8	0	0
<i>Washing Machine</i>	0.8	8	6.4
			145.2
<i>Peak Flow Discharge</i>	8.4l/s		

Table 4 - Foul Flow Discharge Rate Estimation

5.3. Flood Risk within the Development

- 5.3.1. As per Environment Agency Flood Maps, the development is currently in Flood Zone One with a low probability of flooding.
- 5.3.2. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.
- 5.3.3. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
- 5.3.4. The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.
- 5.3.5. Initial levels have been designed to be sympathetic to the existing levels with no vast areas of landscaping resulting in significant or abrupt level changes.
- 5.3.6. Levels will be designed such that in the event of a more extreme rainfall event water will discharge away from buildings.

6. **MAINTENANCE & CONSTRUCTION**

6.1. ***Maintenance Considerations***

- 6.1.1. This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details.
- 6.1.2. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 6.1.3. The surface water network has been designed to accommodate the 1 in 100-year storm rainfall event plus an allowance for climate change particular to the requirements of the development.
- 6.1.4. As the flows are generally being attenuated on site, there will be a period after storm events where the network is still partially or fully surcharged and is draining down.
- 6.1.5. Where this surcharging is still present after 48hrs appropriate action should be taken.
- 6.1.6. A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 6.1.7. No large shrubs should be planted over any geocellular tanks within 3m in all directions and 6m from small/medium specimen tree planting. Larger trees should not be planted within 20m of the tanks.
- 6.1.8. It is advisable that above ground signage is installed detailing size and depth of any below ground structures to make any future works manageable.
- 6.1.9. It is assumed that the maintenance of the drainage network will be the responsibility of an on-site facilities management team.
- 6.1.10. A copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.
- 6.1.11. It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- 6.1.12. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 6.1.13. Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 6.1.14. During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter.

6.1.15. Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

6.1.16. Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

6.2. Construction

6.2.1. Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

6.2.2. Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

6.2.3. The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer, must be of a suitable nature and quality for their intended use.

6.2.4. The detailed design of the system and product selection for the storage and pipe solution will be made at the detailed design stage when all the site constraints can be considered. There are numerous products available for storage of water below ground and care will be needed to ensure that the right product is chosen for the final loading conditions.

7. CONCLUSIONS AND RECOMMENDATIONS

- 7.1. This report gives details of the Drainage Strategy which has been undertaken in relation to the proposed development on Sulby Street, Manchester.
- 7.2. The development will be situated on the previously developed derelict site to provide two building blocks providing 8 two storey townhouses and 12 one bedroom apartments situated over a 2 storey building.
- 7.3. Separate foul and surface water systems will be provided on the development, only connecting at the final manhole on the development before discharge to the public combined sewer.
- 7.4. The development has been considered to be greenfield as it has the site has been derelict for in excess of 12 months. Therefore, a 5l/s discharge rate for the surface water is agreed as in accordance with the LLFA requirements.
- 7.5. The proposed development provides an opportunity to reduce local area flood risk by controlling surface water on site. Following the SuDS and water disposal hierarchy it has been determined the most viable solution will be to control surface water using flow controls and stored on site before being discharged to the public combined sewer.
- 7.6. The proposed system will be designed to control surface water run-off for all storms up to and including the 100 year plus climate change event. Water will be stored on site below ground before being discharged at the agreed flow rate. Final run-off rates will be dependent on approval by United Utilities
- 7.7. A total of 64 cubic metres of storage is required for the for the entire development provided through the use of an attenuation tank (49m³) the pipes and manhole chambers providing the remainder.
- 7.8. New connections will be required from the development into the existing combined sewer with preliminary details shown on the Drainage Strategy drawing. These may require temporary sewer diversions and road closures to form the connection safely.
- 7.9. A Wastewater Pre-Development Enquiry has been submitted to United Utilities for comment on the proposed drainage strategy presented within this report. At the time of writing, no response has been received.
- 7.10. The proposed system will be designed to meet the Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems, March 2015.

APPENDIX A***Drainage Strategy Drawing***

KEY

G

GULLY

RWP

RAINWATER PIPE

SVP

SOIL VENT PIPE

F(X)

MANHOLE (FOUL WATER)

S(X)

MANHOLE (SURFACE WATER)

C(X)

MANHOLE (COMBINED WATER)

NEW FOUL WATER

NEW SURFACE WATER

Ex COMBINED WATER DRAIN

BOUNDARY



SCALE BAR 1:200

- NOTES:
1.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS.
2.

OWNERSHIP OF PIPE NETWORKS ARE TO BE CONFIRMED PRIOR TO ANY DIVERSION WORKS.
3.

THIS DRAWING INDICATES DRAINAGE PRINCIPLES AND STRATEGY ONLY AND FURTHER DETAIL DESIGN IS REQUIRED FOLLOWING CONFIRMATION OF BUILDING SET OUT, PROPOSED LEVELS, PROPOSED INTERNAL POP UPS AND FURTHER DISCUSSIONS WITH ALL RELEVANT PARTIES REGARDING ALLOWABLE DISCHARGE.
4.

THE DEVELOPMENT HAS BEEN CONSIDERED AS GREENFIELD IN ACCORDANCE WITH LLFA GUIDANCE.
5.

DURING THE DETAILED DESIGN PHASE, ALL STORM EVENT DURATIONS UP TO AND INCLUDING 6 HOURS WILL BE MODELLED TO DETERMINE THE FINAL STORAGE REQUIREMENT FOR THE DEVELOPMENT.
6.

ALL PROPOSED RESTRICTED FLOW RATES AND CONNECTION POINTS WILL BE SUBJECT TO UNITED UTILITIES AGREEMENT AND APPROVAL.
7.

FOUL WATER FLOW RATES ARE ESTIMATED IN ACCORDANCE WITH BS EN 752:2008 AND DESIGNED FOR PEAK FLOW RATES.
8.

UNITED UTILITIES CONFIRMATION OF APPROVAL FOR THE FLOW RATE ENTERING THE PUBLIC SEWER WILL BE REQUIRED TO PROCEED WITH THE DETAILED DESIGN.
9.

ALL EXISTING ON-SITE DRAINAGE (ABANDONED OR LIVE) TO BE IDENTIFIED AND TERMINATED AT SITE BOUNDARY UNO.

SW DISPOSAL HIERARCHY STATEMENT

1.

USE ON SITE - SUBJECT TO DETAILED DESIGN AND INPUT FROM M&E CONSULTANTS. POSITIONING OF GREYWATER TANKS MAY PROVE DIFFICULT. MAY PROVE TO BE ONLY USED N CONJUNCTION WITH OTHER OPTIONS.
2.

INFILTRATION - SITE INVESTIGATION IS REQUIRED TO DETERMINE IF INFILTRATION IS A FEASIBLE OPTION.
3.

DISCHARGE TO WATERCOURSE - DISTANCE TO NEAREST WATERCOURSE WOULD ENTAIL CROSSING THIRD PARTY LAND.
4.

DISCHARGE TO SURFACE WATER SEWERS - NO SURFACE WATER SEWER WITHIN PROXIMITY OF THE DEVELOPMENT.
5.

DISCHARGE TO COMBINED SEWER - THIS IS CURRENTLY THE FEASIBLE OPTION WITH A COMBINED SEWER BELOW SULBY STREET.

SuDS STRATEGY

- LIVING ROOF**

- RUN-OFF CAN BE CONTROLLED AT ITS SOURCE BY PROVIDING GREEN/BROWN ROOF AREAS. ROOF STRUCTURE DESIGN WOULD NEED TO ACCOMODATE THE ADDITIONAL WEIGHT OF THIS
- PONDS/BASINS/SWALES**

- NO AREA WITHIN DEVELOPMENT THAT WOULD BE FEASIBLE FOR A FEATURE LIKE THIS
- INFILTRATION/ PERMEABLE SURFACES**

- SOAKAWAYS MUST BE 5M FROM BOUNDARY LINE AND FOUNDATIONS. IN CONJUNCTION WITH TREE ROOT AREAS, THERE IS NO AREA WITHIN THE SITE THAT WOULD BE FEASIBLE FOR A FEATURE LIKE THIS.
- LANDSCAPED AREAS**

- THERE IS AN OPPORTUNITY TO HEAVILY LANDSCAPE EXTERNAL AREAS TO AID IN THIS FEATURE. THIS WOULD NEED TO BE USED IN CONJUNCTION WITH A PRIMARY MEANS OF SURFACE WATER DRAINAGE.
- TANKED SYSTEM**

- THIS IS CURRENTLY THE FEASIBLE PRIMARY SuDS OPTION WITH A FLOW CONTROL INSTALLED DOWNSTREAM.
- POLLUTION**

- THE DEVELOPMENT DOES NOT CONTAIN 50 PARKING SPACES OR A PARKING AREA GREATER THAN 800M², THEREFORE A PETROL INTERCEPTOR IS NOT REQUIRED.

01	05/04/2022	ISSUED FOR INFORMATION	SB	OB	MD
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Client	THE CHALLENGER GROUP				
Project	SULBY STREET MANCHESTER				
Office	LIVERPOOL				
Discipline	CIVIL				
Title	DRAINAGE STRATEGY				
Scale @ A1	1-200	Status	INFORMATION		



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Job Number	Originator	Building/Zone	Level
4/8268	CCL	SUL	DRN
Type	Discipline	Drawing No.	Revision
GA	C	050	01

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SURFACE WATER STRATEGY:
THE DEVELOPMENT HAS BEEN CLASSIFIED BY MANCHESTER CITY COUNCIL AS GREENFIELD AND THE MAXIMUM SURFACE WATER DISCHARGE FROM THE SITE IS TO BE 5l/s. DISCHARGE IS TO CONNECT TO THE FOUL AT A DEMARCATION CHAMBER LOCATED WITHIN THE SITE BOUNDARY BEFORE DISCHARGING INTO THE PUBLIC SEWER BELOW SULBY STREET.

FOUL WATER STRATEGY:
THIS WILL BE COLLECTED ON SITE THROUGH A SEPERATE FOUL DRAINAGE SYSTEM WHICH COMBINES WITH THE SURFACE WATER AT THE BOUNDARY OF THE SITE - DOWNSTREAM OF THE FLOW CONTROL CHAMBERS. THE ESTIMATED PEAK FOUL FLOW IS SUBJECT TO CONFIRMATION OF NUMBERS AND LAYOUTS OF ROOMS.

BASED ON AREAS SUPPORTED, MAXIMUM TOTAL STORAGE VOLUME OF 64m³ IS REQUIRED (49m³ PROVIDED BY THE TANK) FOR THE SYSTEM FOR ALL STORM EVENTS UP TO AND INCLUDING THE 1:100 YEAR STORM + 30% CLIMATE CHANGE TO BE CONTAINED BELOW GROUND.

THIS IS A THEORETICAL PRELIMINARY DESIGN AS ASSUMPTIONS MADE MUST BE CONFIRMED (I.E. LEVELS, AREAS SUPPORTED). CONSTRUCTION STAGE DESIGN IS SUBJECT TO DETAILED DESIGN. DO NOT CONSTRUCT FROM THIS DRAWING.

UNLESS NOTED OTHERWISE, FOUL NETWORK IS TO COMPRISE OF 600MM DIAMETER INSPECTION CHAMBERS WITH 225mm DIAMETER PIPES LINKED BETWEEN LAID TO FALL AT 1 IN 225.

THE INDICATIVE DRAINAGE ARRANGEMENTS SHOWN ON EACH PLOT IS SUBJECT TO COORDINATION WITH THE ARCHITECT AND LANDSCAPE ARCHITECT FOR LEVELS, M&E CONSULTANT FOR POP-UPS.

THIS DRAWING IS FOR INFORMATION ONLY AND IS SUBJECT TO FURTHER DISCUSSIONS WITH THE RELEVANT AUTHORITIES AND SUBSEQUENT FURTHER DETAILED DESIGN - DO NOT CONSTRUCT FROM THIS DRAWING.

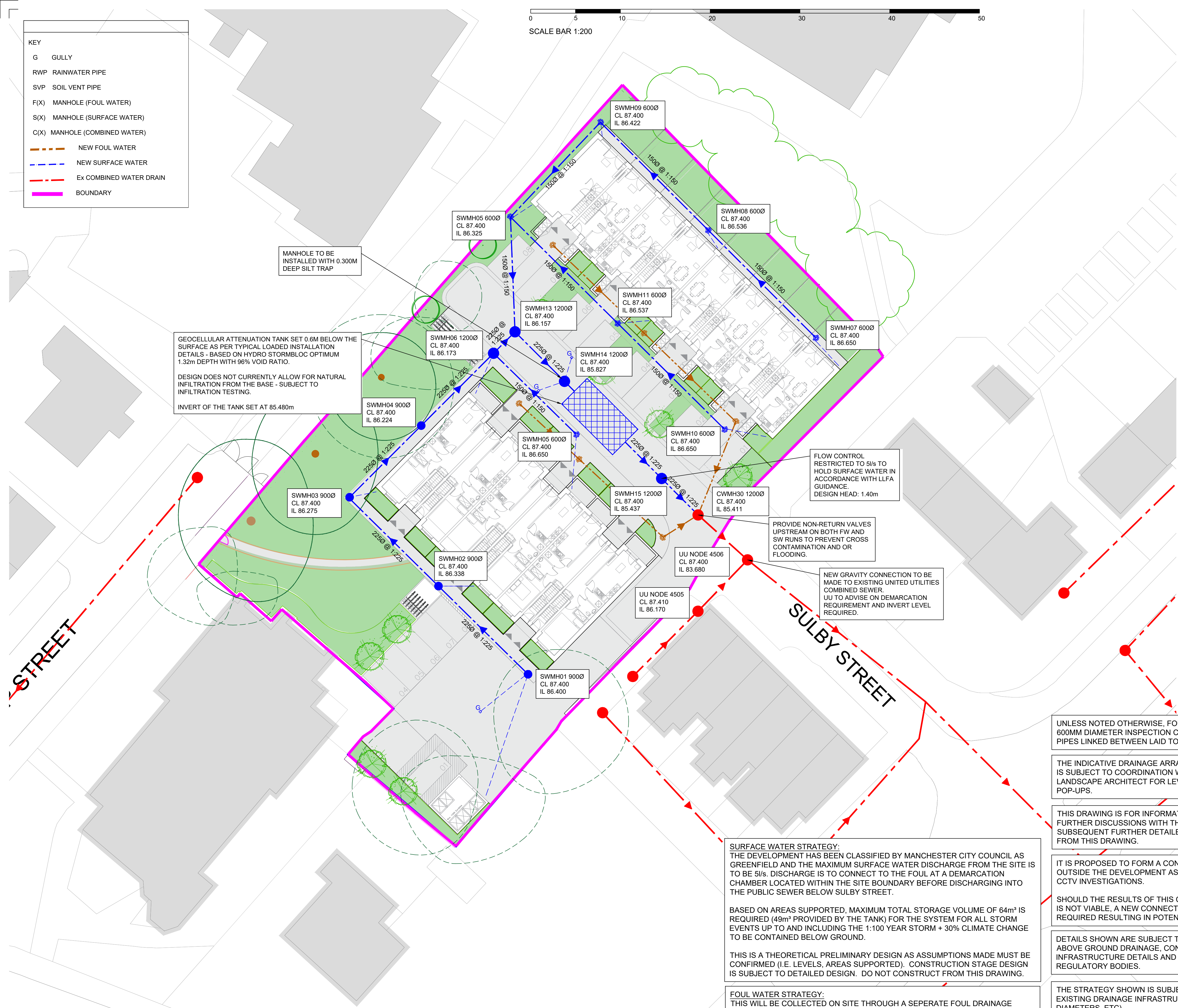
IT IS PROPOSED TO FORM A CONNECTION TO THE LIVE SEWER OUTSIDE THE DEVELOPMENT AS SHOWN SUBJECT TO FURTHER CCTV INVESTIGATIONS.

SHOULD THE RESULTS OF THIS CONCLUDE THAT THE CONNECTION IS NOT VIABLE, A NEW CONNECTION AND MANHOLE WILL BE REQUIRED RESULTING IN POTENTIAL ROAD CLOSURES.

DETAILS SHOWN ARE SUBJECT TO CONFIRMATION OF LAYOUTS, ABOVE GROUND DRAINAGE, CONFIRMATION OF EXISTING DRAINAGE INFRASTRUCTURE DETAILS AND AGREEMENTS FROM ALL REGULATORY BODIES.

THE STRATEGY SHOWN IS SUBJECT TO CONFIRMATION OF THE EXISTING DRAINAGE INFRASTRUCTURE (LEVELS, FALLS, PIPE DIAMETERS, ETC).

THE STRATEGY ASSUMES DUE TO LEVELS NO PUMPING IS REQUIRED.



Birmingham 0121 260 7600, Glasgow 0141 227 5300, London 020 3077 0970, Manchester 0161 610 6000, Newcastle 0191 221 0102, Norwich 01603 305490, Plymouth 01752 641788

APPENDIX B***Initial Drainage Model Calculations***

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.360	Preferred Cover Depth (m)	1.200
CV	0.750	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)	Easting (m)	Northing (m)	Depth (m)
1	0.027	5.00	87.400	900	24.599	33.991	1.000
2	0.010	5.00	87.400	900	14.604	43.787	1.062
3	0.010	5.00	87.400	900	4.477	53.715	1.125
4			87.400	900	12.677	61.747	1.176
14	0.025	5.00	87.400	1200	27.899	67.414	1.573
5	0.010	5.00	87.400	600	29.664	61.051	0.750
6	0.012	5.00	87.400	1200	20.682	69.818	1.227
7	0.007	5.00	87.400	600	56.773	71.548	0.750
8	0.007	5.00	87.400	600	44.733	83.653	0.864
9	0.007	5.00	87.400	600	32.694	95.758	0.978
10	0.007	5.00	87.400	600	46.621	61.331	0.750
11	0.007	5.00	87.400	600	34.581	73.175	0.863
12	0.007	5.00	87.400	600	22.671	85.150	1.075
13			87.400	1200	23.127	72.329	1.243
TANK			87.400		32.629	62.632	1.920
15			87.400	1200	39.527	55.864	1.963
CW21			87.400	1200	43.692	51.764	1.989

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)
3.000	1	2	13.995	0.600	86.400	86.338	0.062	225.0	225	5.27	50.0
3.001	2	3	14.182	0.600	86.338	86.275	0.063	225.0	225	5.54	50.0
3.002	3	4	11.478	0.600	86.275	86.224	0.051	225.0	225	5.76	50.0
3.003	4	6	11.368	0.600	86.224	86.173	0.051	225.0	225	5.98	50.0
1.005	14	TANK	6.726	0.600	86.127	86.097	0.030	225.0	225	6.52	50.0
3.004	6	13	3.505	0.600	86.173	86.157	0.016	225.0	225	6.05	50.0
1.000	7	8	17.073	0.600	86.650	86.536	0.114	150.0	150	5.35	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	0.867	34.5	3.7	0.775	0.837	0.027	0.0	50	0.569
3.001	0.867	34.5	5.0	0.837	0.900	0.037	0.0	58	0.620
3.002	0.867	34.5	6.4	0.900	0.951	0.047	0.0	65	0.666
3.003	0.867	34.5	6.4	0.951	1.002	0.047	0.0	65	0.666
1.005	0.867	34.5	18.4	1.048	1.078	0.136	0.0	117	0.882
3.004	0.867	34.5	9.4	1.002	1.018	0.069	0.0	80	0.738
1.000	0.818	14.5	0.9	0.600	0.714	0.007	0.0	26	0.461

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)
1.001	8	9	17.072	0.600	86.536	86.422	0.114	150.0	150	5.70	50.0
1.002	9	12	14.594	0.600	86.422	86.325	0.097	150.0	150	5.99	50.0
2.000	10	11	16.889	0.600	86.650	86.537	0.113	150.0	150	5.34	50.0
2.001	11	12	16.889	0.600	86.537	86.424	0.113	150.0	150	5.69	50.0
1.003	12	13	12.829	0.600	86.325	86.239	0.086	150.0	150	6.25	50.0
1.004	13	14	6.850	0.600	86.157	86.127	0.030	225.0	225	6.39	50.0
1.006	TANK	15	9.664	0.600	85.480	85.437	0.043	225.0	225	6.70	50.0
1.007	15	CW21	5.844	0.600	85.437	85.411	0.026	225.0	225	6.81	50.0
4.000	5	6	12.551	0.600	86.650	86.566	0.084	150.0	150	5.26	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	0.818	14.5	1.9	0.714	0.828	0.014	0.0	37	0.566
1.002	0.818	14.5	2.8	0.828	0.925	0.021	0.0	45	0.635
2.000	0.818	14.5	0.9	0.600	0.713	0.007	0.0	26	0.461
2.001	0.818	14.5	1.9	0.713	0.826	0.014	0.0	37	0.566
1.003	0.818	14.5	5.7	0.925	1.011	0.042	0.0	65	0.770
1.004	0.867	34.5	15.0	1.018	1.048	0.111	0.0	104	0.839
1.006	0.867	34.5	18.4	1.695	1.738	0.136	0.0	117	0.882
1.007	0.867	34.5	18.4	1.738	1.764	0.136	0.0	117	0.882
4.000	0.818	14.5	1.4	0.600	0.684	0.010	0.0	31	0.511

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	13.995	225.0	225	Circular	87.400	86.400	0.775	87.400	86.338	0.837
3.001	14.182	225.0	225	Circular	87.400	86.338	0.837	87.400	86.275	0.900
3.002	11.478	225.0	225	Circular	87.400	86.275	0.900	87.400	86.224	0.951
3.003	11.368	225.0	225	Circular	87.400	86.224	0.951	87.400	86.173	1.002
1.005	6.726	225.0	225	Circular	87.400	86.127	1.048	87.400	86.097	1.078
3.004	3.505	225.0	225	Circular	87.400	86.173	1.002	87.400	86.157	1.018
1.000	17.073	150.0	150	Circular	87.400	86.650	0.600	87.400	86.536	0.714
1.001	17.072	150.0	150	Circular	87.400	86.536	0.714	87.400	86.422	0.828
1.002	14.594	150.0	150	Circular	87.400	86.422	0.828	87.400	86.325	0.925
2.000	16.889	150.0	150	Circular	87.400	86.650	0.600	87.400	86.537	0.713
2.001	16.889	150.0	150	Circular	87.400	86.537	0.713	87.400	86.424	0.826

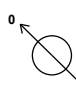
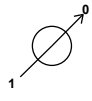
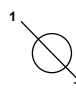
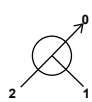
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	1	900	Manhole	Adoptable	2	900	Manhole	Adoptable
3.001	2	900	Manhole	Adoptable	3	900	Manhole	Adoptable
3.002	3	900	Manhole	Adoptable	4	900	Manhole	Adoptable
3.003	4	900	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.005	14	1200	Manhole	Adoptable	TANK		Junction	
3.004	6	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable
1.000	7	600	Manhole	Adoptable	8	600	Manhole	Adoptable
1.001	8	600	Manhole	Adoptable	9	600	Manhole	Adoptable
1.002	9	600	Manhole	Adoptable	12	600	Manhole	Adoptable
2.000	10	600	Manhole	Adoptable	11	600	Manhole	Adoptable
2.001	11	600	Manhole	Adoptable	12	600	Manhole	Adoptable

Pipeline Schedule

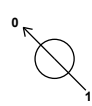
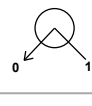
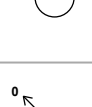
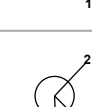
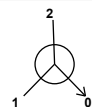
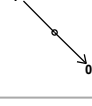
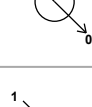
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	12.829	150.0	150	Circular	87.400	86.325	0.925	87.400	86.239	1.011
1.004	6.850	225.0	225	Circular	87.400	86.157	1.018	87.400	86.127	1.048
1.006	9.664	225.0	225	Circular	87.400	85.480	1.695	87.400	85.437	1.738
1.007	5.844	225.0	225	Circular	87.400	85.437	1.738	87.400	85.411	1.764
4.000	12.551	150.0	150	Circular	87.400	86.650	0.600	87.400	86.566	0.684

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	12	600	Manhole	Adoptable	13	1200	Manhole	Adoptable
1.004	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
1.006	TANK		Junction		15	1200	Manhole	Adoptable
1.007	15	1200	Manhole	Adoptable	CW21	1200	Manhole	Adoptable
4.000	5	600	Manhole	Adoptable	6	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	24.599	33.991	87.400	1.000	900		0	3.000	86.400	225
2	14.604	43.787	87.400	1.062	900		1	3.000	86.338	225
						0	3.001	86.338	225	
3	4.477	53.715	87.400	1.125	900		1	3.001	86.275	225
						0	3.002	86.275	225	
4	12.677	61.747	87.400	1.176	900		1	3.002	86.224	225
						0	3.003	86.224	225	
14	27.899	67.414	87.400	1.573	1200		1	1.004	86.127	225
						0	1.005	86.127	225	
5	29.664	61.051	87.400	0.750	600		0	4.000	86.650	150
6	20.682	69.818	87.400	1.227	1200		1	4.000	86.566	150
						2	3.003	86.173	225	
						0	3.004	86.173	225	
7	56.773	71.548	87.400	0.750	600		0	1.000	86.650	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
8	44.733	83.653	87.400	0.864	600		1	1.000	86.536	150
9	32.694	95.758	87.400	0.978	600		0	1.001	86.536	150
							1	1.001	86.422	150
10	46.621	61.331	87.400	0.750	600		0	1.002	86.422	150
							0	2.000	86.650	150
11	34.581	73.175	87.400	0.863	600		1	2.000	86.537	150
							0	2.001	86.537	150
12	22.671	85.150	87.400	1.075	600		1	2.001	86.424	150
							2	1.002	86.325	150
							0	1.003	86.325	150
13	23.127	72.329	87.400	1.243	1200		1	3.004	86.157	225
							2	1.003	86.239	150
							0	1.004	86.157	225
TANK	32.629	62.632	87.400	1.920		1	1.005	86.097	225	
						0	1.006	85.480	225	
15	39.527	55.864	87.400	1.963	1200		1	1.006	85.437	225
							0	1.007	85.437	225
CW21	43.692	51.764	87.400	1.989	1200		1	1.007	85.411	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	18.000	Drain Down Time (mins)	240
Ratio-R	0.360	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

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 %)
2	0	0	0
30	0	10	0
100	40	10	0

Node 15 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	85.437	Product Number	CTL-SHE-0095-5000-1700-5000
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	85.480
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.96	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	38.4	0.0	1.320	38.4	0.0	1.321	0.0	0.0

APPENDIX C***United Utilities Service Record Drawing***

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Refno	Cover	Func	SW	Invert	Size	z	Shape	Mail	Length	Grad	Refno	Cover	Func	SW	Invert	Size	z	Shape	Mail	Length	Grad
1315			SW	100	150			8.488984	2708	85.74	CO	83.13	225							26.40029	1 in 132
1316			CO	300	150			7.130470	4701	87.55	SW	91.08	300							19.69772	1 in 132
2404			CO	150	150			16.542227	5504	CO	150									6.268023	
4803			SW	225	150			14.676922	5404	85.64	CO	84.3	225							78.74443	1 in 131/244047
4803			SW	225	150			16.98984	5402	86.58	CO	82.6	300							8.544003	1 in 62
3203			CO	225	150			17.073483	5405	86.68	CO	83.32	300							17.88854	1 in 62
1316			SW	100	150			13.64151	5405	86.96	CO	85.69	225							20.66172	1 in 103
2710			CO	150	150			17.162385	5613	CO	100									19.68182	
1313		87.57	SW	86.15	150			20.63001	5506	CO	100									13.07712	
1407			CO	150	150			19.23227	2541	87.15	CO	82.61	400							73.16464	1 in 88
5609			CO	150	150			11.36897	2541	87.15	CO	85.06	225							25.50978	1 in 103
2712			CO	150	150			14.43409	2609	88.17	CO	82.44	300							39	
1406			CO	150	150			86.66669	4801	87.46	CO	86.1	225							12.04199	
1406			CO	150	150			19.081334	4810	87.46	CO	85.1	225							13.06526	
3313			CO	150	150			13.036498	6320	CO	150									10.33291	
3313			CO	150	150			15.84171	5305	85.81	CO	81.51	300							53.06833	1 in 22
3310			CO	150	150			UN 3.817338	1 in	6802	90.57	SW	87.36	225						60.46487	1 in 86
4808			CO	150	150			22.20292	5313	CO	100									1.84729	
1405			CO	150	150			15.98581	6307	CO	100									13.14314	
1507			CO	150	150			15.17709	5407	85.82	CO	81.86	300							4.172559	
3309			CO	150	150			UN 2.915322	1 in	1614	86.41	CO	85.19	225						5.385105	1 in 89
2513	87.3		CO	85.57	225			20.70774	9504	SW	0	225								82.85029	
1511			CO	150	150			8.818768	4204	86.4	CO	85.0	225							22.36068	
3816			CO	150	150			17.614544	5610	CO	100									22.16125	
2711			CO	150	150			4.115357	5301	85.17	CO	77.45	300							17.65883	1 in 251
6411			CO	150	150			2.811772	3819	CO	150									5.697028	
5412			CO	150	150			8.807758	1024	88.04	CO	99.82	225							1.41321	1 in 2
5414			CO	150	150			13.14442	4506	87.4	CO	83.68	300							25.6125	
4308			CO	150	150			2.81598	1002	87.84	CO	85.79	225							37.575959	1 in 104
4308			CO	150	150			4.827135	4506	86.9	CO	83.56	300							67.06713	1 in 96
1408			CO	150	150			18.15349	5308	84.08	CO	77.34	900							20.87006	1 in 192
3307			CO	225	225			5.680325	2462	87.48	CO	82.2	225							30.41381	1 in 52
3815			CO	150	150			8.014612	6602	86.29	CO	83.2	225							45.27892	1 in 31
6409			CO	150	150			5.086423	5301	87.16	CO	81.61	300							43.20987	
4309			CO	150	150			13.806508	6211	CO	150									36.00826	
6311			CO	150	150			8.227118	5303	86.01	CO	83.58	300							6.708204	1 in 75
5316			CO	150	150			4.888898	2601	87.77	CO	81.88	300							60.00633	1 in 115
3818			CO	150	150			7.497783	CO												
4804			CO	150	150			16.84532	CO												
3511			CO	300	300			16.71797	CO												
8312			CO	150	150			10.02076	CO												
5503	87.12		CO	83.45	300			87.86968	1 in 158												
1511	87.8		SW	37.5	225			23.8542	1 in 60												
3811	86.93		CO	85.11	300			2.236219	1 in 0												
2205	87.23		CO	84.48	225			7.785204	1 in 11												
3811	86.28		CO	82.78	225			30.82462	1 in 66												
3402	85.84		CO	85.22	225			25.94567	1 in 133												
2509	87.11		CO	84.18	300			24.00382	1 in 100												
2808	86.89		CO	83.62	300			28.17801	1 in 69												
6301	82.51		81	79.49	225			8													
4209			CO	150	150			23.8099													
1503	87.04		SW	94.96	225			22.50255	1 in 98												
6303	81.88		CO	78.18	300			50.15619	1 in 33												
2201	87.04		CO	82.26	300			52.21419													
3821	86.91		CO	73.57	800			CO 23.7551													
4404	87.12		CO	79.78	750			71.6033	1 in 163												
2205	87.23		CO	84.48	225			8.785204	1 in 11												
2706	85.67		CO	84.17	300			86.7405	1 in 128												
6319			CO	150	150			11.38451	1 in 333												
4505	87.41		CO	86.17	225			7.81025	1 in 52												
4303	87.1		CO	82.59	300			49.57922	1 in 73												
1306	88.11	FO	84.34	300				42.54499	1 in 185												
2602	86.58	FO	83.01	300				56.34488	1 in 85												
1311	87.63	FO	85.38	300				49.4935	1 in 1												
1307	87.65	FO	83.78	300				45.61708	1 in 285												
3812	87.05	FO	83.78	300				34.34353	1 in 140												
1513			CO	150	150			44.73138	1 in 160												
3812	86.38		CO	85.17	150			13.01491													
2202	87.19	SW	84.44	225				26.1725	1 in 523												
1708	86.44		CO	84.66	225			58.6812	1 in 122												
6801	80.35	SW	86.64	225				31.07612	1 in 69												
6201	94.07	CO	89.99	800				63.61175	1 in 11												
2701	86.72		CO	83.46	300			30.7887	1 in 2												
3506	87.31	CO	83.46	300				83.25864	1 in 59												
1502	86.87		CO	84.68	225			83.6488	1 in 2												
4802	84.43		CO	83.11	225			2.34635													
8318			CO	150	150			49.57922	1 in 451												
2209	86.65		CO	83.9	225			3.86655	1 in 79												
4403	87.39		CO	79.99	750			21.4083	1 in 401												
2521	86.93		CO	81.46	300			CO	26												
4508	87.31	CO	84.46	300				26	2 in 124												
5302	82.68		CO	77.2	225			26.40072	1 in 102												
2815			CO	225	225			81.48783	1 in 82												
2241	86.05		CO	83.36	300			11.31371													
2241	87.31	CO	84.16	300				7.87045													
4401	87.16		CO	80.85	450			24.3159	1 in 128												
3504	87.35		CO	81.4	400			31.7005	1 in 62												
3504	87.31	CO	81.4	400				37.36467	1 in 221												
3504	87.32	CO	81.4	400				65.19192	1 in 194												
5620			CO	150	150			81.32699	1 in 69												
6803	90.01																				

LEGEND

Abandoned Foul Surface Water Combined

Public Sewer

Private Sewer

Section 104

Rising Main

Sludge Main

Overflow

Water Course

Highway Drain

All point assets follow the standard colour convention:

brown - foul **purple** - overflow

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

MANHOLE FUNCTION

- | | |
|----|---------------|
| FO | Foul |
| SW | Surface Water |
| CO | Combined |
| OV | Overflow |

SEWER SHAPE

- | | | |
|-------------|----|-------------|
| Circular | TR | Trapezoidal |
| Egg | AR | Arch |
| Oval | BA | Barrel |
| Flat Top | HO | HorseShoe |
| Rectangular | UN | Unspecified |
| Square | | |

SEWER MATERIAL

- | | |
|------|---------------------------|
| AS | Asbestos Cement |
| BR | Brick |
| PE | Polyethylene |
| PM | Reinforced Plastic Matrix |
| CO | Concrete |
| CSB | Concrete Segment Bolted |
| CSU | Concrete Segment Unbolted |
| CB | Concrete Box Culverted |
| PC | Plastic / Steel Composite |
| GRPC | Glass Reinforced Plastic |
| DI | Ductile Iron |
| PVC | Polyvinyl Chloride |
| CI | Cast Iron |
| SI | Spun Iron |
| ST | Steel |
| VC | Vitrified Clay |
| PP | Polypropylene |
| PF | Pitch Fibre |
| CM | Masonry, Coursed |
| MR | Masonry, Random |
| U | Unspecified |

Address or Site Reference:

Sulby Street Development,

Scale: 1:1250

Date: 06/01/2022

Sheet: 1 of 1

1 of 1

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Property Searches

