

# Flood Risk Assessment and Drainage Strategy

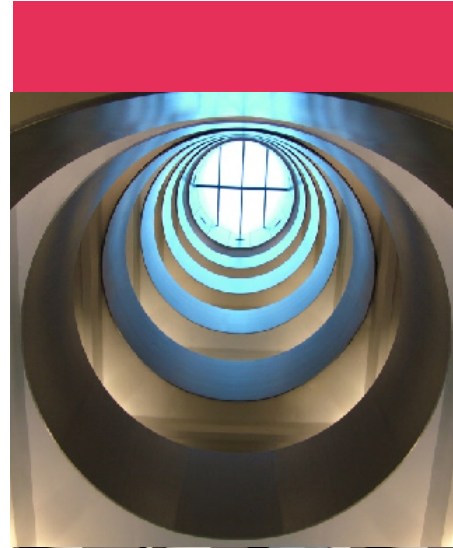
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United Utilities Correspondence

Manchester LLFA Correspondence

CRT Correspondence

### **Appendix G**

Drainage Strategy

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Proposed Surface Water Calculations

## 1.0 Introduction

### 1.1 Project Background

- 1.1.1 Curtins has been appointed by Manchester Life Development Company 3 Ltd to provide a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed scheme 'Jersey Wharf' located at land bound by Jersey Street to the north, Rochdale Canal to the south, Flint Glass Wharf/Works to the west and grassland to the east.
- 1.1.2 The report provides information on the nature of flood risk at the site and follows Government guidance regarding development and flood risk.
- 1.1.3 The report is based on currently available information and preliminary discussions.
- 1.1.4 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.5 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

### 1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
  - Investigate all potential risks of flooding to the site,
  - Consider the impact the development may have elsewhere with regards to flooding,
  - Consider design proposals to mitigate any potential risk of flooding determined to be present; and
  - Consider foul and surface water drainage proposals for the proposed development.
- 1.2.3 The total site area is approximately 0.54 hectares and following scrutiny of the Environment Agency flood maps it has been identified that site lies within Flood Zone 1. However, the Manchester Strategic Flood Risk Assessment (SFRA) has designated the site within a Critical Drainage Area (CDA) therefore, a Flood Risk Assessment is required to support a planning application.

- 1.2.4 In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for all developments.
- 1.2.5 A Drainage Strategy will therefore be required as part of the Planning Application for the development, as the site is considered to be 'major' development by the Town and Country Planning Order 2015.
- 1.2.6 This Flood Risk Assessment and Drainage Strategy reviews the following information:
- Environment Agency flood maps for rivers and sea flooding.
  - UK Government Flood Warning Information Service maps for surface water flooding and reservoir flooding.
  - Manchester City, Salford City and Trafford Councils Level 1 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2010.
  - Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010.
  - Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2011.
  - Preliminary Flood Risk Assessment (PFRA) for Manchester County Council dated May 2011.
  - Manchester City Council SuDS Requirements for New Developments.
  - United Utilities Public Sewer Records dated July 2020.
  - Topographical Survey by Malcolm Hughes Land Surveyors dated February 2021
  - CCTV Drainage Survey by TEAM Drainage dated February 2021.

### 1.3 Proposed Development

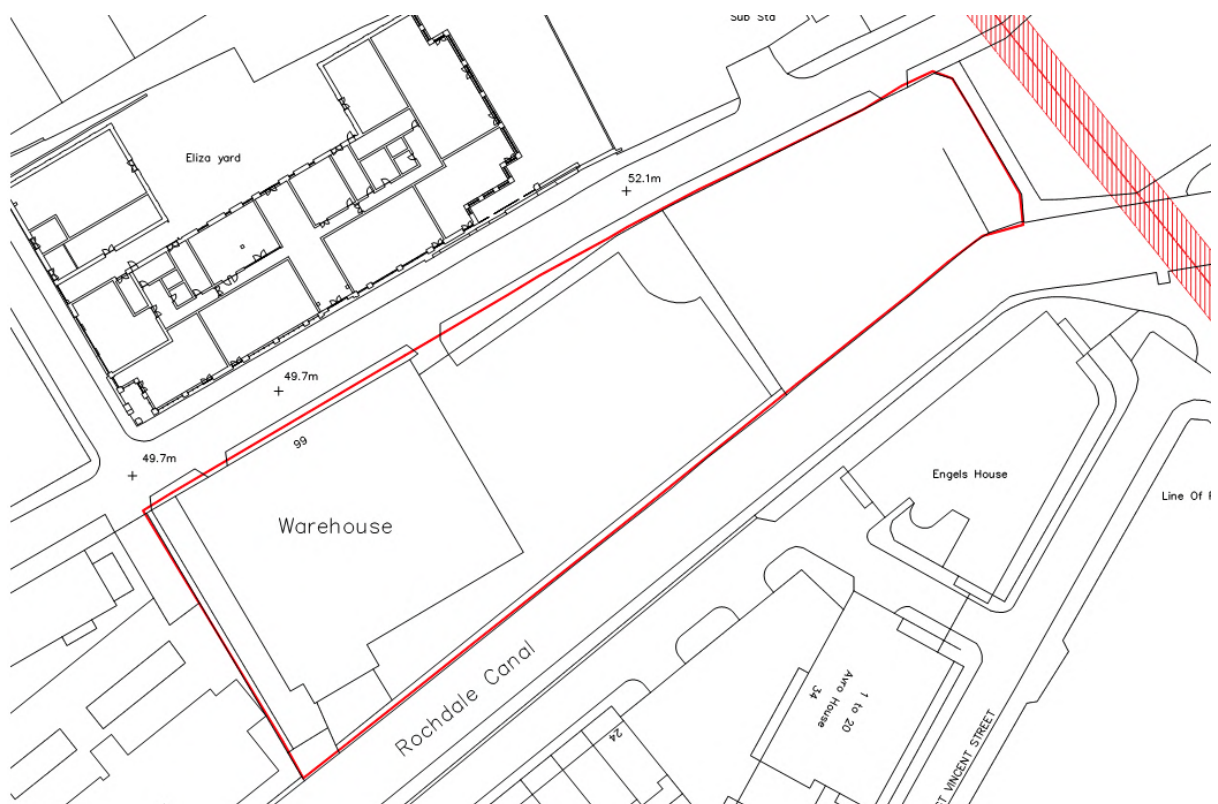
- 1.3.1 The proposed scheme is to deliver a 190-unit residential development, with ground floor commercial floorspace, and ancillary amenity space within an 8-storey building, cycle parking provision, hard and soft landscaping, access and servicing and other associated works.
- 1.3.2 The Proposed Site Layout is enclosed in *Appendix A*.

## 2.0 Existing Site Details

### 2.1 History and Current Use

- 2.1.1 The Site is bounded by Jersey Street to the north, Rochdale Canal to the south, Flint Glass Wharf/Works to the west and grassland to the east. Refer to Figure 1.
- 2.1.2 The eastern portion of the Site is grassland area, the middle of the site is currently vacant and comprises hardstanding and the western side portion of the site comprises a low-rise warehouse and associated car park. The site is currently fenced off which restricts access.
- 2.1.3 Adjacent to west of the Site are Flint Glass Works and Flint Glass Wharf, warehouses converted to offices and residential respectively. Across Jersey Street to the north of the Site is the recently approved Eliza Yard, a mid-rise residential development being brought forward by Manchester Life as part of the next phase of regeneration within Ancoats as well as a large, underutilised car park.

**Figure 1: Aerial Photograph (© Google 2021)**



### 2.2 Existing Watercourses and Other Waterbodies

- 2.2.1 No above ground watercourses have been identified within the proposed site.

- 2.2.2 The Rochdale Canal is located along the southern boundary of the site.
- 2.2.3 The Ashton Canal is located approximately 500m to the south of the site.
- 2.2.4 The nearest main watercourse is the River Irk and is approximately 1000m to the North.

### 2.3 Existing Drainage

- 2.3.1 The United Utilities public sewer records have been obtained for the site and surrounding area and confirm that there are no public sewers located within the site boundary.
- 2.3.2 The United Utilities sewer records are enclosed in *Appendix B*.
- 2.3.3 The records indicate that the following public sewers are located within the vicinity of the site:
  - There is a 406mm combined sewer within Jersey Street to the north of the site, the sewer appears to flow in a south-westerly direction.
  - There is a combined sewer (unrecorded size) within Jersey Street to the north of the site, the sewer appears to flow in a north-easterly direction where it connects to a 525x1050mm combined sewer to the east of the site (at manhole UU reference 3801) which flows in a south-easterly direction under the canal.
- 2.3.4 There are various sewers in the wider vicinity of the site, however they are not considered of direct relevance to the development works.
- 2.3.5 It should be noted that the unrecorded size combined sewer and the 525x1050mm combined sewer noted above are in close proximity to the development boundary and therefore the position of these sewers should be confirmed with the site boundary.
- 2.3.6 A CCTV Drainage Survey has been completed in and around the development site. The survey confirms the following:
  - There is an existing private combined drainage system on site within the western portion, in and around the existing warehouse. The existing drainage system discharges into the combined public sewer system in Jersey Street. The existing outfall was unable to be accessed with the camera as the outfall has a trap on its outfall.
  - No further drainage was identified within the northern/eastern portion of the site; however, access was limited.
  - The 406mm combined public sewer noted above was unable to be accessed at the 'HS' and the 'junction point' adjacent to Poland Street (reference taken from the UU sewer records), however an additional manhole has been located within Jersey Street in between the 'HS' and the junction point at Poland Street which accepts a connection from the site to the north (Eliza

Yard). The survey confirms that the main sewer is a 400x300mm brick sewer and the manhole is approximately 3.19m deep. The sewer is noted as in poor condition.

- The unrecorded size combined sewer in Jersey Street has been surveyed from manhole referenced 3801 and this confirms that the sewer is a 675x450mm brick sewer, however the sewer was unable to be surveyed up to the 'HS' noted on the sewer records as the sewer was collapsed at approximately 6.7m upstream of manhole 3801. The exact position of the sewer could therefore not be determined and potentially lies close to the development boundary.
- The 525mm sewer noted above to the east of the site downstream of manhole 3801 has been surveyed and confirmed as a 525mm sewer, this is located outside of the site boundary.

2.3.7 The CCTV Drainage Survey is enclosed in *Appendix C*.

## 2.4 Topography

2.4.1 A Topographical Survey has been completed at the site and is enclosed in *Appendix D*.

2.4.2 The Survey was completed in February 2021 by Malcolm Hughes Land Surveyors.

2.4.3 The topographical survey confirms that the ground levels are approximately 50mAOD and typically flat across the site. There is a small area of the site that is raised to 51mAOD to respond to the higher road level on Jersey Street.

2.4.4 A historic infilled canal arm, Prussia Arm, is present at the Site on a north south axis which crosses under the original stone bridge on Jersey Street. As such the level on Jersey Street rises by approximately 2 metres along its length in both directions. It is anticipated that this canal arm bridge will be removed by Manchester City Councils public realm project prior to start on site regularising the levels along Jersey Street.

## 2.5 Geology

2.5.1 The British Geological Survey (BGS) map confirms that the superficial deposits are listed as Till, Devensian – Diamicton.

2.5.2 The bedrock geology is described as Manchester Maris Formation – Mudstone.

2.5.3 Reviewing a local BGS borehole has indicated the strata to encompass mainly of clay. Made Ground is expected on the surface due to the developed nature of the site.

2.5.4 The site is not located within a Groundwater Source Protection Zone.

## 3.0 Development and Flood Risk

### 3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In July 2021, the Department of Communities and Local Government published the National Planning Policy Framework document (NPPF) and the Planning Practice Guidance was published in March 2014 which provides guidance on how flood risk should be assessed during the planning and development process.

**Table 1: (Extract from Planning Practice Guidance) Flood Zone Classifications**

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea !\[\]\(30072721fe92392a2d7c953be68f714a\_img.jpg\)](#)), available on the Environment Agency's web site, as indicated in the table below.

| Flood Zone                                 | Definition                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zone 1<br>Low<br>Probability               | Land having a less than 1 in 1,000 annual probability of river or sea flooding.<br>(Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)                                                                                                                                                                                                  |
| Zone 2<br>Medium<br>Probability            | Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or<br>Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.<br>(Land shown in light blue on the Flood Map)                                                                                                                               |
| Zone 3a<br>High<br>Probability             | Land having a 1 in 100 or greater annual probability of river flooding; or<br>Land having a 1 in 200 or greater annual probability of sea flooding.<br>(Land shown in dark blue on the Flood Map)                                                                                                                                                        |
| Zone 3b<br>The<br>Functional<br>Floodplain | <b>This zone comprises land where water has to flow or be stored in times of flood.</b><br>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.<br>(Not separately distinguished from Zone 3a on the Flood Map) |

**Table 2: (Extract from Planning Practice Guidance) Flood Risk Vulnerability Classification**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Essential Infrastructure</b> <ul style="list-style-type: none"><li>• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</li><li>• Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.</li><li>• Wind turbines.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Highly Vulnerable</b> <ul style="list-style-type: none"><li>• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.</li><li>• Emergency dispersal points.</li><li>• Basement dwellings.</li><li>• Caravans, mobile homes and park homes intended for permanent residential use.</li><li>• Installations requiring <b>hazardous substances consent</b>. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as ‘Essential Infrastructure’).</li></ul> |
| <b>More Vulnerable</b> <ul style="list-style-type: none"><li>• Hospitals</li><li>• Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.</li><li>• Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.</li><li>• Non-residential uses for health services, nurseries and educational establishments.</li><li>• Landfill* and sites used for waste management facilities for hazardous waste.</li><li>• Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</li></ul>                                                                                                                                                                                                                                  |

### **Less Vulnerable**

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill\* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

### **Water-Compatible Development**

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

**Table 3: (Extract from Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone Compatibility**

| Flood Zones | Flood Risk Vulnerability Classification |                         |                         |                 |                  |
|-------------|-----------------------------------------|-------------------------|-------------------------|-----------------|------------------|
|             | Essential infrastructure                | Highly vulnerable       | More vulnerable         | Less vulnerable | Water compatible |
| Zone 1      | ✓                                       | ✓                       | ✓                       | ✓               | ✓                |
| Zone 2      | ✓                                       | Exception Test required | ✓                       | ✓               | ✓                |
| Zone 3a †   | Exception Test required †               | ✗                       | Exception Test required | ✓               | ✓                |
| Zone 3b *   | Exception Test required *               | ✗                       | ✗                       | ✗               | ✓*               |

**Key:**

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

\* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

### **3.2 Site Specific NPPF Flood Risk Categorisation**

- 3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the UK Government web based 'Flood Map for Planning' which is used to inform planning of a site's Flood Zone(s) and the probability of flooding from rivers or sea (not taking into account the presence of flood defences or climate change). However, the web based 'Long Term Flood Risk Assessment for Locations in England' should also be used to identify the long-term flood risks from rivers and seas, surface water and reservoirs.
- 3.2.2 The Flood Map for Planning report is enclosed in *Appendix E*, and it can be seen that the site is classified as entirely within Flood Zone 1.
- 3.2.3 Further site-specific review of the flood risk to the site is provided in section 4.

### **3.3 Site Specific Flood Zone Compatibility**

- 3.3.1 The proposals for the development site are likely to fall within the following category:
- Buildings used for Dwellings houses.
- 3.3.2 Dwellings are classed as 'More Vulnerable' development in the Flood Risk Vulnerability Classification (Table 2).
- 3.3.3 The site is located within Flood Zone 1 for which a 'More Vulnerable' development is deemed to be appropriate. Therefore, the development does not trigger the requirement for a sequential test/exception test (refer to the Flood Zone compatibility table in the NPPF technical guidance).

## 4.0 Hydrological Assessment

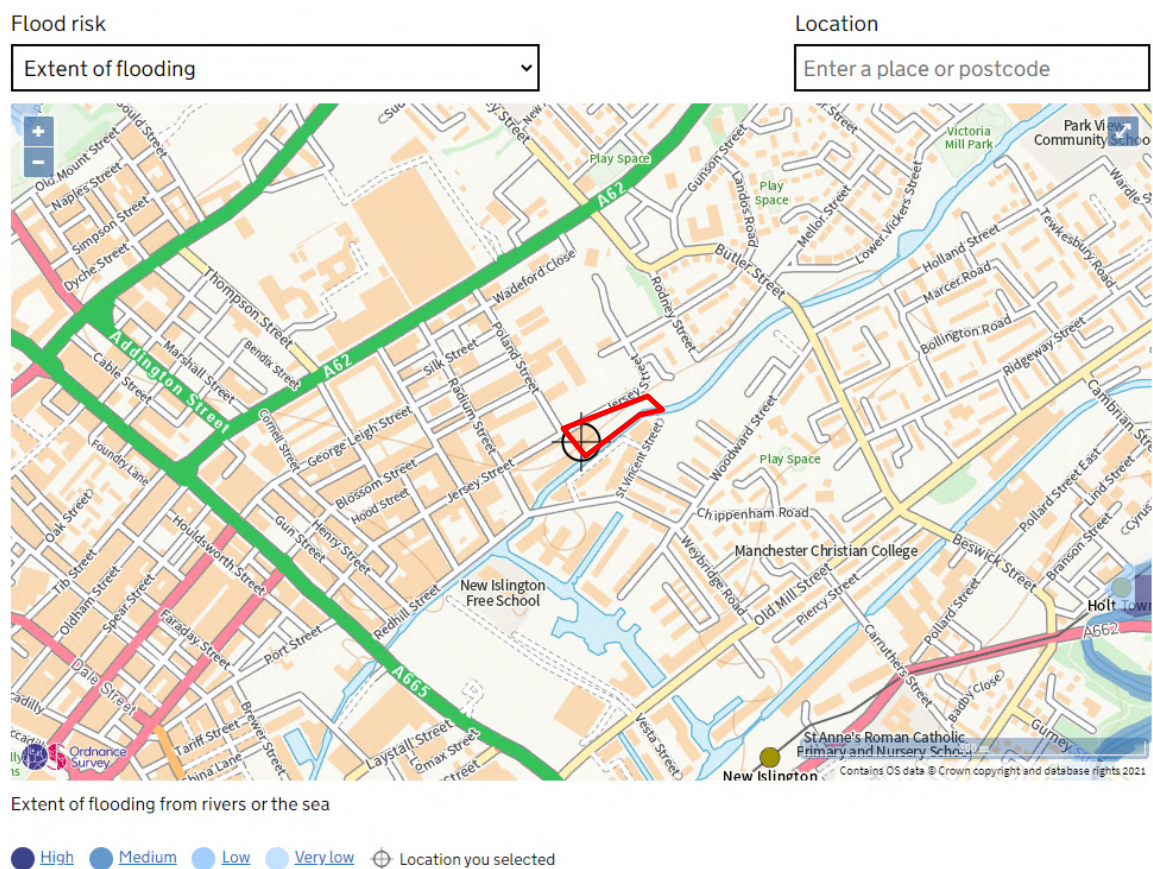
### 4.1 Sources of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

### 4.2 Fluvial Flooding (Rivers and Streams)

- 4.2.1 Flooding to the site from rivers and sea is indicated below in Figure 2, taken from the UK Government's Long-Term Flood Risk Information.

**Figure 2 - Long Term Flood Risk Assessment Map – Flood Risk from Rivers or Sea (© Crown Copyright)**



- 4.2.2 It can be seen that the entire site sits in an area of very low risk from fluvial and river flooding (Figure 3 for definition). Therefore, the proposed site is considered to be at very low risk from fluvial flooding.

**Figure 3 - Long Term Flood Risk Assessment (Detailed Information) – Flood Risk from Rivers or Sea (© Crown Copyright)**

### Flood risk from rivers or the sea



**Very low risk** means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

[Back to map](#)

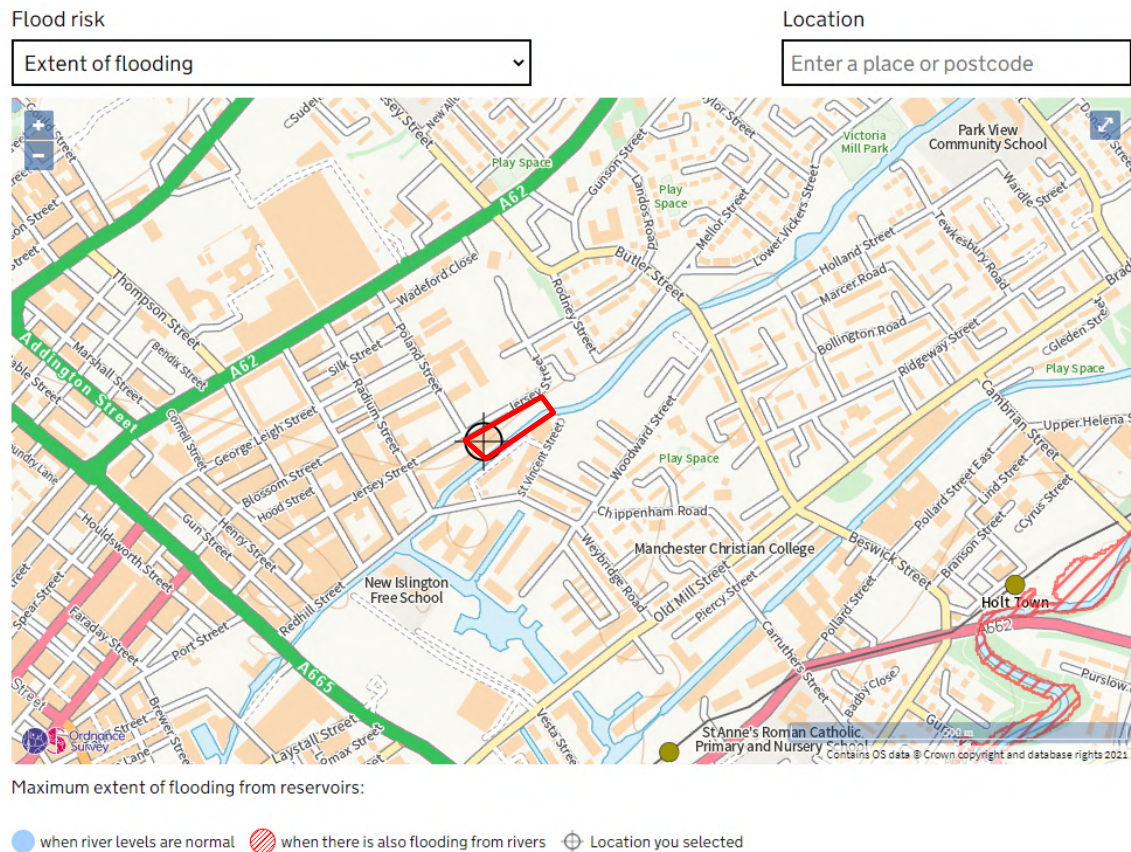
## 4.3 Tidal Flooding (Coastal or Estuarine)

- 4.3.1 There is currently no flood risk identified on the Environment Agency flood maps for the site and it is therefore regarded to be at low risk from tidal flooding.

## 4.4 Reservoir Flooding

- 4.4.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.
- 4.4.2 The Long-Term Flood Risk Assessment (Flood Risk from Reservoirs) map shows that the site is not a risk of flooding from reservoirs (Figure 4).

**Figure 4 - Long Term Flood Risk Assessment Map – Flood Risk from Reservoirs (© Crown Copy Right)**



## 4.5 Canal Flooding

- 4.5.1 The nearest canal to the site is the Rochdale Canal located along the southern site boundary.
- 4.5.2 The canals are identified in the Manchester SFRA as not generally posing a direct flood risk as they are a controlled water body. Therefore, the residual risk of canal flooding is usually associated with lower probability events such as overtopping and/or the breaching of embankments.
- 4.5.3 The Canal Flood Mapping within the Manchester SFRA indicates that the site is not located within a Canal Overtopping Hazard Zone or Canal Breach Zone.
- 4.5.4 Given the above information, it is considered that there is low risk of canal flooding to the site.

## 4.6 Groundwater Flooding

- 4.6.1 There is no mention of significant groundwater issues in the surrounding area in the Manchester SFRA or through the consultation from the LLFA

- 4.6.2 The site is shown to be within an area of medium to low risk of groundwater flooding according to the groundwater flooding map shown within the Governments online 'Magic' maps website.
- 4.6.3 Ground water has been encountered between 1 and 1.5m BgL in boreholes carried out for the site investigation.
- 4.6.4 There are no basements proposed within the development.
- 4.6.5 Based on the current information it is overall assumed that the site is at a low risk of groundwater flooding.

### **4.7 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)**

- 4.7.1 There is onsite drainage installed around the existing building which connects to the United Utilities network in Jersey Street.
- 4.7.2 United Utilities maps show that there are no public sewer located within the development site, however sewers are potentially in close proximity to the north-east corner of the site. Sewer defects encountered during the survey will be reported to United Utilities.
- 4.7.3 There are no records of and highway drainage in the vicinity of the site, however gullies within the adjacent highway are present and assumed to connect to the public sewer system.
- 4.7.4 Providing United Utilities and Manchester City Council maintain their drainage assets within the vicinity of the site, if any, the risk of flooding to the proposed development site from public sewers or highway drainage is considered as low.

### **4.8 Surface Water Flooding to the site**

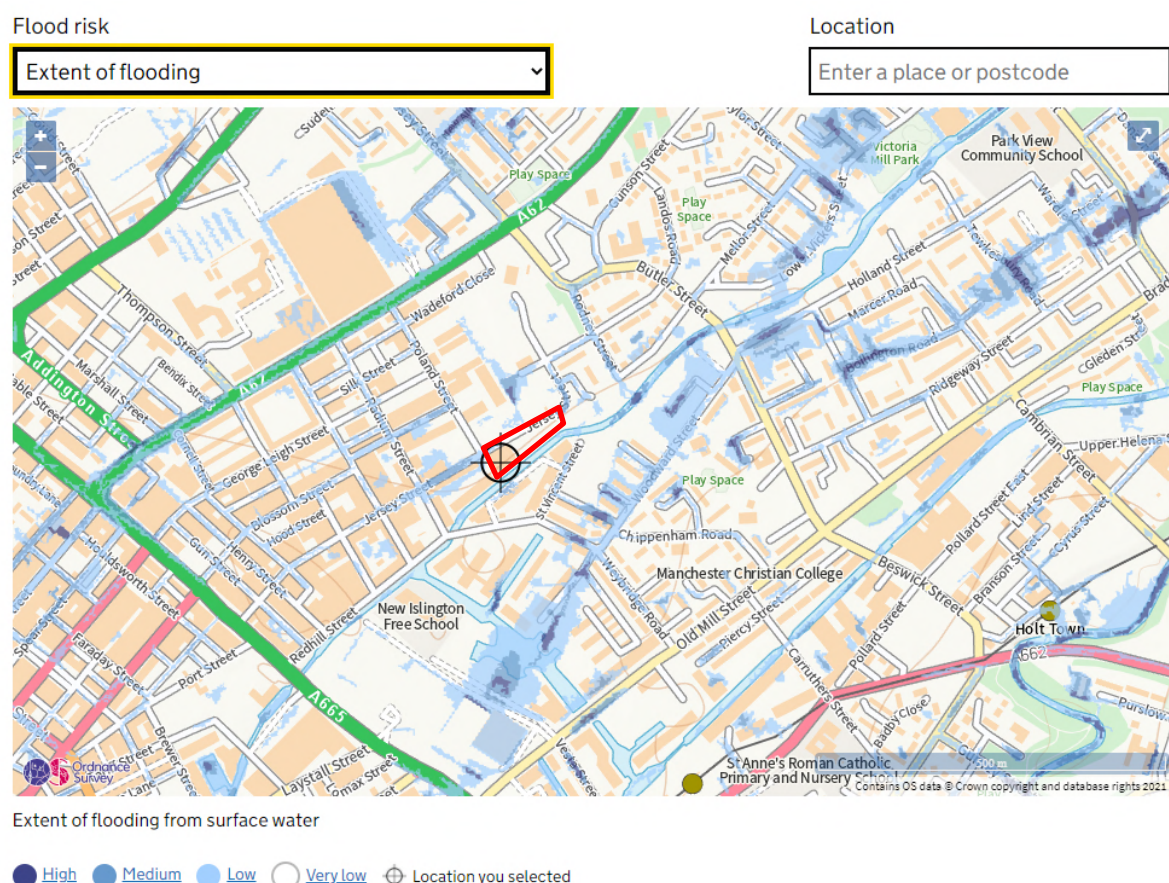
- 4.8.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.
- 4.8.2 From the UK Government's Flood Risk from Surface Water (extent of flooding) map;
  - Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
  - Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.

## Flood Risk Assessment and Drainage Strategy

- Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
- Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

4.8.3 The extent of flooding to the site from surface water is indicated in Figure 5 and it can be seen that the majority of the site is identified as being at a 'very low' risk of flooding from surface water. A small 'low risk' area is shown around the northerly boundary as part of an overland flood flow route. The surrounding roads are classed as 'high risk' however these areas are at a lower level than the development site.

**Figure 5 - Risk of Flooding from Surface Water - Extent of Flooding**



4.8.4 Considering the above information, the risk of surface water flooding to the site is generally considered very low.

### 4.9 Surface Water Flooding from the site

- 4.9.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Where new development is proposed, the proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.9.2 As part of the development, a positive drainage network have been designed and will be installed to mitigate the risk from surface water flooding to the building and the surrounding site.
- 4.9.3 Overall, the surface water flooding from the site to surrounding areas is considered very low.

### 4.10 Historical Flooding

- 4.10.1 No historic records of flooding for the site were received at the time of writing this report.

### 4.11 Summary of Flood Risk

- 4.11.1 From the evidence collated and subsequent negotiations the site can be found to be at **very low risk** of flooding from all sources at present. The installation of a positive drainage network will mitigate any flood risk associated with increasing the impermeable area.

### 5.0 Drainage Strategy

#### 5.1 Existing Drainage

- 5.1.1 The United Utilities public sewer records have been obtained for the site and surrounding area and confirm that there are no public sewers located within the site boundary.
- 5.1.2 The United Utilities sewer records are enclosed in *Appendix B*.
- 5.1.3 The records indicate that the following public sewers are located within the vicinity of the site:
- There is a 406mm combined sewer within Jersey Street to the north of the site, the sewer appears to flow in a south-westerly direction.
  - There is a combined sewer (unrecorded size) within Jersey Street to the north of the site, the sewer appears to flow in a north-easterly direction where it connects to a 525x1050mm combined sewer to the east of the site (at manhole UU reference 3801) which flows in a south-easterly direction under the canal.
- 5.1.4 There are various sewers in the wider vicinity of the site, however they are not considered of direct relevance to the development works.
- 5.1.5 It should be noted that the unrecorded size combined sewer and the 525x1050mm combined sewer noted above are in close proximity to the development boundary and therefore the position of these sewers should be confirmed with the site boundary.
- 5.1.6 A CCTV Drainage Survey has been completed in and around the development site. The survey confirms the following:
- There is an existing private combined drainage system on site within the western portion of the site in and around the existing warehouse. The existing drainage system discharges into the combined public sewer system in Jersey Street. The existing outfall was unable to be accessed with the camera as the outfall has a trap on its outfall.
  - No further drainage was identified within the northern/eastern portion of the site; however, access was limited.
  - The 406mm combined public sewer noted above was unable to be accessed at the 'HS' and the 'junction point' adjacent to Poland Street (reference taken from the UU sewer records), however an additional manhole has been located within Jersey Street in between the 'HS' and the junction point at Poland Street which accepts a connection from the site to the north (Eliza Yard). The survey confirms that the main sewer is a 400x300mm brick sewer and the manhole is approximately 3.19m deep. The sewer is noted as in poor condition.

- The unrecorded size combined sewer in Jersey Street has been surveyed from manhole referenced 3801 and this confirms that the sewer is a 675x450mm brick sewer, however the sewer was unable to be surveyed up to the 'HS' noted on the sewer records as the sewer was collapsed at approximately 6.7m upstream of manhole 3801. The exact position of the sewer could therefore not be determined and potentially lies close to the development boundary.
- The 525mm sewer noted above to the east of the site downstream of manhole 3801 has been surveyed and confirmed as a 525mm sewer, this is located outside of the site boundary.

5.1.7 The CCTV Drainage Survey is enclosed in *Appendix C*.

5.1.8 Based on the above, United Utilities will be consulted further to report the defected and inaccessible sewers within Jersey Street. It is recommended that the location of progress on any remediation works by United Utilities are confirmed.

## 5.2 Proposed Foul Water Drainage

5.2.1 The proposed drainage has been designed a separate foul and surface water drainage system.

5.2.2 The foul water is proposed to discharge to the combined water sewer located to the north of the proposed site, along Jersey Street at two locations.

- It is proposed that the new connection to the west is a new connection into the sewer in Jersey Street as the existing outfall is located under the proposed building location and the existing outfall condition was undetermined due to a trap on the outfall pipe.
- It is proposed that the new connection to the west is a new connection into the sewer in Jersey Street, however it is recommended that the condition of this sewer an position needs to be confirmed with United Utilities (reference section 5.16 point 4).

5.2.3 At this moment, the detailed design for the foul drainage is to be determined. This peak flow rate requires confirming once the final internal layouts and number of appliances are confirmed.

5.2.4 United Utilities have confirmed in their pre-development response that their preferred point of discharge for foul water flows would be to the combined public sewer, to the north of the site, along Jersey Street and can be discharged at an unrestricted rate. Refer to the United Utilities correspondence enclosed in *Appendix F*.

5.2.5 It is assumed the site will remain under one ownership and therefore the drainage system will remain private within the development boundary.

5.2.6 The connection to the public sewer network will be subject to a Section 106 Agreement with United Utilities.

5.2.7 The proposed Drainage Layout is enclosed in *Appendix G*.

### 5.3 Proposed Surface Water Drainage

- 5.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 5.3.2 In February 2016, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 1 demonstrates the climate change allowances with central and upper end allowances being considered.
- 5.3.3 Based on the nature of the development, a lifespan in excess of up to 60 years is anticipated. Therefore, the potential climate change allowance for 2070-2115 ranges between 20% for the central allowance and 40% for the upper end allowance. As such, an allowance of 40% for climate change on peak rainfall intensity will be included in calculations.

**Table 1: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments**

| Applies across all of England | Total potential change anticipated for the '2020s' (2015 to 2039) | Total potential change anticipated for the '2050s' (2040 to 2069) | Total potential change anticipated for the '2080s' (2070 to 2115) |
|-------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|
| Upper end                     | 10%                                                               | 20%                                                               | 40%                                                               |
| Central                       | 5%                                                                | 10%                                                               | 20%                                                               |

- 5.3.4 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

#### ***Infiltration***

- 5.3.5 The ground conditions comprise of made ground overlaying firm to stiff clay, therefore due to the limiting permeability of the clay, infiltration is not suitable. As part of the site investigation, falling head permeability testing has been completed utilising the monitoring well installations. This assessment confirms that the material does not have sufficient permeability characteristic to support an infiltrating drainage system.

## **Watercourse**

- 5.3.6 The nearest watercourse is the Rochdale Canal which is located along the southern site boundary. Discussions with the Canal and Rivers Trust has confirmed that the Rochdale Canal is unable to accept surface water discharge from the site due to capacity issues (Refer to the correspondence enclosed in *Appendix F*).

## **Surface Water Sewer**

- 5.3.7 There are no surface water sewers in the vicinity of the site. There are no identifiable surface water pipes in the highway – either adopted by the Highway Authority or United Utilities.

## **Combined Water sewer**

- 5.3.8 There is a 300x406 combined sewer located on Jersey street, immediately to the north of the site. Following the drainage hierarchy, the site is proposed to drain to this asset to be agreed with United Utilities. This is subject to the approval of the evidence listed above and the discharge is limited to flows no greater than 7.5l/s.
- 5.3.9 Table 2 summarises the options for surface water disposal.

**Table 2: Surface Water Disposal**

| Surface Water Disposal     | Potential | Description                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Infiltration               | X         | It is assumed that the site will not be suitable for infiltration SuDS.                                                                                                                                                                                                                                                                                                                     |
| Watercourse                | X         | The Rochdale Canal is located approximately 50m south of the site. A new connection to the watercourse is not considered a viable option as it would have to pass through third-party land. Correspondence with the Canals and Rivers Trust, dated 25.02.21, has confirmed that the Rochdale Canal is unable to accept surface water discharge from the development due to capacity issues. |
| Surface Water Public Sewer | X         | There are no surface water sewers in the vicinity of the site.                                                                                                                                                                                                                                                                                                                              |
| Combined Public Sewer      | ✓         | There are various combined water sewers in the vicinity of the site. It is therefore proposed to connect to the existing combined sewers located on Jersey Street.                                                                                                                                                                                                                          |

- 5.3.10 Following the CCTV survey of the site, it is evident that surface water is positively draining to the existing public combined sewer in Jersey Street. We have calculated existing flows from the site (0.11ha) using the Wallingford Modified rational method and anticipated flows are;
- 1:1 year rainfall event = 4.4l/s
  - 1:30 year rainfall event = 11.3l/s
  - 1:100-year rainfall event = 14.3l/s
- 5.3.11 Taking the existing flows generated from the full site and applying a 50% reduction in flows in line with existing planning policies, the proposed discharge rate for the redeveloped areas are as follows;
- 1:1 year rainfall event  $4.4/2$  (50%) = 2.2 l/s
  - 1:30 year rainfall event  $11.3/2$  (50%) = 5.7 l/s
  - 1:100-year rainfall event  $14.3/2$  (50%) = 7.2 l/s
- 5.3.12 Given the small nature of this site and the low flows, restricting to these flow rates via a flow control chamber could increase risk of blockages due to the small orifice sizes to the controls. It is therefore proposed that the surface is restricted to a maximum of 5l/s for storms up to and including the 1 in 100-year plus climate change event.
- 5.3.13 Refer to *Appendix F* for LLFA/United Utilities correspondence to date.
- 5.3.14 Attenuation volumes have been calculated at c.195m<sup>3</sup> for the 100-year event with 40% climate change discharging a maximum of 5l/s.
- 5.3.15 Refer to *Appendix H* for the proposed drainage calculations.
- 5.3.16 It is anticipated that the necessary attenuation volumes are to be attenuated within an on-site attenuation tank, however additional capacity is proposed to be incorporated through the use of additional localised SuDS features within the soft landscape and rain garden areas.
- 5.3.17 It is proposed that all sewers within the site boundary will remain private and therefore where sewers remain private, connection to the public sewer network will be subject to a Section 106 Agreement with United Utilities.
- 5.3.18 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.
- 5.3.19 This proposed drainage strategy is subject to change following further survey works on the existing drainage within the site boundary. Receipt of further surveys are not expected prior to submission of the planning application therefore, a condition requiring confirmation of a detailed drainage strategy will be required.

5.3.20 The proposed Drainage Layout is enclosed in *Appendix G*.

## 5.4 Sustainable Drainage Systems and Green Infrastructure

5.4.1 Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. Access roads and pedestrian footways are considered as a low hazard in terms of contamination. Figure 7 illustrates the pollution hazard indices for different land use classifications from The CIRIA SuDS Manual C753 (2015).

**Figure 7: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS manual 2015)**

| TABLE 26.2 Pollution hazard indices for different land use classifications                                                                                                                                                                                                                                             |                        |                              |                                                                            |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------|----------------------------------------------------------------------------|------------------|
| Land use                                                                                                                                                                                                                                                                                                               | Pollution hazard level | Total suspended solids (TSS) | Metals                                                                     | Hydro-carbons    |
| Residential roofs                                                                                                                                                                                                                                                                                                      | Very low               | 0.2                          | 0.2                                                                        | 0.05             |
| Other roofs (typically commercial/ industrial roofs)                                                                                                                                                                                                                                                                   | Low                    | 0.3                          | 0.2 (up to 0.8 where there is potential for metals to leach from the roof) | 0.05             |
| Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day                                                                               | Low                    | 0.5                          | 0.4                                                                        | 0.4              |
| Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways <sup>1</sup>                                                                                                                                 | Medium                 | 0.7                          | 0.6                                                                        | 0.7              |
| Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways <sup>1</sup> | High                   | 0.8 <sup>2</sup>             | 0.8 <sup>2</sup>                                                           | 0.9 <sup>2</sup> |

5.4.2 Figure 8 illustrates the SuDS Component mitigation indices from The CIRIA SuDS Manual C753 (2015).

**Figure 8: Indicative SuDS mitigation indices (Table 26.3 the CIRIA SuDS manual 2015)**

| TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters |                                                                                                                                                                                                                                                    |        |              |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------|
| Type of SuDS component                                                         | Mitigation indices <sup>1</sup>                                                                                                                                                                                                                    |        |              |
|                                                                                | TSS                                                                                                                                                                                                                                                | Metals | Hydrocarbons |
| Filter strip                                                                   | 0.4                                                                                                                                                                                                                                                | 0.4    | 0.5          |
| Filter drain                                                                   | 0.4 <sup>2</sup>                                                                                                                                                                                                                                   | 0.4    | 0.4          |
| Swale                                                                          | 0.5                                                                                                                                                                                                                                                | 0.6    | 0.6          |
| Bioretention system                                                            | 0.8                                                                                                                                                                                                                                                | 0.8    | 0.8          |
| Permeable pavement                                                             | 0.7                                                                                                                                                                                                                                                | 0.6    | 0.7          |
| Detention basin                                                                | 0.5                                                                                                                                                                                                                                                | 0.5    | 0.6          |
| Pond <sup>4</sup>                                                              | 0.7 <sup>3</sup>                                                                                                                                                                                                                                   | 0.7    | 0.5          |
| Wetland                                                                        | 0.8 <sup>3</sup>                                                                                                                                                                                                                                   | 0.8    | 0.8          |
| Proprietary treatment systems <sup>5,6</sup>                                   | These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area. |        |              |

**Notes**

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/qf7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

5.4.3 The selection of treatment should ensure that the SuDS mitigation component index (Figure 8) exceeds the pollution hazard index (Figure 7).

5.4.4 In accordance with the National Planning Policy Framework (NPPF) a sustainable drainage system (SuDS) should be provided unless demonstrated to be inappropriate. The following options have been considered for the site:

**Infiltration Systems:**

5.4.5 Systems such as infiltration trenches and soakaways were considered as part of the surface water management strategy however, the ground conditions and the results of the falling head permeability testing indicate limiting permeability of the underlying clay. Therefore, infiltration systems are not considered suitable for the site.

### ***Green/Blue roofs:***

- 5.4.6 Green/Blue roofs were considered for the site however, found not viable due to all available roof area being utilised for Photovoltaic (PV) panels.

### ***Swales, Wetlands and Attenuation Ponds:***

- 5.4.7 Due to the small nature of the site and the limited space available, pre-treatment steps and retention systems such as swales, wetlands and ponds are not considered suitable for the site due to their space requirements.

### ***Permeable Paving***

- 5.4.8 There may be a possibility to introduce permeable paved areas within the clay paving within the residents gardens, the extent and location will be subject to further co-ordination with the Landscape Architect.

### ***Rain Gardens and Drained Soft Landscaping***

- 5.4.9 It is currently proposed to drain some of the external terraced areas to the soft landscaping which will require positive under drainage. Localised rain gardens are also proposed which will locally drain external paved areas. Further co-ordination of the detail and capacity is required with the Landscape Architect, this will also be in conjunction with any proposals to incorporate permeable paving.

### ***Other SuDS Considerations:***

- 5.4.10 The amount of hard surfacing proposed has been minimised with areas of soft landscape being introduced across the scheme.

### ***SuDS Conclusion***

- 5.4.11 The development is proposing potential options to include areas drained soft landscaping, rain gardens and where possible introduce permeable paving.
- 5.4.12 The surface water discharge will be controlled by a flow control chamber, restricting the maximum flow to 5l/s for storm events up to and including the 1 in 100 year +40% climate change event. A below ground attenuation tank will be utilised to deliver the controlled surface water discharge.
- 5.4.13 The proposed Drainage Layout is enclosed in *Appendix G*.

### 6.0 Maintenance

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. 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.

The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

Where sewers and SuDS features are offered for adoption, the adopting authority will have their own maintenance strategy in place.

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 site. It may be that the exceedance flows above the 1 in 30-year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space. As the flows are generally being attenuated on site and within SuDS features there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted in this section.

#### 6.1 Components

The following components have been included within the drainage design for the proposed development:

- Pipes
- Gullies
- Attenuation Tank
- Flow Control Unit

The maintenance strategy should be implemented to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

The maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

Maintenance of the drainage network will be the responsibility of an on-site facilities management team.

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.

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.

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.

During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter

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.

### **6.2 Inspection, Manhole and Catchpit Chambers**

Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.

The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

### **6.3 Pipes**

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with the Curtins drainage specification.

Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers and manholes.

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

| Maintenance Schedule                                                                                      | Required Action                                                                                       | Frequency                                          |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required). | Initial Inspection should be provided as post construction CCTV survey.                               | N/A                                                |
| Regular maintenance\ inspection                                                                           | Inspect for evidence of poor operation via water level in chambers. If required take remedial action. | 3-monthly, 48 hours after large storms.            |
|                                                                                                           | Check and remove large vegetation growth near pipe runs.                                              | Monthly or as required                             |
| Remedial Action                                                                                           | Rod through poorly performing runs as initial remediation.                                            | As required.                                       |
|                                                                                                           | If continued poor performance jet and CCTV survey poorly performing runs.                             | As required.                                       |
|                                                                                                           | Seek advice as to remediation techniques suitable for the type of performance issue and location.     | As required If above does not improve performance. |

## 6.4 Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.

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 car park channels.

| Maintenance Schedule                                                                                      | Required Action                                                                                                                                                                                                                                                                                                             | Frequency                               |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required). | Initial Inspection.                                                                                                                                                                                                                                                                                                         | Half yearly and after large storms.     |
| Regular maintenance\ inspection                                                                           | Litter and debris removal                                                                                                                                                                                                                                                                                                   | Monthly or as required.                 |
|                                                                                                           | Check and remove large vegetation growth near gully gratings.                                                                                                                                                                                                                                                               | Monthly or as required                  |
|                                                                                                           | Inspect for evidence of poor operation and/or weed growth. If required take remedial action.<br><br>Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving. | 3-monthly, 48 hours after large storms. |
| 6.4.1 Remedial Action                                                                                     | Inspect sumps and outlet pipes and rod through poorly performing channels and outlets as initial remediation.                                                                                                                                                                                                               | As required.                            |

## 6.5 Attenuation Tanks

The attenuation tanks are currently specified as geocellular units, which are wrapped in a geotextile blanket.

The geocellular units and geotextile are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration.

Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.

Regular inspection and maintenance is important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

| Maintenance Schedule                                                                                      | Required Action                                                                                                                        | Frequency                                             |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required). | Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required. | Monthly and after large storms.                       |
| Regular maintenance\ inspection                                                                           | Inspect and identify any areas that are not operating correctly. If required, take remedial action.                                    | Monthly for 3 months, then six monthly.               |
|                                                                                                           | Debris removal from catchment surface (where may cause risks to performance).                                                          | Monthly                                               |
|                                                                                                           | Remove sediment from pre-treatment structures.                                                                                         | Annually (or as required after heavy rainfall events) |
| Remedial Actions                                                                                          | Repair/rehabilitation of inlets, outlets and overflows.                                                                                | As required.                                          |

## 6.6 Flow Control Units

Maintenance should be carried out in accordance with the suppliers guidelines.

| Maintenance Schedule                                                                                               | Required Action                                                                                                          | Frequency                                                       |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).<br>6.6.1 | Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.<br>6.6.2 | 6.6.3 Monthly and after large storms.<br>6.6.4                  |
| Regular maintenance\ inspection<br>6.6.5                                                                           | Inspect and identify any areas that are not operating correctly. If required, take remedial action.                      | Monthly for 3 months, then six monthly.<br>6.6.6                |
| 6.6.7                                                                                                              | Debris removal from catchment surface (where may cause risks to performance).<br>6.6.8                                   | Monthly<br>6.6.9                                                |
| 6.6.10                                                                                                             | Remove sediment from pre-treatment structures and flow control chambers.<br>6.6.11                                       | Annually (or as required after heavy rainfall events)<br>6.6.12 |
| 6.6.13 Remedial Actions                                                                                            | Repair/rehabilitation of inlets.                                                                                         | As required.                                                    |

## 6.7 Ponds and Wetlands

| Maintenance Schedule            | Required Action                                                                                                                                                                                                                        | Frequency                                             |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Regular maintenance\ inspection | Remove Litter and debris                                                                                                                                                                                                               | Monthly or as required                                |
|                                 | Cut the Grass – Public Area                                                                                                                                                                                                            | Monthly (during growing season)                       |
|                                 | Cut the Meadow Grass                                                                                                                                                                                                                   | Half Yearly (spring before nesting season and autumn) |
|                                 | Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)                                                                                                                                                | Monthly at the start then as required.                |
|                                 | Inspect Inlets, outlets, bankside, structures, pipework etc for evidence of blockage and/or physical damage                                                                                                                            | Monthly                                               |
|                                 | Inspect water body for signs of poor water quality                                                                                                                                                                                     | Monthly (May – October)                               |
|                                 | Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options. | Half Yearly                                           |
|                                 | Check any mechanical devices, eg penstock                                                                                                                                                                                              | Half Yearly                                           |
|                                 | Hand cut submerged and emergent aquatic plants (at                                                                                                                                                                                     | Annually                                              |

|                        |                                                                                                                                                            |                                                                                      |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                        | minimum of 0.1% above pond base, include max 25% pond surface                                                                                              |                                                                                      |
|                        | Remove 25% of bank vegetation from water's edge to minimum of 1m above water level                                                                         | Annually                                                                             |
|                        | Tidy all dead growth (scrub clearance) before start of growing season (Note Tree Maintenance is usually part of the overall landscape management contract) | Annually                                                                             |
|                        | Remove sediment from any forebay                                                                                                                           | Every 1 – 5 years, or as required                                                    |
|                        | Remove sediment and planning from one quadrant of the main body of ponds without sediment forebays                                                         | Every 5 years or as required                                                         |
| Occasional Maintenance | Remove sediment from the main body of big ponds when pool volume is reduced by 20%                                                                         | With effective pre-treatment this will only be required rarely- eg every 25-50 years |
| Remedial Actions       | Repair erosion or other damage.                                                                                                                            | As Required                                                                          |
|                        | Replant where necessary                                                                                                                                    | As required                                                                          |
|                        | Aerate Pond when signs of eutrophication are detected                                                                                                      | As required                                                                          |
|                        | Realign rip-rap or repair other damage                                                                                                                     | As required                                                                          |
|                        | Repair/rehabilitate intets, outlets and overflows                                                                                                          | As required.                                                                         |

**Appendix A**

Proposed Site Layout



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- NOTES:
- 1. Do not scale from this drawing.
  - 2. Always work to noted dimensions.
  - 3. All dimensions are in millimetres unless otherwise stated.
  - 4. All setting out, levels and dimensions to be agreed on site.
  - 5. The dimensions of all materials must be checked on site before being laid out.
  - 6. This drawing must be read with the relevant specification clauses and detail drawings.
  - 7. Order of construction and setting out to be agreed on site.

KEY



Refer to the below in conjunction with this drawing:

- 2643-PLA-XX-XX-DR-L-0002- General Arrangement
- 2643-PLA-XX-XX-DR-L-0003- Tree retention and removal
- 2643-PLA-XX-XX-DR-L-0004- Soils
- 2643-PLA-XX-XX-DR-L-1000- Hardworks
- 2643-PLA-XX-XX-DR-L-3001- Levels
- 2643-PLA-XX-XX-DR-L-2001- Softworks
- 2643-PLA-XX-XX-DR-L-3001- Levels
- 2643-PLA-XX-XX-DR-L-4000- Furniture

| S4-P08   | 29-04-22 | Stage approval | AS    | SAB     |
|----------|----------|----------------|-------|---------|
| Revision | Date     | Description    | Drawn | Apprvd. |

**Plantit I.E. Limited**

**E:** info@plantit-ie.com **W:** plantit-ie.com

**MANCHESTER**  
2 Back Grafton St , Altrincham, WA14 1DY  
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T: 0207 253 5678

**LIVERPOOL**  
Tempest 5.3, 12 Tithebarn Street, Liverpool, L2 2DT  
T: 0151 363 1230

Client Manchester Life

Project Jersey Wharf, Ancoats Manchester

Drg Title General Arrangement

|            |            |             |
|------------|------------|-------------|
| Created on | Created by | Approved by |
| 05-10-21   | AS         | SAB         |

|       |      |           |
|-------|------|-----------|
| Scale | Size | Workstage |
| 1:250 | A1   | STAGE 3   |

|                          |             |          |
|--------------------------|-------------|----------|
| Drg No.                  | Suitability | Revision |
| 2643-PLA-XX-XX-DR-L-0002 | S4          | P08      |

**Appendix B**

United Utilities Sewer Records



**Curtins Consulting Ltd**

**51-55  
Tithebarn Street,  
Liverpool,  
L2 2SB**

**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](mailto:propertysearches@uuplc.co.uk)**

**Your Ref: CSMA 601 076740 Ancoats Plot B  
Our Ref: UUPS-ORD-175968  
Date: 23/07/2020**

**Dear Sirs**

**Location: EASY EQUIPMENT LTD 66 JERSEY STREET, MANCHESTER, M4 6JW**

I acknowledge with thanks your request dated 21/07/2020 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)".

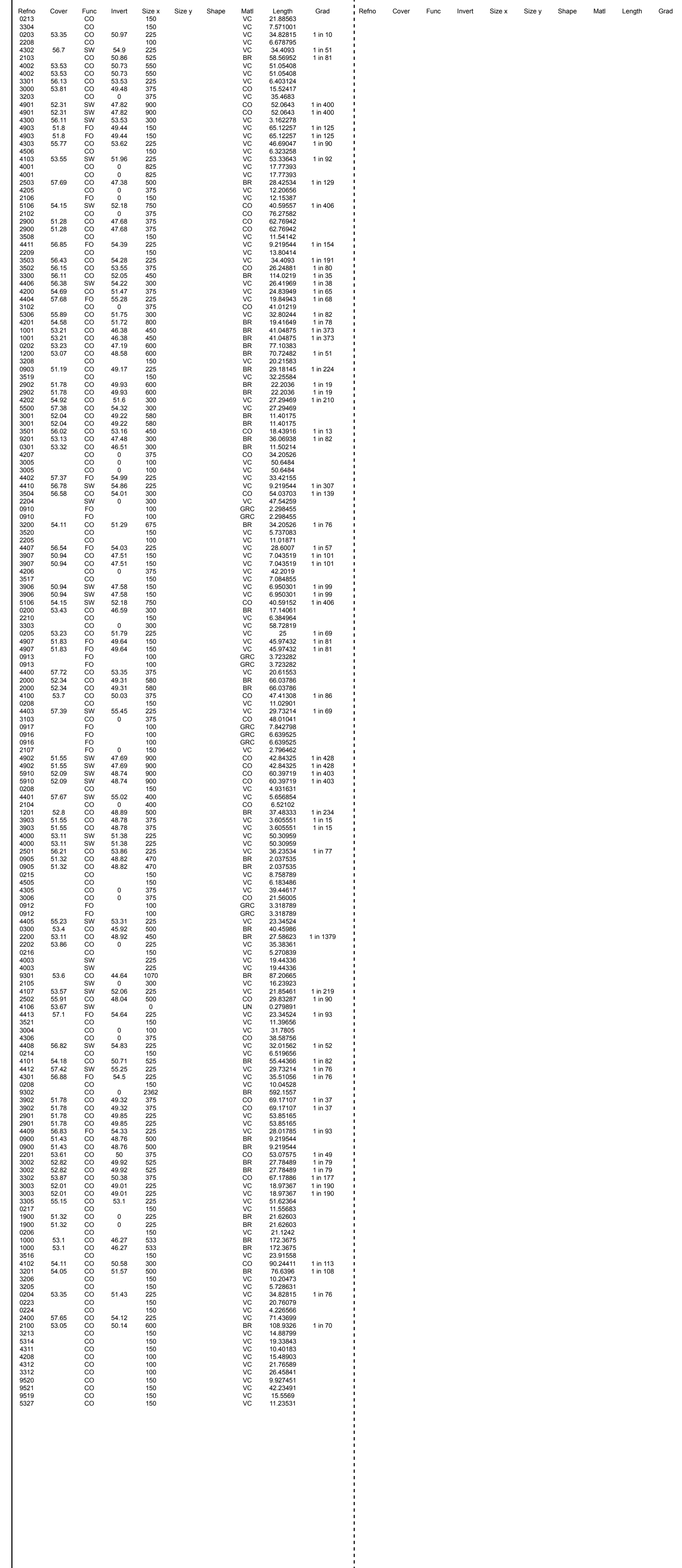
### **TERMS AND CONDITIONS:**

- 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.





| Refo | Cover | Func | Invert | Size x | Size y | Shape | Matl     | Length   | Grad |
|------|-------|------|--------|--------|--------|-------|----------|----------|------|
| 4803 | 50.85 | SW   | 0.00   | 100    | 100    | CO    | 28.1042  | 1 in 403 |      |
| 4805 | 49.52 | CO   | 0.00   | 46.32  | 225    | CO    | 14.0367  | 1 in 193 |      |
| 3800 | 51.18 | CO   | 0.00   | 47.07  | 450    | CO    | 71.40572 |          |      |
| 4808 | 50.82 | CO   | 0.00   | 46.32  | 225    | BR    | 4.81465  |          |      |
| 4202 | 53.63 | CO   | 0.00   | 50.73  | 550    | VC    | 51.05408 |          |      |
| 4202 | 53.63 | CO   | 0.00   | 50.73  | 550    | VC    | 51.05408 |          |      |
| 9701 | 50.48 | CO   | 0.00   | 44.21  | 370    | BR    | 40.49691 |          |      |
| 9701 | 50.48 | CO   | 0.00   | 44.21  | 370    | BR    | 40.49691 |          |      |
| 6700 | 50.39 | CO   | 0.00   | 44.9   | 375    | VC    | 15.26434 |          |      |
| 4801 | 52.31 | SW   | 0.00   | 47.82  | 800    | CO    | 52.0643  | 1 in 400 |      |
| 4901 | 52.31 | SW   | 0.00   | 47.82  | 800    | CO    | 52.0643  | 1 in 400 |      |
| 4402 | 51.8  | FO   | 0.00   | 49.44  | 600    | VC    | 6.826793 | 1 in 7   |      |
| 4402 | 51.8  | FO   | 0.00   | 49.44  | 600    | VC    | 6.826793 | 1 in 7   |      |
| 4903 | 51.8  | FO   | 0.00   | 49.44  | 600    | VC    | 6.826793 | 1 in 7   |      |
| 4903 | 51.8  | FO   | 0.00   | 49.44  | 600    | VC    | 6.826793 | 1 in 7   |      |
| 5507 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 10.95113 |          |      |
| 4510 | 50.31 | CO   | 0.00   | 47.91  | 100    | VC    | 13.42718 |          |      |
| 4800 | 47.43 | CO   | 0.00   | 44.78  | 450    | CO    | 54.20332 | 1 in 151 |      |
| 4103 | 53.65 | SW   | 0.00   | 51.96  | 225    | VC    | 53.33643 | 1 in 82  |      |
| 4001 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 17.7393  |          |      |
| 4001 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 17.7393  |          |      |
| 2610 | 47.54 | CO   | 0.00   | 44.47  | 450    | PVC   | 1.067193 |          |      |
| 1904 | 46.96 | CO   | 0.00   | 47.91  | 100    | BR    | 48.8774  |          |      |
| 3808 | 46.96 | CO   | 0.00   | 47.91  | 100    | BR    | 48.8774  |          |      |
| 0806 | 50.9  | CO   | 0.00   | 46.32  | 225    | BR    | 3        |          |      |
| 0806 | 50.9  | CO   | 0.00   | 46.32  | 225    | BR    | 3        |          |      |
| 4613 | 51.28 | CO   | 0.00   | 47.88  | 375    | VC    | 10.95113 |          |      |
| 2900 | 51.28 | CO   | 0.00   | 47.88  | 375    | VC    | 10.95113 |          |      |
| 1809 | 49.03 | CO   | 0.00   | 46.18  | 375    | BR    | 8.89375  |          |      |
| 4703 | 49.03 | CO   | 0.00   | 46.18  | 375    | BR    | 8.89375  |          |      |
| 4502 | 49.44 | CO   | 0.00   | 46.87  | 225    | VC    | 16.05242 | 1 in 134 |      |
| 4910 | 50.86 | FO   | 0.00   | 47.12  | 150    | VC    | 27.11203 | 1 in 129 |      |
| 5700 | 49.11 | CO   | 0.00   | 46.36  | 150    | BR    | 20.24846 | 1 in 34  |      |
| 0705 | 50.0  | CO   | 0.00   | 46.32  | 225    | BR    | 8.44076  |          |      |
| 3605 | 49.06 | CO   | 0.00   | 46.38  | 450    | UN    | 37.40898 |          |      |
| 1001 | 53.21 | CO   | 0.00   | 46.38  | 450    | BR    | 41.04875 | 1 in 373 |      |
| 1001 | 53.21 | CO   | 0.00   | 46.38  | 450    | BR    | 41.04875 | 1 in 373 |      |
| 0903 | 51.19 | CO   | 0.00   | 49.17  | 225    | BR    | 28.18145 | 1 in 224 |      |
| 3811 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 11.04069 |          |      |
| 2902 | 51.78 | CO   | 0.00   | 49.93  | 600    | BR    | 22.2036  | 1 in 19  |      |
| 5608 | 48.11 | CO   | 0.00   | 45.52  | 225    | VC    | 49.84877 |          |      |
| 3001 | 52.04 | CO   | 0.00   | 49.22  | 580    | BR    | 11.40175 |          |      |
| 3001 | 52.04 | CO   | 0.00   | 49.22  | 580    | BR    | 11.40175 |          |      |
| 1800 | 50.45 | CO   | 0.00   | 49.07  | 150    | VC    | 24.8411  | 1 in 79  |      |
| 4805 | 50.49 | SW   | 0.00   | 48.42  | 225    | BR    | 8.154181 | 1 in 62  |      |
| 3802 | 46.34 | CO   | 0.00   | 47.51  | 300    | BR    | 7.060821 | 1 in 141 |      |
| 3005 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 50.6484  | 1 in 81  |      |
| 0710 | 50.48 | CO   | 0.00   | 45.94  | 600    | BR    | 15.24797 |          |      |
| 0710 | 50.48 | CO   | 0.00   | 45.94  | 600    | BR    | 15.24797 |          |      |
| 9901 | 51.21 | CO   | 0.00   | 43.93  | 400    | BR    | 43.93    |          |      |
| 9901 | 51.21 | CO   | 0.00   | 43.93  | 400    | BR    | 43.93    |          |      |
| 0910 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 2.288455 |          |      |
| 0910 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 2.288455 |          |      |
| 3901 | 51.08 | CO   | 0.00   | 47.14  | 450    | CO    | 7.112387 | 1 in 102 |      |
| 3901 | 51.08 | CO   | 0.00   | 47.14  | 450    | CO    | 7.112387 | 1 in 102 |      |
| 3907 | 50.94 | CO   | 0.00   | 47.51  | 150    | VC    | 7.043519 | 1 in 101 |      |
| 3907 | 50.94 | CO   | 0.00   | 47.51  | 150    | VC    | 7.043519 | 1 in 101 |      |
| 5402 | 50.4  | CO   | 0.00   | 47.82  | 420    | BR    | 19.18469 |          |      |
| 0909 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 13.88026 |          |      |
| 3906 | 50.94 | SW   | 0.00   | 47.58  | 150    | VC    | 6.903031 | 1 in 99  |      |
| 3906 | 50.94 | SW   | 0.00   | 47.58  | 150    | VC    | 6.903031 | 1 in 99  |      |
| 4702 | 48.61 | CO   | 0.00   | 46.07  | 375    | CO    | 61.40033 | 1 in 60  |      |
| 5806 | 48.54 | CO   | 0.00   | 45.51  | 300    | VC    | 48.14488 |          |      |
| 5702 | 48.17 | CO   | 0.00   | 46.47  | 225    | VC    | 15.26434 | 1 in 139 |      |
| 4804 | 50.37 | CO   | 0.00   | 48.45  | 900    | VC    | 13.40712 | 1 in 447 |      |
| 4807 | 48.73 | CO   | 0.00   | 45.69  | 225    | VC    | 17.04448 | 1 in 40  |      |
| 0800 | 50.65 | CO   | 0.00   | 47.34  | 525    | BR    | 8.942722 |          |      |
| 4907 | 51.83 | FO   | 0.00   | 49.64  | 150    | VC    | 45.97432 | 1 in 81  |      |
| 4907 | 51.83 | FO   | 0.00   | 49.64  | 150    | VC    | 45.97432 | 1 in 81  |      |
| 0908 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 11.03464 |          |      |
| 0913 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 3.723282 |          |      |
| 0913 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 3.723282 |          |      |
| 3800 | 50.37 | CO   | 0.00   | 45.46  | 525    | CO    | 25.63201 | 1 in 35  |      |
| 2000 | 52.34 | CO   | 0.00   | 49.31  | 580    | BR    | 66.03786 |          |      |
| 2000 | 52.34 | CO   | 0.00   | 49.31  | 580    | BR    | 66.03786 |          |      |
| 0711 | 50.63 | CO   | 0.00   | 46.85  | 375    | CO    | 2.877241 |          |      |
| 0501 | 50.16 | CO   | 0.00   | 44.29  | 600    | BR    | 21.47091 | 1 in 41  |      |
| 0501 | 50.16 | CO   | 0.00   | 44.29  | 600    | BR    | 21.47091 | 1 in 41  |      |
| 4810 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 10.29758 |          |      |
| 0917 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 7.842788 |          |      |
| 0916 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 6.836255 |          |      |
| 0916 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 6.836255 |          |      |
| 4902 | 51.55 | SW   | 0.00   | 47.69  | 800    | CO    | 42.84325 | 1 in 428 |      |
| 4902 | 51.55 | SW   | 0.00   | 47.69  | 800    | CO    | 42.84325 | 1 in 428 |      |
| 3601 | 46.69 | CO   | 0.00   | 42.87  | 900    | CO    | 32.9511  | 1 in 412 |      |
| 5910 | 52.09 | SW   | 0.00   | 48.74  | 900    | VC    | 60.39719 | 1 in 403 |      |
| 5910 | 52.09 | SW   | 0.00   | 48.74  | 900    | VC    | 60.39719 | 1 in 403 |      |
| 5906 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 23.02173 |          |      |
| 3903 | 51.55 | CO   | 0.00   | 48.78  | 375    | VC    | 3.695551 | 1 in 15  |      |
| 3903 | 51.55 | CO   | 0.00   | 48.78  | 375    | VC    | 3.695551 | 1 in 15  |      |
| 4000 | 53.11 | SW   | 0.00   | 51.38  | 225    | VC    | 50.30959 | 1 in 15  |      |
| 4000 | 53.11 | SW   | 0.00   | 51.38  | 225    | VC    | 50.30959 | 1 in 15  |      |
| 4505 | 51.32 | CO   | 0.00   | 48.92  | 470    | UN    | 27.24673 |          |      |
| 0905 | 51.32 | CO   | 0.00   | 48.92  | 470    | BR    | 2.037535 |          |      |
| 3611 | 46.55 | CO   | 0.00   | 42.28  | 225    | VC    | 13.14941 | 1 in 103 |      |
| 4500 | 46.27 | CO   | 0.00   | 42.15  | 225    | VC    | 34.71311 | 1 in 46  |      |
| 4502 | 49.44 | CO   | 0.00   | 46.87  | 225    | VC    | 32.88858 | 1 in 409 |      |
| 3704 | 46.23 | CO   | 0.00   | 43.83  | 675    | VC    | 18.02716 | 1 in 258 |      |
| 4405 | 50.45 | CO   | 0.00   | 46.42  | 600    | BR    | 14.30672 |          |      |
| 3801 | 50.45 | CO   | 0.00   | 46.18  | 100    | BR    | 17.34462 | 1 in 49  |      |
| 0912 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 3.318789 |          |      |
| 0912 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 3.318789 |          |      |
| 4601 | 48.2  | CO   | 0.00   | 45.03  | 375    | CO    | 18.02716 | 1 in 82  |      |
| 3600 | 46.49 | CO   | 0.00   | 43.09  | 450    | CO    | 25.30392 |          |      |
| 4802 | 48.07 | CO   | 0.00   | 46.15  | 225    | VC    | 73.60027 |          |      |
| 3703 | 48.41 | CO   | 0.00   | 43.75  | 675    | VC    | 16.70305 | 1 in 17  |      |
| 4604 | 48.07 | CO   | 0.00   | 46.15  | 225    | VC    | 16.70305 | 1 in 17  |      |
| 4906 | 51.24 | SW   | 0.00   | 48.59  | 900    | CO    | 28.39734 | 1 in 406 |      |
| 4906 | 51.24 | SW   | 0.00   | 48.59  | 900    | CO    | 28.39734 | 1 in 406 |      |
| 4003 | 50.45 | CO   | 0.00   | 46.32  | 225    | VC    | 19.44336 |          |      |
| 4603 | 48.4  | CO   | 0.00   | 46.54  | 225    | VC    | 41.04875 | 1 in 108 |      |
| 2404 | 46.87 | CO   | 0.00   | 46.14  | 150    | BR    | 96.23354 | 1 in 116 |      |
| 4705 | 48.85 | CO   | 0.00   | 46.51  | 225    | VC    | 80.80223 | 1 in 184 |      |
| 3004 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 35.94798 |          |      |
| 3004 | 50.0  | CO   | 0.00   | 46.32  | 225    | VC    | 35.94798 |          |      |
| 5503 | 49.34 | CO   | 0.00   | 47.52  | 225    | VC    | 31.7805  |          |      |
| 1700 | 50.44 | CO   | 0.00   | 47.11  | 300    | BR    | 63.82098 | 1 in 100 |      |
| 3803 | 50.62 | CO   | 0.00   | 47.84  | 550    | BR    | 31.63168 | 1 in 122 |      |
| 3802 | 47.86 | CO   | 0.00   | 44.33  | 510    | BR    | 22.30688 |          |      |
| 4614 | 48.07 | CO   | 0.00   | 46.15  | 150    | CO    | 11.84022 | 1 in 28  |      |
| 1802 | 50.41 | CO   | 0.00   | 47.46  | 225    | BR    | 61.70277 | 1 in 221 |      |
| 0911 | 50.0  | CO   | 0.00   | 46.32  | 225    | GRC   | 3.020749 |          |      |
| 4807 | 50.51 | FO   | 0.00   | 48.55  | 150    | VC    | 22.77997 | 1 in 124 |      |
| 4802 | 48.2  | CO   | 0.00   | 45.32  | 225    | VC    | 33.90055 | 1 in 100 |      |
| 3902 | 51.78 | CO   | 0.00   | 49.32  | 375    | CO    | 69.17107 | 1 in 37  |      |
| 4400 | 49.5  | CO   | 0.00   | 47.44  | 225    | VC    | 82.91961 | 1 in 40  |      |
| 2901 | 51.78 | CO   | 0.00   | 49.85  | 225    | VC    | 69.17107 | 1 in 37  |      |
| 2901 | 51.78 | CO   | 0.00   | 49.85  | 225    | VC    | 69.17107 | 1 in 37  |      |
| 0701 | 50.45 | CO   | 0.00   | 46.42  | 375    | VC    | 53.85165 |          |      |
| 0900 | 51.43 | CO   | 0.00   | 48.76  | 500    | CO    | 15.13275 | 1 in 151 |      |
| 0900 | 51.43 | CO   | 0.00   | 48.76  | 500    | CO    | 15.13275 | 1 in 151 |      |
| 3702 | 49.49 | CO   | 0.00   | 46.63  | 525    | BR    | 8.219544 |          |      |
| 3002 | 52.82 | CO   | 0.00   | 49.82  | 525    | BR    | 8.219544 |          |      |
| 300  |       |      |        |        |        |       |          |          |      |



| LEGEND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  Abandoned<br> Foul<br> Surface Water<br> Combined<br> Public Sewer<br> Private Sewer<br> Section 104<br> Rising Main<br> Sludge Main<br> Overflow<br> Water Course<br> Highway Drain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  Public Sewer<br> Private Sewer<br> Section 104<br> Rising Main<br> Sludge Main<br> Overflow<br> Water Course<br> Highway Drain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| All point assets follow the standard colour convention:<br><span style="color: red;">●</span> red - combined <span style="color: blue;">●</span> blue - surface water<br><span style="color: brown;">●</span> brown - foul <span style="color: purple;">●</span> purple - overflow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <ul style="list-style-type: none"> <li> Manhole</li> <li> Head of System</li> <li> Extent of Survey</li> <li> Rodding Eye</li> <li> Inlet</li> <li> Discharge Point</li> <li> Vortex</li> <li> Penstock</li> <li> Washout Chamber</li> <li> Valve</li> <li> Air Valve</li> <li> Non Return Valve</li> <li> Soakaway</li> <li> Gully</li> <li> Cascade</li> <li> Flow Meter</li> <li> Hatch Box</li> <li> Oil Interceptor</li> <li> Summit</li> <li> Drop Shaft</li> <li> Orifice Plate</li> </ul> | <ul style="list-style-type: none"> <li> Side Entry Manhole</li> <li> Outfall</li> <li> Screen Chamber</li> <li> Inspection Chamber</li> <li> Bifurcation Chamber</li> <li> Lamp Hole</li> <li> T Junction / Saddle</li> <li> Catchpit</li> <li> Valve Chamber</li> <li> Vent Column</li> <li> Vortex Chamber</li> <li> Penstock Chamber</li> <li> Network Storage Tank</li> <li> Sewer Overflow</li> <li> Ww Treatment Works</li> <li> Ww Pumping Station</li> <li> Septic Tank</li> <li> Control Kiosk</li> <li> Change of Characteristic</li> </ul> |
| <h3>MANHOLE FUNCTION</h3> <p>FO Foul</p> <p>SW Surface Water</p> <p>CO Combined</p> <p>OV Overflow</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <h3>SEWER SHAPE</h3> <p>CI Circular</p> <p>EG Egg</p> <p>OV Oval</p> <p>FT Flat Top</p> <p>RE Rectangular</p> <p>SQ Square</p> <p>TR Trapezoidal</p> <p>AR Arch</p> <p>BA Barrel</p> <p>HO HorseShoe</p> <p>UN Unspecified</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <h3>SEWER MATERIAL</h3> <p>AC Asbestos Cement</p> <p>BR Brick</p> <p>PE Polyethylene</p> <p>RP Reinforced Plastic Matrix</p> <p>CO Concrete</p> <p>CSB Concrete Segment Bolted</p> <p>CSU Concrete Segment Unbolted</p> <p>CC Concrete Box Culverted</p> <p>PSC Plastic / Steel Composite</p> <p>GRC Glass Reinforced Plastic</p> <p>DI Ductile Iron</p> <p>PVC Polyvinyl Chloride</p> <p>CI Cast Iron</p> <p>SI Spun Iron</p> <p>ST Steel</p> <p>VC Vitrified Clay</p> <p>PP Polypropylene</p> <p>PF Pitch Fibre</p> <p>MAC Masonry, Coursed</p> <p>MAR Masonry, Random</p> <p>U Unspecified</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <h3>Address or Site Reference:</h3> <p>EASY EQUIPMENT LTD 66 JERSEY STREET,<br/>MANCHESTER,<br/>M4 6JW</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <h3>OS sheet Number:</h3> <p>Scale: 1:1250</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <h3>SJ8599SW</h3> <p>Date: 23/07/2020</p> <p>Nodes: 179</p> <p>Sheet: 3 of 3</p> <p>Printed by: Property Searches</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

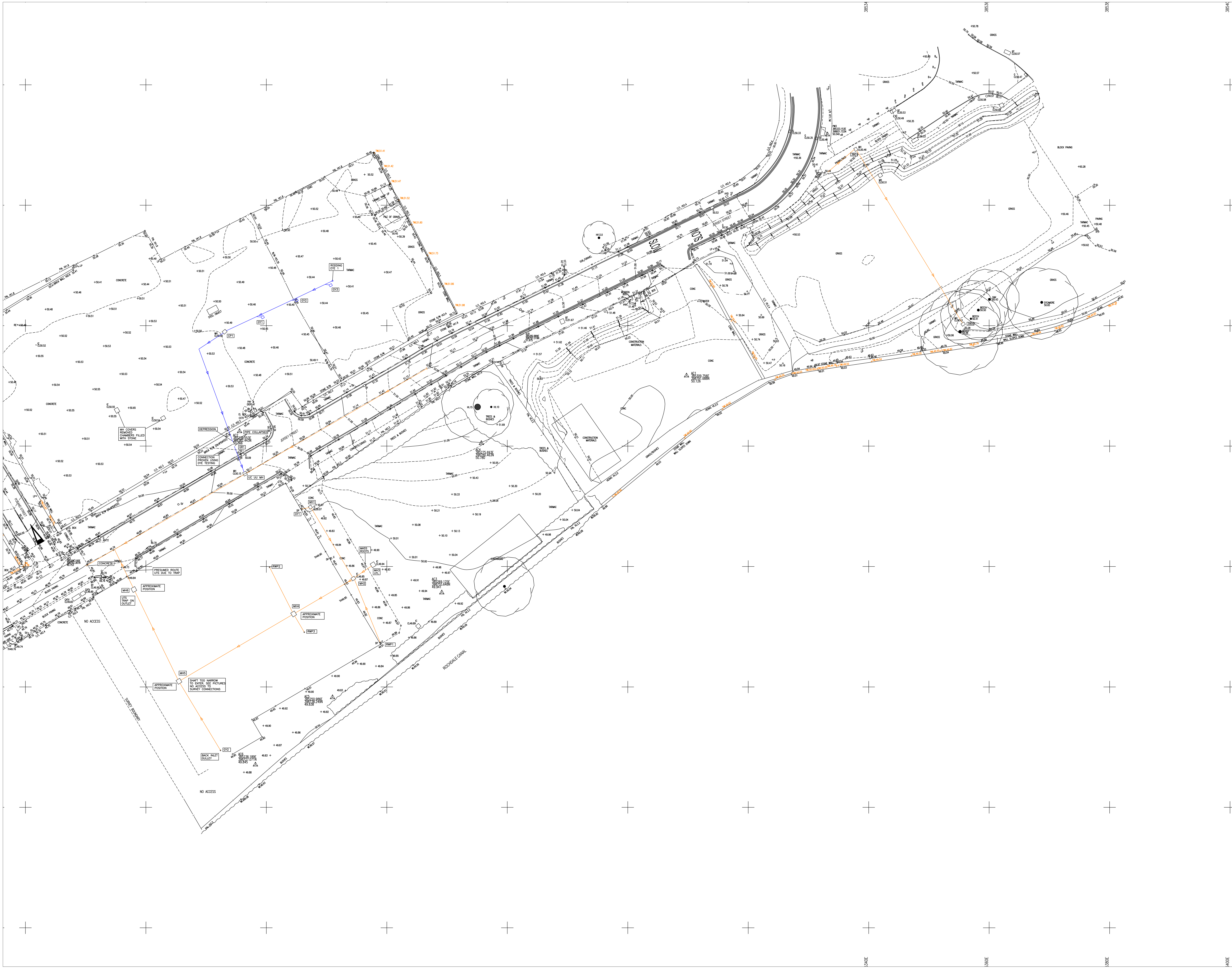
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**SEWER  
RECORDS**



**Appendix C**

CCTV Drainage Survey



**TEAM DRAINAGE UK**

Peel House, 2nd Floor  
Peel Road, Pimlico,  
Skelmersdale,  
WMS SPT  
Tel: 01695 768 714  
WWW.teamdrainageuk.com

**Survey Notes**

Grid - Local  
Levels - Local

**Drainage Key:**

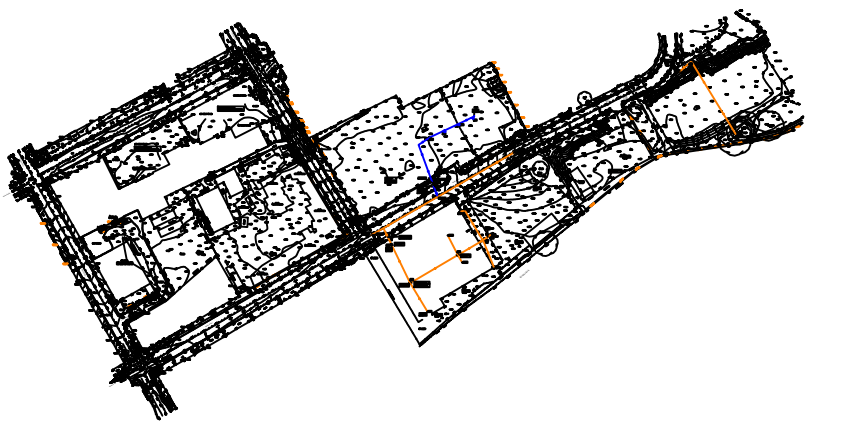
Foul Water Sewer  
Storm Water Sewer  
Combined Water Sewer  
Assumed Route  
Taken from Records  
Survey Boundary

**Geo Positioning Drainage Key:**

Foul Water Sewer  
Storm Water Sewer  
Combined Water Sewer



**Site Plan**



**Revision**

| Revision | Date | Description |
|----------|------|-------------|
|          |      |             |

**Client Name**

Curtins Consulting  
Merchant Exchange  
Manchester  
M1 5WG

**Project Name**

Jersey Street  
Manchester

**Drawing Title**

Drainage Survey

|             |              |           |            |          |   |
|-------------|--------------|-----------|------------|----------|---|
| Drawing No. | CC28.04.2021 | Sheet No. | 01         | Revision | - |
| Drawn       | AA           | Date      | 28/04/2021 |          |   |
| Checked     | SS           | Scale     | 1:200      |          |   |



**TEAM  
DRAINAGE**

## Team Drainage Ltd Manhole Survey Card

|           |                                   |        |        |
|-----------|-----------------------------------|--------|--------|
| Card No   |                                   | Map No |        |
| Catchment | UU                                | MH No  | UCUUMH |
| Location  | In Jersey Street in front of site |        |        |
| Town      | Ancoats                           |        |        |

|         |        |  |        |        |          |         |         |            |                |
|---------|--------|--|--------|--------|----------|---------|---------|------------|----------------|
| ★<br>PU | Status |  | Syphon | ★<br>C | Function | ★<br>MH | MH Type | 17/02/2021 | Date of Survey |
|---------|--------|--|--------|--------|----------|---------|---------|------------|----------------|

### COVER DETAILS

☒ Square
 ☐ Rectangle
 ☐ Triangle
 ☒ Dbl Triangle
 ☐ Circular
 ☐ Oval
 ☐ Other
 ☐ Multiple
 ☐ Hinged
 ☐ Lockable

Cover Level  m
 H / M / L Cover Duty ☒ H
 Initials  LR

### PIPE DETAILS

#### Incoming Pipes

| Clockwise from pipe X | Pipe | Depth from Invert (m) | Upstream / Downstream MH Ref | Shape | Size (mm) |   | Pipe Mat | Lining Mat | Back Drop Dia (mm) | Back Drop Depth (m) |
|-----------------------|------|-----------------------|------------------------------|-------|-----------|---|----------|------------|--------------------|---------------------|
|                       | A    | 3.09                  | Unknown                      | C     | 225       | X | VC       |            |                    |                     |
|                       | B    | 3.13                  | HOS 1                        | E     | 400       | X | VC       |            |                    |                     |
|                       | C    |                       |                              |       |           | X |          |            |                    |                     |
|                       | D    |                       |                              |       |           | X |          |            |                    |                     |
|                       | E    |                       |                              |       |           | X |          |            |                    |                     |
|                       | F    |                       |                              |       |           | X |          |            |                    |                     |

#### Outgoing Pipes

|   |      |         |   |     |   |     |    |  |  |  |
|---|------|---------|---|-----|---|-----|----|--|--|--|
| X | 3.19 | UU Node | E | 400 | X | 300 | VC |  |  |  |
| Y |      |         |   |     | X |     |    |  |  |  |

|                            |        |    |                        |         |    |                                  |   |
|----------------------------|--------|----|------------------------|---------|----|----------------------------------|---|
| Cover Opening at narrowest | 600.00 | mm | Chamber Size at widest | 1050.00 | mm | Evidence of Surcharge            | N |
| Shaft at narrowest         | 570.00 | mm | Shaft Depth (from CL)  | 600.00  | mm | OX / H2S / METH Toxic atmosphere | N |

### MANHOLE CONSTRUCTION DETAILS

☒ Pre Cast Concrete
 ☐ In Situ Concrete
 ☐ Brick
 ☐ GRP
 ☐ Arch
 ☐ Corbel
 ☐ Taper
 ☐ Side Entry

☒ Reducing Slab
 ☐ Segments
 ☐ No. of Landings
 ☐ No. of Step Irons
 ☐ No. of Ladders

☒ No. of Regulating Brick Courses

### CONDITION INFORMATION (specific in remark)

|                  | Cover                               | Shaft                               | Irons / Ladders                     | Chamber                             | Benching                            | Channel                             |
|------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| OK               | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Needs attention  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Urgent attention | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

Depth of Flow  mm
 Depth of Silt  mm
 Height of Surcharge from CL  mm

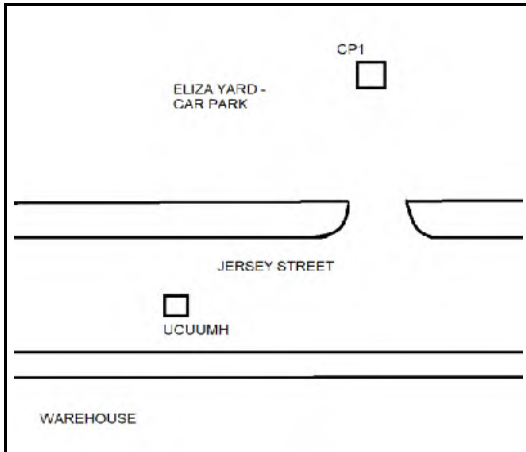
### REMARKS

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★ See Overleaf for Key

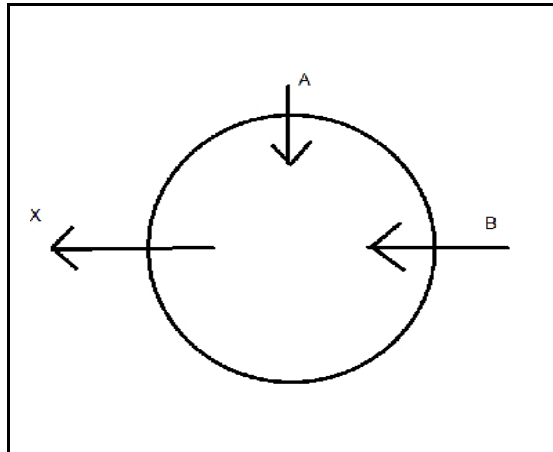
LOCATION SKETCH

N



PLAN OF MANHOLE

N



LOCATION PHOTO

N



PHOTO OF MANHOLE

N



## STATUS

PU : Public  
24 : Section 24

PR : Private  
HD : Highway Drain

WC : Culverted Watercourse

} Applies to main outlet

## FUNCTION

F : Foul

C : Combined

S : Surface Water

} Applies to main outlet

## MANHOLE TYPE

IF : Infall  
LH : Lamphole  
GU : Gully

MH : Manhole  
RE : Rodding Eye  
OF : Outfall

CP : Catchpit  
SO : Storm Overflow  
SA : Soakaway

CSO : Consented Sewer Overflow  
DS : Dual system Manhole  
PS : Pumping Station

## COVER DUTY

L : Light Duty

M : Medium Duty

H : Heavy Duty

## SHAPE

C : Circular  
S : Square  
B : Barrel  
X : Other (state in words)

E : Egg  
T : Trapezoidal  
H : Horseshoe (Inverted U)

R : Rectangular  
A : Arched  
U : U-shaped with flat top

PIPE (OR LINING)  
MATERIAL

AK : Alkathene  
CI : Cast Iron  
CSB : Concrete Segments (Bolted)  
DI : Ductile Iron  
PSC : Plastic/Steel Composite  
RPM : Reinforced Plastic Matrix  
PP : Polypropylene  
MAF : Masonry, Random Courses

AC : Asbestos Cement  
SI : Spun (Grey) Iron  
CSU : Concrete Segments (Unbolted)  
GRC : Glass Reinforced Concrete  
PVC : Polyvinyl Chloride  
ST : Steel  
PF : Pitch Fibre  
XXX : Other (State in remarks)

BR : Brick  
CO : Concrete  
CC : Concrete Box Culvert  
GRP : Glass Reinforced Plastic  
PE : Polyethylene  
VC : Vitrified Clay  
MAC : Masonry, Coursed

## LINING

BL : Bitumen  
CL : Cement

RL : Resin  
PI : Plastic

IS : Insituform



**TEAM  
DRAINAGE**

## Team Drainage Ltd Manhole Survey Card

|           |                             |        |      |
|-----------|-----------------------------|--------|------|
| Card No   |                             | Map No |      |
| Catchment | UU                          | MH No  | 3801 |
| Location  | In rough ground near canal. |        |      |
| Town      | Ancoats                     |        |      |

|         |        |        |          |         |         |            |                |
|---------|--------|--------|----------|---------|---------|------------|----------------|
| ★<br>PU | Status | ★<br>C | Function | ★<br>MH | MH Type | 19/02/2021 | Date of Survey |
|---------|--------|--------|----------|---------|---------|------------|----------------|

### COVER DETAILS

☒ Square
 ☐ Rectangle
 ☐ Triangle
 ☐ Dbl Triangle
 ☐ Circular
 ☐ Oval
 ☐ Other
 ☐ Multiple
 ☐ Hinged
 ☐ Lockable

Cover Level  m
 H / M / L Cover Duty ☒ H
 Initials  LR

### PIPE DETAILS

#### Incoming Pipes

| Clockwise from pipe X | Pipe | Depth from Invert (m) | Upstream / Downstream MH Ref | Shape | Size (mm) |   | Pipe Mat | Lining Mat | Back Drop Dia (mm) | Back Drop Depth (m) |
|-----------------------|------|-----------------------|------------------------------|-------|-----------|---|----------|------------|--------------------|---------------------|
|                       | A    | 4.87                  | 3801                         | C     | 525       | X | CO       |            |                    |                     |
|                       | B    |                       |                              |       |           | X |          |            |                    |                     |
|                       | C    |                       |                              |       |           | X |          |            |                    |                     |
|                       | D    |                       |                              |       |           | X |          |            |                    |                     |
|                       | E    |                       |                              |       |           | X |          |            |                    |                     |
|                       | F    |                       |                              |       |           | X |          |            |                    |                     |

#### Outgoing Pipes

|   |      |      |   |     |   |    |  |  |  |  |
|---|------|------|---|-----|---|----|--|--|--|--|
| X | 4.88 | 3702 | C | 525 | X | CO |  |  |  |  |
| Y |      |      |   |     | X |    |  |  |  |  |

|                            |        |    |                        |         |    |                                               |   |
|----------------------------|--------|----|------------------------|---------|----|-----------------------------------------------|---|
| Cover Opening at narrowest | 450.00 | mm | Chamber Size at widest | 1800.00 | mm | Evidence of Surcharge                         | N |
| Shaft at narrowest         | 470.00 | mm | Shaft Depth (from CL)  | 890.00  | mm | OX / H <sub>2</sub> S / METH Toxic atmosphere | N |

### MANHOLE CONSTRUCTION DETAILS

☐ Pre Cast Concrete
 ☐ In Situ Concrete
 ☒ Brick
 ☐ GRP
 ☐ Arch
 ☐ Corbel
 ☐ Taper
 ☐ Side Entry

☐ Reducing Slab
 ☐ Segments
 ☐ No. of Landings
 ☒ 14 No. of Step Irons
 ☐ No. of Ladders

☐ No. of Regulating Brick Courses

### CONDITION INFORMATION (specific in remark)

|                  | Cover                               | Shaft                               | Irons / Ladders                     | Chamber                             | Benching                            | Channel                             |
|------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| OK               | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Needs attention  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Urgent attention | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

Depth of Flow  mm
 Depth of Silt  mm
 Height of Surcharge from CL  mm

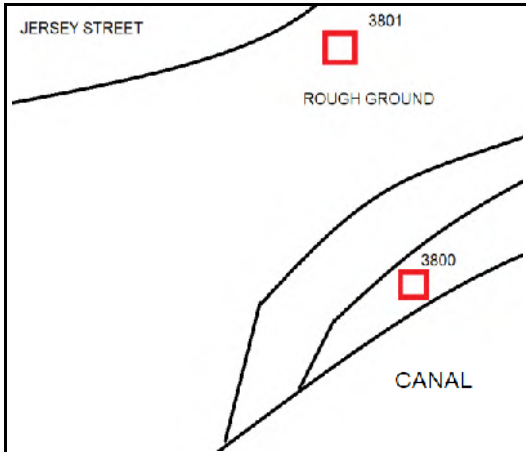
### REMARKS

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|  |

★ See Overleaf for Key

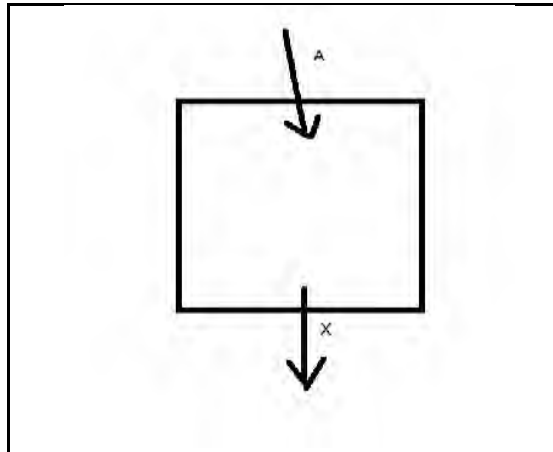
LOCATION SKETCH

N



PLAN OF MANHOLE

N



LOCATION PHOTO

N



PHOTO OF MANHOLE

N



## STATUS

PU : Public  
24 : Section 24

PR : Private  
HD : Highway Drain

WC : Culverted Watercourse

} Applies to main outlet

## FUNCTION

F : Foul

C : Combined

S : Surface Water

} Applies to main outlet

## MANHOLE TYPE

IF : Infall  
LH : Lamphole  
GU : Gully

MH : Manhole  
RE : Rodding Eye  
OF : Outfall

CP : Catchpit  
SO : Storm Overflow  
SA : Soakaway

CSO : Consented Sewer Overflow  
DS : Dual system Manhole  
PS : Pumping Station

## COVER DUTY

L : Light Duty

M : Medium Duty

H : Heavy Duty

## SHAPE

C : Circular  
S : Square  
B : Barrel  
X : Other (state in words)

E : Egg  
T : Trapezoidal  
H : Horseshoe (Inverted U)

R : Rectangular  
A : Arched  
U : U-shaped with flat top

PIPE (OR LINING)  
MATERIAL

AK : Alkathene  
CI : Cast Iron  
CSB : Concrete Segments (Bolted)  
DI : Ductile Iron  
PSC : Plastic/Steel Composite  
RPM : Reinforced Plastic Matrix  
PP : Polypropylene  
MAF : Masonry, Random Courses

AC : Asbestos Cement  
SI : Spun (Grey) Iron  
CSU : Concrete Segments (Unbolted)  
GRC : Glass Reinforced Concrete  
PVC : Polyvinyl Chloride  
ST : Steel  
PF : Pitch Fibre  
XXX : Other (State in remarks)

BR : Brick  
CO : Concrete  
CC : Concrete Box Culvert  
GRP : Glass Reinforced Plastic  
PE : Polyethylene  
VC : Vitrified Clay  
MAC : Masonry, Coursed

## LINING

BL : Bitumen  
CL : Cement

RL : Resin  
PI : Plastic

IS : Insituform



**TEAM  
DRAINAGE**

## Team Drainage Ltd Manhole Survey Card

|           |                                   |        |      |
|-----------|-----------------------------------|--------|------|
| Card No   |                                   | Map No |      |
| Catchment | UU                                | MH No  | 3801 |
| Location  | In rough ground on Jersey Street. |        |      |
| Town      | Ancoats                           |        |      |

|         |        |        |          |         |         |            |                |
|---------|--------|--------|----------|---------|---------|------------|----------------|
| ★<br>PU | Status | ★<br>C | Function | ★<br>MH | MH Type | 19/02/2021 | Date of Survey |
|---------|--------|--------|----------|---------|---------|------------|----------------|

### COVER DETAILS

☒ Square
 ☐ Rectangle
 ☐ Triangle
 ☐ Dbl Triangle
 ☐ Circular
 ☐ Oval
 ☐ Other
 ☐ Multiple
 ☐ Hinged
 ☐ Lockable

Cover Level  m
 H / M / L Cover Duty ☒ H
 Initials  LR

### PIPE DETAILS

Incoming Pipes

| Clockwise from pipe X | Pipe | Depth from Invert (m) | Upstream / Downstream MH Ref | Shape | Size (mm) |   | Pipe Mat | Lining Mat | Back Drop Dia (mm) | Back Drop Depth (m) |
|-----------------------|------|-----------------------|------------------------------|-------|-----------|---|----------|------------|--------------------|---------------------|
|                       | A    | 4.11                  | HOS2                         | U     | 675       | X | 450      | BR         |                    |                     |
|                       | B    | 4.10                  | 3802                         | C     | 525       | X |          | CO         |                    |                     |
|                       | C    | 4.11                  | 3804                         | U     | 675       | X | 450      | BR         |                    |                     |
|                       | D    |                       |                              |       |           | X |          |            |                    |                     |
|                       | E    |                       |                              |       |           | X |          |            |                    |                     |
|                       | F    |                       |                              |       |           | X |          |            |                    |                     |

Outgoing Pipes

|   |      |      |   |     |   |  |    |  |  |  |
|---|------|------|---|-----|---|--|----|--|--|--|
| X | 4.16 | 3800 | C | 525 | X |  | CO |  |  |  |
| Y |      |      |   |     | X |  |    |  |  |  |

|                            |        |    |                        |         |    |                                               |   |
|----------------------------|--------|----|------------------------|---------|----|-----------------------------------------------|---|
| Cover Opening at narrowest | 450.00 | mm | Chamber Size at widest | 2000.00 | mm | Evidence of Surcharge                         | N |
| Shaft at narrowest         | 470.00 | mm | Shaft Depth (from CL)  | 570.00  | mm | OX / H <sub>2</sub> S / METH Toxic atmosphere | N |

### MANHOLE CONSTRUCTION DETAILS

☐ Pre Cast Concrete
 ☐ In Situ Concrete
 ☒ Brick
 ☐ GRP
 ☐ Arch
 ☐ Corbel
 ☐ Taper
 ☐ Side Entry

☐ Reducing Slab
 ☐ Segments
 ☐ No. of Landings
 ☐ 9 No. of Step Irons
 ☐ No. of Ladders

☒ 35 No. of Regulating Brick Courses

### CONDITION INFORMATION (specific in remark)

|                  | Cover                               | Shaft                               | Irons / Ladders                     | Chamber                             | Benching                            | Channel                             |
|------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| OK               | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Needs attention  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Urgent attention | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |

Depth of Flow  mm
 Depth of Silt  mm
 Height of Surcharge from CL  mm

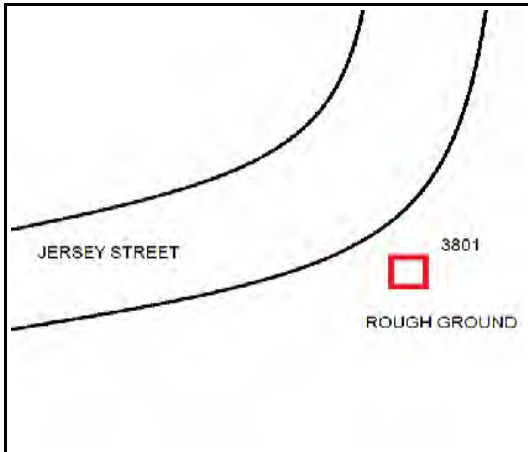
### REMARKS

|  |
|--|
|  |
|  |
|  |

★ See Overleaf for Key

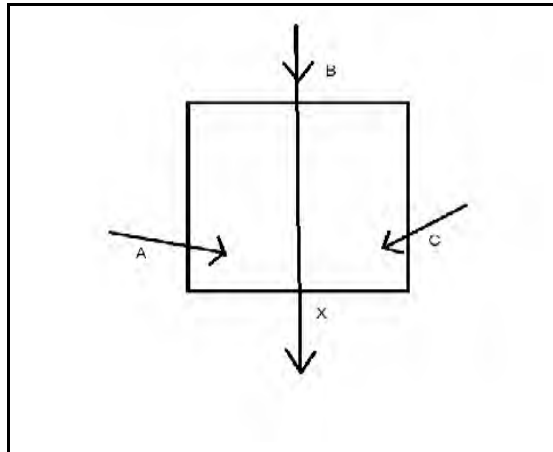
LOCATION SKETCH

N



PLAN OF MANHOLE

N



LOCATION PHOTO

N



PHOTO OF MANHOLE

N



## STATUS

PU : Public  
24 : Section 24

PR : Private  
HD : Highway Drain

WC : Culverted Watercourse

} Applies to main outlet

## FUNCTION

F : Foul

C : Combined

S : Surface Water

} Applies to main outlet

## MANHOLE TYPE

IF : Infall  
LH : Lamphole  
GU : Gully

MH : Manhole  
RE : Rodding Eye  
OF : Outfall

CP : Catchpit  
SO : Storm Overflow  
SA : Soakaway

CSO : Consented Sewer Overflow  
DS : Dual system Manhole  
PS : Pumping Station

## COVER DUTY

L : Light Duty

M : Medium Duty

H : Heavy Duty

## SHAPE

C : Circular  
S : Square  
B : Barrel  
X : Other (state in words)

E : Egg  
T : Trapezoidal  
H : Horseshoe (Inverted U)

R : Rectangular  
A : Arched  
U : U-shaped with flat top

PIPE (OR LINING)  
MATERIAL

AK : Alkathene  
CI : Cast Iron  
CSB : Concrete Segments (Bolted)  
DI : Ductile Iron  
PSC : Plastic/Steel Composite  
RPM : Reinforced Plastic Matrix  
PP : Polypropylene  
MAF : Masonry, Random Courses

AC : Asbestos Cement  
SI : Spun (Grey) Iron  
CSU : Concrete Segments (Unbolted)  
GRC : Glass Reinforced Concrete  
PVC : Polyvinyl Chloride  
ST : Steel  
PF : Pitch Fibre  
XXX : Other (State in remarks)

BR : Brick  
CO : Concrete  
CC : Concrete Box Culvert  
GRP : Glass Reinforced Plastic  
PE : Polyethylene  
VC : Vitrified Clay  
MAC : Masonry, Coursed

## LINING

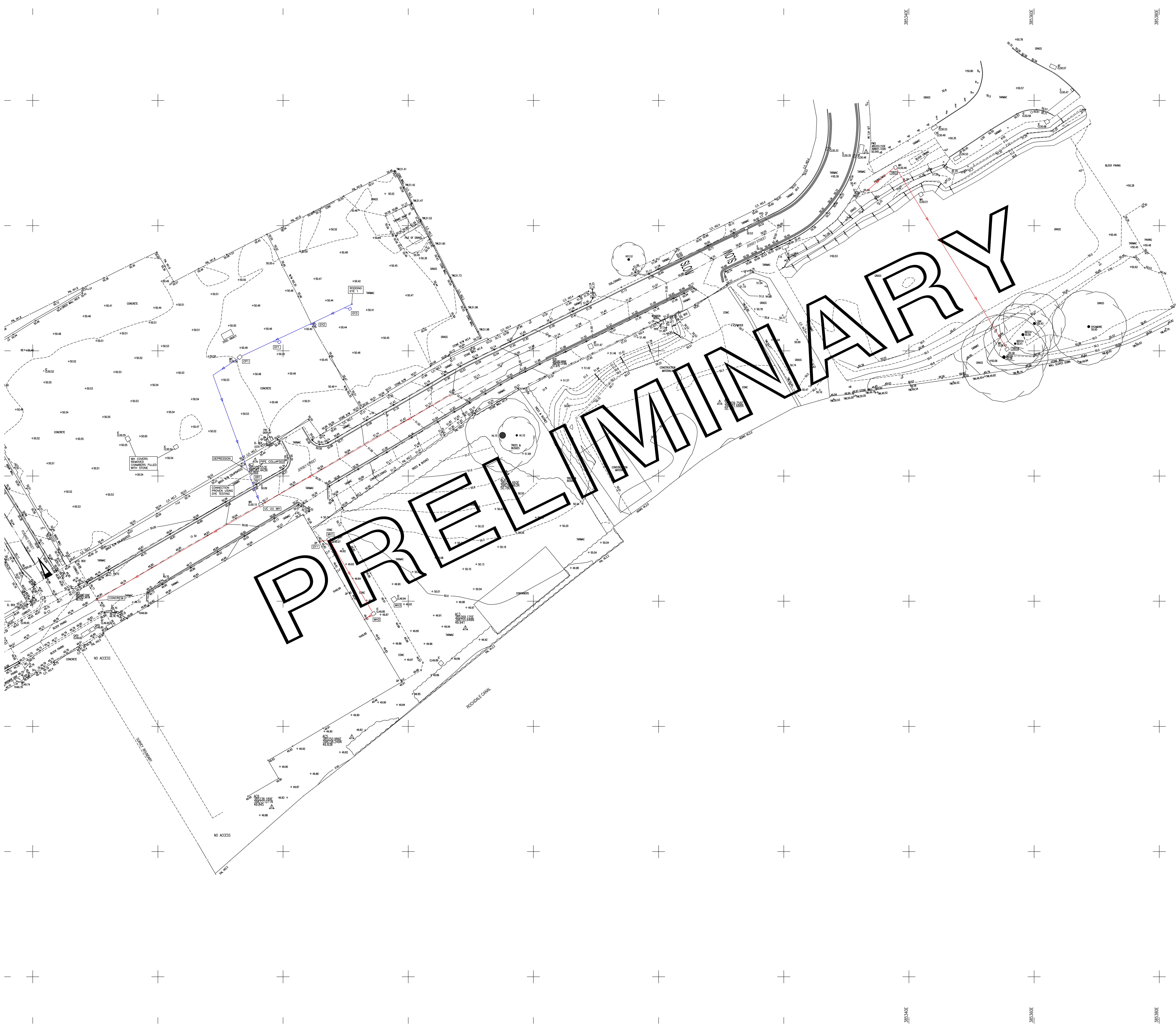
BL : Bitumen  
CL : Cement

RL : Resin  
PI : Plastic

IS : Insituform

**Appendix D**

Topographical Survey



Source: Light

Footbridge

RL

10

|                           |    |
|---------------------------|----|
| Station Station           | 88 |
| Due Stop                  | 85 |
| Drain                     | 88 |
| Prop. Start               | 75 |
| Site Post or Warning Post | 88 |
| Service Marker            | 88 |
| Site Stone                | 88 |
| Reflector Post            | 88 |

**Appendix E**

Environment Agency Flood Map for Planning

# Flood map for planning

Your reference  
**Jersey Street**

Location (easting/northing)  
**385240/398752**

Created  
**11 Nov 2021 22:48**

**Your selected location is in flood zone 1, an area with a low probability of flooding.**

## This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

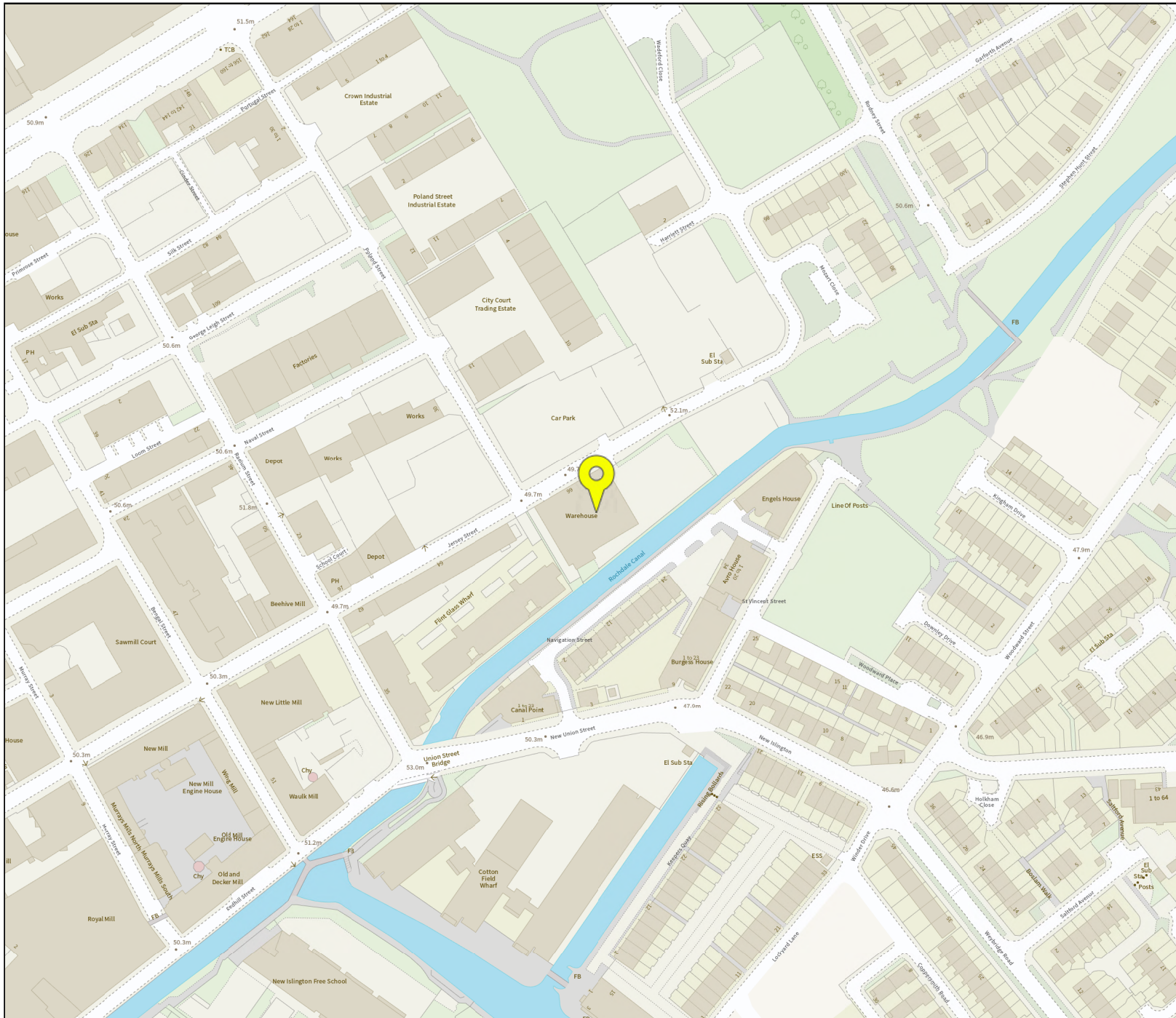
## Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



## Flood map for planning

Your reference  
**Jersey Street**

Location (easting/northing)  
**385240/398752**

Scale  
**1:2500**

Created  
**11 Nov 2021 22:48**

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m

### **Appendix F**

United Utilities Correspondence

Manchester LLFA Correspondence

CRT Correspondence

**Subject:** FW: Pre Development Enquiry for: GENQ CA28 PLOT C ANCOATS M4 6JW UU  
Reference Number : 4200044769

---

**From:** Wastewater Developer Services <[WastewaterDeveloperServices@uuplc.co.uk](mailto:WastewaterDeveloperServices@uuplc.co.uk)>  
**Sent:** 09 November 2021 09:12  
**To:** Charlie Smith <[Charlie.Smith@curtins.com](mailto:Charlie.Smith@curtins.com)>  
**Cc:** Wastewater Developer Services <[WastewaterDeveloperServices@uuplc.co.uk](mailto:WastewaterDeveloperServices@uuplc.co.uk)>  
**Subject:** Pre Development Enquiry for: GENQ CA28 PLOT C ANCOATS M4 6JW UU Reference Number : 4200044769

Good Morning, Charlie

**Pre Development Enquiry for: GENQ CA28 PLOT C ANCOATS M4 6JW UU Reference Number : 4200044769**

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

#### **Foul Water**

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 300 x 406mm diameter public combined sewer within Jersey Street located to the North of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

#### **Surface Water**

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.*

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**

2. to a surface waterbody;
3. to a surface water sewer or highway drain;
4. to a combined sewer.

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

### **Infiltration**

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

### **Waterbody**

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to Rochdale Canal located **South** of the proposed site.

We would encourage you to identify and engage with any third party landowner and riparian owner to agree access and discharge rights to the water body if this is not in your ownership.

### **Highway Drainage**

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

## **Public Sewer**

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 300 x 406mm diameter public combined sewer within Jersey Street located North of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 7.5l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

## **Levels**

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

## **Land drainage / Overland flows / track drainage**

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

## **Existing Wastewater Assets Crossing the Site**

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records

## **Existing Water Assets Crossing the Site**

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

**[DeveloperServicesWater@uuplc.co.uk](mailto:DeveloperServicesWater@uuplc.co.uk)**. Further information for this service can be found on our website via the link below:

**<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>**

## **Connection Application**

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements

and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,



**Gary Jaundrell**

Assistant Developer Engineer  
Developer Services & Metering  
Customer Services

T: 07388 715 589

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hands



Disinfect  
common surfaces



Practise social  
distancing



FEVER +  
COUGH

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have symptoms

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## Chloé Grimsley

---

**From:** Oliver Timmins <oliver.timmins@manchester.gov.uk>  
**Sent:** 10 November 2021 16:24  
**To:** Charlie Smith  
**Cc:** Carl Dawson; Chloé Grimsley  
**Subject:** RE: 077879 - Manlife Plot C, Ancoats, Manchester, M4 6JW, LLFA

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi Charlie,

Thanks for the email.

Unfortunately, the council servers block Wetransfer therefore I am unable to open the site layout.

My first query is to ask if there has been any consideration (or correspondence with the Canal and Rivers Trust) for the site to discharge surface water into the Rochdale Canal?

Secondly, in regards to the proposed discharge rates, we would need to see a breakdown of how discharge rates were calculated (highlighting each variable value), before confirming that these are acceptable. Also, again we would need to see a breakdown of the proposed discharge rate calculations before agreeing to a single flow restriction for all events. However, this being said, in principle we would not have any serious concerns with the site discharging surface water at a maximum pass flow of 5l/s for all events up to and including the 1 in 100 year event plus 40% climate change.

Kind Regards,

Oliver

Oliver Timmins  
Engineer (Flood Risk Management)  
Mobile: 07814082200  
Email: [oliver.timmins@manchester.gov.uk](mailto:oliver.timmins@manchester.gov.uk)

Lead Local Flood Authority  
Highways  
Growth & Development and Neighbourhoods Directorate  
Manchester City Council  
PO Box 532 Town Hall  
Manchester  
M60 2LA

Web: <http://www.manchester.gov.uk>

---

**From:** Charlie Smith <Charlie.Smith@curtins.com>  
**Sent:** 02 November 2021 16:32  
**To:** Oliver Timmins <oliver.timmins@manchester.gov.uk>  
**Cc:** Carl Dawson <Carl.Dawson@curtins.com>; Chloé Grimsley <Chloe.Grimmsley@curtins.com>  
**Subject:** 077879 - Manlife Plot C, Ancoats, Manchester, M4 6JW, LLFA

Good afternoon,

We are currently producing a drainage strategy for a site located off Jersey Street, Ancoats, Manchester M4 6JW (NGR – X:385272, Y:398780) – Please see location plan in the download link.

The scheme is to redevelop an existing warehouse building and associated storage yard. The main building is to be demolished and the area to be redeveloped for residential and commercial end use.

Infiltration testing has been undertaken and due to a naturally high water level infiltration has been proven as not feasible.

The site is located on the edge of the Rochdale canal.

Following SuDs hierarchy the next option is to discharge surface water flows to the public SW sewer. Reviewing United Utilities Sewer maps there are no SW Sewers within close proximity to the site.

The only option is to discharge to the existing public combined sewer located within Jersey Street.

Following a CCTV survey of the site, it is evident that surface water is positively draining to the existing public combined sewer in Jersey Street.

We have calculated existing flows from the site (0.11ha) using the Wallingford Modified rational method and the results are below;

1:1 year rainfall event = 4.4 l/s

1:30 year rainfall event = 11.3 l/s

1:100 year rainfall event = 14.3 l/s

Taking the existing flows generated from the full site, less the existing building to remain and applying a 50% reduction in flows in line with existing planning policies, the proposed discharge rate for the redeveloped areas are as follows;

1:1 year rainfall event  $4.4/2$  (50%) = 2.2 l/s

1:30 year rainfall event  $11.3/2$  (50%) = 5.7 l/s

1:100 year rainfall event  $14.3/2$  (50%) = 7.2 l/s

\*We suggest increasing to 5 l/s to reduce the risk of blockage due to the small orifice required.

In order to achieve the above flow restrictions, flow control device would be located within the last chamber prior to discharging to the public SW sewer. As these flows are relatively small, should you be happy to accept a single flow discharge rate, for storms up to and including 1 in 100 year plus 40% climate change, we propose this to be 5 l/s, please advise if you are happy with the above, or if you would like a complex control restricting flows for each of the 1, 30 and 100 year return periods?

Attenuation within our site will be provided using appropriate SuDs features.

We have also issued the above proposed flow rates to UU for their comment.

Please see WeTransfer link below for all attachments.

<https://we.tl/t-wQTUdPpPNw>

If you have any questions please do not hesitate to get in contact.

Kind Regards,

**Charlie Smith** Civil Engineer

**Curtins**

T. 0161 236 2394 | [charlie.smith@curtins.com](mailto:charlie.smith@curtins.com)

Merchant Exchange  
17-19 Whitworth Street West  
Manchester M1 5WG



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**From:** Victoria Checkley  
**Sent:** 25 February 2021 13:57  
**To:** Adam Hogan; Chloé Grimsley  
**Cc:** Laura Rodriguez  
**Subject:** FW: MCR Life Projects - C&RT drainage statement  
**Attachments:** Manchester Life - phase 3 sites.pdf

Hi,

Please find below confirmation that the CRT will not accept surface water flows from the developments.

Regards

Victoria

**Victoria Checkley** Technical Director

**Curtins**

T. 0161 236 2394 | M. 07855 109421 | [victoria.checkley@curtins.com](mailto:victoria.checkley@curtins.com)

---

**From:** Ian Knight <[ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)>  
**Sent:** 25 February 2021 12:08  
**To:** Victoria Checkley <[Victoria.Checkley@curtins.com](mailto:Victoria.Checkley@curtins.com)>; Hutton, Helen <[Helen.Hutton@macegroup.com](mailto:Helen.Hutton@macegroup.com)>; Shane Desmond <[shane.desmond@mcrlife.co.uk](mailto:shane.desmond@mcrlife.co.uk)>  
**Subject:** FW: MCR Life Projects - C&RT drainage statement

Victoria,

The below might be a bit more helpful.

Thanks

Ian



**Ian Knight**

**Programme Manager**

**Manchester Life Development Company Limited**

**Unit 5, Royal Mill, 17 Redhill Street, Manchester M4 5BA**

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[ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)

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---

**From:** Deborah McCormick <[Deborah.McCormick@canalrivertrust.org.uk](mailto:Deborah.McCormick@canalrivertrust.org.uk)>  
**Sent:** 25 February 2021 12:03  
**To:** Ian Knight <[ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)>  
**Cc:** Gareth Taylor <[Gareth.Taylor@canalrivertrust.org.uk](mailto:Gareth.Taylor@canalrivertrust.org.uk)>  
**Subject:** RE: MCR Life Projects - C&RT drainage statement

Ian,

To confirm, at this time, the Trust is unable to accept SWD into the Rochdale canal at the location of your developments.

Regards  
Deborah

**Deborah McCormick**

BSc(Hons) Utilities Surveyor

North West Region

I work Monday to Thursday

**T** 01942 405766 **M** 07768 447444

**E** [deborah.mccormick@canalrivertrust.org.uk](mailto:deborah.mccormick@canalrivertrust.org.uk)

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**Rainbow Ally**

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Joe,

Of course, thank you.

Debbie,

Please find attached a simple google earth mark up of the proposed sites coming forward as well as the original attachment to my Friday email to Joe.

Please let us know if you need anything else.

Thanks

Ian



**Ian Knight**

**Programme Manager**

**Manchester Life Development Company Limited**

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[ian.knight@mclife.co.uk](mailto:ian.knight@mclife.co.uk)

[www.mclife.co.uk](http://www.mclife.co.uk)

---

**From:** Joe Hildred <[Joe.Hildred@canalrivertrust.org.uk](mailto:Joe.Hildred@canalrivertrust.org.uk)>

**Sent:** 23 February 2021 15:44

**To:** Ian Knight <[ian.knight@mclife.co.uk](mailto:ian.knight@mclife.co.uk)>; David J. George <[David.George@canalrivertrust.org.uk](mailto:David.George@canalrivertrust.org.uk)>; Deborah McCormick <[Deborah.McCormick@canalrivertrust.org.uk](mailto:Deborah.McCormick@canalrivertrust.org.uk)>

**Cc:** Hutton, Helen <[Helen.Hutton@macegroup.com](mailto:Helen.Hutton@macegroup.com)>; Edwards, Amelia <[Amelia.Edwards@macegroup.com](mailto:Amelia.Edwards@macegroup.com)>

**Subject:** RE: MCR Life Projects - C&RT drainage statement

Hi Ian

Yes sorry I was consulting with some colleagues yesterday and today.

Can I connect you with Debbie please who is in a much better place to advice you correctly first time. It may be a good start if you could send her an exact plan of the location you are talking about if that's ok?

Best wishes

Joe

---

**From:** Ian Knight <[ian.knight@mclife.co.uk](mailto:ian.knight@mclife.co.uk)>

**Sent:** 23 February 2021 15:41

**To:** Joe Hildred <[Joe.Hildred@canalrivertrust.org.uk](mailto:Joe.Hildred@canalrivertrust.org.uk)>; David J. George <[David.George@canalrivertrust.org.uk](mailto:David.George@canalrivertrust.org.uk)>

**Cc:** Hutton, Helen <[Helen.Hutton@macegroup.com](mailto:Helen.Hutton@macegroup.com)>; Edwards, Amelia <[Amelia.Edwards@macegroup.com](mailto:Amelia.Edwards@macegroup.com)>

**Subject:** RE: MCR Life Projects - C&RT drainage statement

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Joe, David,

Apologies for chasing, I'm aware I only sent the below email on Friday, have you had any opportunity to review it?

Thanks

Ian



**Ian Knight**

**Programme Manager**

**Manchester Life Development Company Limited**

**Unit 5, Royal Mill, 17 Redhill Street, Manchester M4 5BA**

**M+44 (0)7798 500 438**

[ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)  
[www.mcrlife.co.uk](http://www.mcrlife.co.uk)

---

**From:** Ian Knight  
**Sent:** 19 February 2021 16:33  
**To:** Joe Hildred <[Joe.Hildred@canalrivertrust.org.uk](mailto:Joe.Hildred@canalrivertrust.org.uk)>; David J. George <[David.George@canalrivertrust.org.uk](mailto:David.George@canalrivertrust.org.uk)>  
**Cc:** Hutton, Helen <[Helen.Hutton@macegroup.com](mailto:Helen.Hutton@macegroup.com)>; Edwards, Amelia <[Amelia.Edwards@macegroup.com](mailto:Amelia.Edwards@macegroup.com)>  
**Subject:** MCR Life Projects - C&RT drainage statement

Joe,

I hope your towpath enhancement project is progressing and you are both otherwise well. I'm hoping you can help us with something.

As we discussed a few weeks ago, we are progressing two projects in the vicinity of the Rochdale Canal, one of which backs directly onto the canal.

We are progressing our drainage design on the basis that we absolutely cannot discharge surface water into the Rochdale canal on the basis of advice received from Darren Spann in 2015. The note he provided (attached) was very helpful as it stopped us going around in circles with the local planning authority and UU in regards to their drainage hierarchy.

Would it be possible for you to provide an email or note which confirms this advice is still applicable and we are not permitted to discharge into the canal?

Thanks

Ian



**Ian Knight**

**Programme Manager**  
**Manchester Life Development Company Limited**  
**Unit 5, Royal Mill, 17 Redhill Street, Manchester M4 5BA**  
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[ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)  
[www.mcrlife.co.uk](http://www.mcrlife.co.uk)

-----Original Appointment-----

**From:** Joe Hildred <[Joe.Hildred@canalrivertrust.org.uk](mailto:Joe.Hildred@canalrivertrust.org.uk)>  
**Sent:** 06 January 2021 15:23  
**To:** Joe Hildred; David J. George; Cardwell, Ed; [ian.knight@mcrlife.co.uk](mailto:ian.knight@mcrlife.co.uk)  
**Subject:** Rochdale Canal TP - Canal & River Trust/MCR Life  
**When:** 22 January 2021 14:00-15:30 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.  
**Where:** Microsoft Teams Meeting

Hi everyone, thanks for providing your availability. This meeting is for Canal & River Trust to introduce Ian from Manchester Life to the towpath improvements (concept document) and Ian to talk through nearby developments he is involved in.

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## Microsoft Teams meeting

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### Cadw mewn cysylltiad

Cofrestrwch i dderbyn e-gylchlythyr Glandŵr Cymru <https://canalrivertrust.org.uk/newsletter>

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Mae'r e-bost hwn a'i atodiadau ar gyfer defnydd y derbynnydd bwriedig yn unig. Os nad chi yw derbynnydd bwriedig yr e-bost hwn a'i atodiadau, ni ddylech gymryd unrhyw gamau ar sail y cynnwys, ond yn hytrach dylech eu dileu heb eu copïo na'u hanfon ymlaen a rhoi gwybod i'r anfonwr eich bod wedi eu derbyn ar ddamwain. Mae unrhyw farn neu safbwynt a fynegir yn eiddo i'r awdur yn unig ac nid ydynt o reidrwydd yn cynrychioli barn a safbwyntiau Glandŵr Cymru.

Mae Glandŵr Cymru yn gwmni cyfyngedig drwy warant a gofrestrwyd yng Nghymru a Lloegr gyda rhif cwmni 7807276 a rhif elusen gofrestredig 1146792. Swyddfa gofrestredig: First Floor North, Station House, 500 Elder Gate, Milton Keynes MK9 1BB.

**Appendix G**

Drainage Strategy



**Appendix H**

Proposed Surface Water Calculations

### Design Settings

|                       |                   |                                      |               |
|-----------------------|-------------------|--------------------------------------|---------------|
| Rainfall Methodology  | FSR               | Maximum Time of Concentration (mins) | 30.00         |
| Return Period (years) | 100               | 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)            | 17.000            | Minimum Backdrop Height (m)          | 0.200         |
| Ratio-R               | 0.400             | 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<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Easting<br>(m) | Northing<br>(m) | Depth<br>(m) |
|------|--------------|------------------|-----------------------|------------------|----------------|-----------------|--------------|
| SW1  | 0.004        | 5.00             | 50.450                | 600              | 385336.393     | 398820.325      | 1.375        |
| SW2  | 0.008        | 5.00             | 50.200                | 600              | 385339.329     | 398813.982      | 1.174        |
| SW3  |              |                  | 49.600                | 600              | 385343.766     | 398805.245      | 1.432        |
| SW4  | 0.003        | 5.00             | 49.670                | 600              | 385337.175     | 398801.611      | 1.547        |
| SW4A |              |                  | 49.670                | 600              | 385333.800     | 398799.746      | 1.570        |
| SW5  | 0.013        | 5.00             | 49.670                | 600              | 385327.124     | 398796.067      | 1.615        |
| SW6  | 0.039        | 5.00             | 49.670                | 600              | 385322.805     | 398793.682      | 1.645        |
| SW7  | 0.024        | 5.00             | 49.670                | 600              | 385316.908     | 398790.433      | 1.685        |
| SW8  | 0.022        | 5.00             | 49.670                | 600              | 385310.621     | 398786.966      | 1.749        |
| SW9  | 0.006        | 5.00             | 49.670                | 600              | 385298.519     | 398780.292      | 1.875        |
| SW10 | 0.008        | 5.00             | 49.670                | 600              | 385294.411     | 398778.025      | 1.933        |
| SW11 | 0.013        | 5.00             | 50.500                | 600              | 385281.458     | 398788.625      | 1.400        |
| SW12 | 0.035        | 5.00             | 49.870                | 600              | 385288.858     | 398774.964      | 2.170        |
| SW13 | 0.015        | 5.00             | 50.350                | 600              | 385275.434     | 398779.253      | 1.450        |
| SW14 | 0.009        | 5.00             | 50.200                | 600              | 385277.062     | 398776.279      | 1.450        |
| SW15 | 0.009        | 5.00             | 49.700                | 600              | 385283.281     | 398764.893      | 2.030        |
| SW16 |              |                  | 49.650                | 600              | 385284.316     | 398763.023      | 1.989        |
| SW17 | 0.032        | 5.00             | 49.670                | 600              | 385271.048     | 398751.200      | 2.088        |
| SW18 |              |                  | 49.675                | 1200             | 385265.627     | 398751.916      | 2.117        |
| SW19 | 0.008        | 5.00             | 50.600                | 600              | 385262.404     | 398761.501      | 1.430        |
| SW20 | 0.026        | 5.00             | 50.460                | 600              | 385258.052     | 398759.093      | 1.340        |
| SW21 | 0.003        | 5.00             | 50.270                | 600              | 385251.271     | 398755.334      | 1.228        |
| SW22 | 0.017        | 5.00             | 50.120                | 1200             | 385245.825     | 398752.315      | 1.142        |
| SW23 | 0.018        | 5.00             | 49.990                | 600              | 385241.666     | 398750.029      | 0.820        |
| SW24 | 0.008        | 5.00             | 49.750                | 1200             | 385244.712     | 398739.572      | 1.100        |
| SW25 | 0.056        | 5.00             | 49.700                | 1200             | 385252.972     | 398737.591      | 2.237        |
| SW27 | 0.003        | 5.00             | 49.650                | 600              | 385238.242     | 398725.414      | 2.262        |
| SW28 | 0.008        | 5.00             | 49.650                | 1200             | 385229.948     | 398719.063      | 2.461        |
| SW29 | 0.005        | 5.00             | 50.000                | 1200             | 385225.921     | 398725.776      | 2.831        |
| SW30 | 0.011        | 5.00             | 50.000                | 1200             | 385220.577     | 398734.258      | 2.857        |
| SW31 | 0.019        | 5.00             | 49.950                | 1200             | 385212.980     | 398746.576      | 2.844        |
| SW32 | 0.024        | 5.00             | 49.850                | 600              | 385222.159     | 398752.336      | 1.400        |
| CO1  |              |                  | 49.950                | 1200             | 385210.339     | 398752.397      | 2.864        |
| CO2  |              |                  | 49.780                | 1200             | 385206.807     | 398758.498      | 2.724        |

### Pipeline Schedule

| Link  | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|-------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 1.000 | 6.990         | 142.6          | 225         | Circular     | 50.450       | 49.075       | 1.150           | 50.200       | 49.026       | 0.949           |
| 1.001 | 9.799         | 11.4           | 225         | Circular     | 50.200       | 49.026       | 0.949           | 49.600       | 48.168       | 1.207           |
| 1.002 | 7.526         | 167.3          | 225         | Circular     | 49.600       | 48.168       | 1.207           | 49.670       | 48.123       | 1.322           |
| 1.003 | 3.856         | 170.0          | 225         | Circular     | 49.670       | 48.123       | 1.322           | 49.670       | 48.100       | 1.345           |
| 1.004 | 7.623         | 169.4          | 225         | Circular     | 49.670       | 48.100       | 1.345           | 49.670       | 48.055       | 1.390           |
| 1.005 | 4.934         | 164.5          | 225         | Circular     | 49.670       | 48.055       | 1.390           | 49.670       | 48.025       | 1.420           |
| 1.006 | 6.733         | 168.3          | 225         | Circular     | 49.670       | 48.025       | 1.420           | 49.670       | 47.985       | 1.460           |
| 1.007 | 7.180         | 112.2          | 225         | Circular     | 49.670       | 47.985       | 1.460           | 49.670       | 47.921       | 1.524           |
| 1.008 | 13.820        | 271.0          | 225         | Circular     | 49.670       | 47.921       | 1.524           | 49.670       | 47.870       | 1.575           |
| 1.009 | 4.692         | 170.0          | 300         | Circular     | 49.670       | 47.795       | 1.575           | 49.670       | 47.767       | 1.603           |
| 1.010 | 6.341         | 170.0          | 300         | Circular     | 49.670       | 47.737       | 1.633           | 49.870       | 47.700       | 1.870           |
| 2.000 | 15.537        | 12.6           | 150         | Circular     | 50.500       | 49.100       | 1.250           | 49.870       | 47.871       | 1.849           |
| 1.011 | 11.512        | 225.0          | 300         | Circular     | 49.870       | 47.721       | 1.849           | 49.700       | 47.670       | 1.730           |
| 3.000 | 3.390         | 22.6           | 150         | Circular     | 50.350       | 48.900       | 1.300           | 50.200       | 48.750       | 1.300           |
| 3.001 | 12.974        | 25.9           | 150         | Circular     | 50.200       | 48.750       | 1.300           | 49.700       | 48.250       | 1.300           |
| 1.012 | 2.137         | 225.0          | 300         | Circular     | 49.700       | 47.670       | 1.730           | 49.650       | 47.661       | 1.689           |
| 1.013 | 17.771        | 225.0          | 300         | Circular     | 49.650       | 47.661       | 1.689           | 49.670       | 47.582       | 1.788           |
| 1.014 | 5.468         | 227.8          | 300         | Circular     | 49.670       | 47.582       | 1.788           | 49.675       | 47.558       | 1.817           |
| 1.015 | 19.114        | 225.0          | 300         | Circular     | 49.675       | 47.558       | 1.817           | 49.700       | 47.473       | 1.927           |
| 5.000 | 4.974         | 100.0          | 150         | Circular     | 50.600       | 49.170       | 1.280           | 50.460       | 49.120       | 1.190           |
| 5.001 | 7.753         | 100.0          | 150         | Circular     | 50.460       | 49.120       | 1.190           | 50.270       | 49.042       | 1.078           |
| 5.002 | 6.227         | 89.0           | 150         | Circular     | 50.270       | 49.048       | 1.072           | 50.120       | 48.978       | 0.992           |
| 6.000 | 4.746         | 24.7           | 150         | Circular     | 49.990       | 49.170       | 0.670           | 50.120       | 48.978       | 0.992           |
| 4.000 | 48.650        | 59.5           | 150         | Circular     | 49.750       | 48.650       | 0.950           | 49.700       | 47.832       | 1.718           |
| 5.003 | 16.367        | 43.3           | 150         | Circular     | 50.120       | 48.978       | 0.992           | 49.700       | 48.600       | 0.950           |

| Link  | US<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|-------|------------|-------------|--------------|------------|------------|-------------|--------------|------------|
| 1.000 | SW1        | 600         | Manhole      | Adoptable  | SW2        | 600         | Manhole      | Adoptable  |
| 1.001 | SW2        | 600         | Manhole      | Adoptable  | SW3        | 600         | Manhole      | Adoptable  |
| 1.002 | SW3        | 600         | Manhole      | Adoptable  | SW4        | 600         | Manhole      | Adoptable  |
| 1.003 | SW4        | 600         | Manhole      | Adoptable  | SW4A       | 600         | Manhole      | Adoptable  |
| 1.004 | SW4A       | 600         | Manhole      | Adoptable  | SW5        | 600         | Manhole      | Adoptable  |
| 1.005 | SW5        | 600         | Manhole      | Adoptable  | SW6        | 600         | Manhole      | Adoptable  |
| 1.006 | SW6        | 600         | Manhole      | Adoptable  | SW7        | 600         | Manhole      | Adoptable  |
| 1.007 | SW7        | 600         | Manhole      | Adoptable  | SW8        | 600         | Manhole      | Adoptable  |
| 1.008 | SW8        | 600         | Manhole      | Adoptable  | SW9        | 600         | Manhole      | Adoptable  |
| 1.009 | SW9        | 600         | Manhole      | Adoptable  | SW10       | 600         | Manhole      | Adoptable  |
| 1.010 | SW10       | 600         | Manhole      | Adoptable  | SW12       | 600         | Manhole      | Adoptable  |
| 2.000 | SW11       | 600         | Manhole      | Adoptable  | SW12       | 600         | Manhole      | Adoptable  |
| 1.011 | SW12       | 600         | Manhole      | Adoptable  | SW15       | 600         | Manhole      | Adoptable  |
| 3.000 | SW13       | 600         | Manhole      | Adoptable  | SW14       | 600         | Manhole      | Adoptable  |
| 3.001 | SW14       | 600         | Manhole      | Adoptable  | SW15       | 600         | Manhole      | Adoptable  |
| 1.012 | SW15       | 600         | Manhole      | Adoptable  | SW16       | 600         | Manhole      | Adoptable  |
| 1.013 | SW16       | 600         | Manhole      | Adoptable  | SW17       | 600         | Manhole      | Adoptable  |
| 1.014 | SW17       | 600         | Manhole      | Adoptable  | SW18       | 1200        | Manhole      | Adoptable  |
| 1.015 | SW18       | 1200        | Manhole      | Adoptable  | SW25       | 1200        | Manhole      | Adoptable  |
| 5.000 | SW19       | 600         | Manhole      | Adoptable  | SW20       | 600         | Manhole      | Adoptable  |
| 5.001 | SW20       | 600         | Manhole      | Adoptable  | SW21       | 600         | Manhole      | Adoptable  |
| 5.002 | SW21       | 600         | Manhole      | Adoptable  | SW22       | 1200        | Manhole      | Adoptable  |
| 6.000 | SW23       | 600         | Manhole      | Adoptable  | SW22       | 1200        | Manhole      | Adoptable  |
| 4.000 | SW24       | 1200        | Manhole      | Adoptable  | SW25       | 1200        | Manhole      | Adoptable  |
| 5.003 | SW22       | 1200        | Manhole      | Adoptable  | SW25       | 1200        | Manhole      | Adoptable  |

### Pipeline Schedule

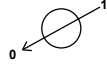
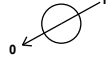
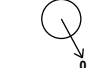
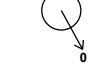
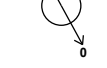
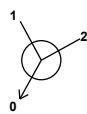
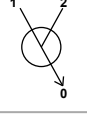
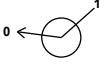
| Link  | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) | DS CL (m) | DS IL (m) | DS Depth (m) |
|-------|------------|-------------|----------|-----------|-----------|-----------|--------------|-----------|-----------|--------------|
| 1.016 | 19.112     | 254.8       | 300      | Circular  | 49.700    | 47.463    | 1.937        | 49.650    | 47.388    | 1.962        |
| 1.017 | 10.446     | 213.2       | 300      | Circular  | 49.650    | 47.388    | 1.962        | 49.650    | 47.339    | 2.011        |
| 1.018 | 7.828      | 400.0       | 450      | Circular  | 49.650    | 47.189    | 2.011        | 50.000    | 47.169    | 2.381        |
| 1.019 | 10.025     | 385.6       | 450      | Circular  | 50.000    | 47.169    | 2.381        | 50.000    | 47.143    | 2.407        |
| 1.020 | 14.472     | 391.1       | 450      | Circular  | 50.000    | 47.143    | 2.407        | 49.950    | 47.106    | 2.394        |
| 7.000 | 10.837     | 100.0       | 150      | Circular  | 49.850    | 48.450    | 1.250        | 49.950    | 48.342    | 1.458        |
| 1.021 | 6.392      | 319.6       | 450      | Circular  | 49.950    | 47.106    | 2.394        | 49.950    | 47.086    | 2.414        |
| 1.022 | 7.050      | 235.0       | 300      | Circular  | 49.950    | 47.086    | 2.564        | 49.780    | 47.056    | 2.424        |

| Link  | US Node | Dia (mm) | Node Type | MH Type   | DS Node | Dia (mm) | Node Type | MH Type   |
|-------|---------|----------|-----------|-----------|---------|----------|-----------|-----------|
| 1.016 | SW25    | 1200     | Manhole   | Adoptable | SW27    | 600      | Manhole   | Adoptable |
| 1.017 | SW27    | 600      | Manhole   | Adoptable | SW28    | 1200     | Manhole   | Adoptable |
| 1.018 | SW28    | 1200     | Manhole   | Adoptable | SW29    | 1200     | Manhole   | Adoptable |
| 1.019 | SW29    | 1200     | Manhole   | Adoptable | SW30    | 1200     | Manhole   | Adoptable |
| 1.020 | SW30    | 1200     | Manhole   | Adoptable | SW31    | 1200     | Manhole   | Adoptable |
| 7.000 | SW32    | 600      | Manhole   | Adoptable | SW31    | 1200     | Manhole   | Adoptable |
| 1.021 | SW31    | 1200     | Manhole   | Adoptable | CO1     | 1200     | Manhole   | Adoptable |
| 1.022 | CO1     | 1200     | Manhole   | Adoptable | CO2     | 1200     | Manhole   | Adoptable |

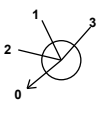
### Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections                                                                          | Link | IL (m) | Dia (mm) |     |
|------|-------------|--------------|--------|-----------|----------|--------------------------------------------------------------------------------------|------|--------|----------|-----|
| SW1  | 385336.393  | 398820.325   | 50.450 | 1.375     | 600      |  | 0    | 1.000  | 49.075   | 225 |
| SW2  | 385339.329  | 398813.982   | 50.200 | 1.174     | 600      |  | 1    | 1.000  | 49.026   | 225 |
| SW3  | 385343.766  | 398805.245   | 49.600 | 1.432     | 600      |  | 1    | 1.001  | 48.168   | 225 |
| SW4  | 385337.175  | 398801.611   | 49.670 | 1.547     | 600      |  | 1    | 1.002  | 48.123   | 225 |
| SW4A | 385333.800  | 398799.746   | 49.670 | 1.570     | 600      |  | 1    | 1.003  | 48.100   | 225 |
| SW5  | 385327.124  | 398796.067   | 49.670 | 1.615     | 600      |  | 1    | 1.004  | 48.055   | 225 |
| SW6  | 385322.805  | 398793.682   | 49.670 | 1.645     | 600      |  | 1    | 1.005  | 48.025   | 225 |
|      |             |              |        |           |          |  | 0    | 1.006  | 48.025   | 225 |

### Manhole Schedule

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                                                       | Link        | IL<br>(m)               | Dia<br>(mm)                |                   |
|------|----------------|-----------------|-----------|--------------|-------------|-------------------------------------------------------------------------------------------------------------------|-------------|-------------------------|----------------------------|-------------------|
| SW7  | 385316.908     | 398790.433      | 49.670    | 1.685        | 600         | <div><br/>0</div>               | 1           | 1.006                   | 47.985                     | 225               |
|      |                |                 |           |              |             | <div><br/>0</div>               | 0           | 1.007                   | 47.985                     | 225               |
| SW8  | 385310.621     | 398786.966      | 49.670    | 1.749        | 600         | <div><br/>0</div>               | 1           | 1.007                   | 47.921                     | 225               |
|      |                |                 |           |              |             | <div><br/>0</div>               | 0           | 1.008                   | 47.921                     | 225               |
| SW9  | 385298.519     | 398780.292      | 49.670    | 1.875        | 600         | <div><br/>0</div>              | 1           | 1.008                   | 47.870                     | 225               |
|      |                |                 |           |              |             | <div><br/>0</div>             | 0           | 1.009                   | 47.795                     | 300               |
| SW10 | 385294.411     | 398778.025      | 49.670    | 1.933        | 600         | <div><br/>0</div>             | 1           | 1.009                   | 47.767                     | 300               |
|      |                |                 |           |              |             | <div><br/>0</div>             | 0           | 1.010                   | 47.737                     | 300               |
| SW11 | 385281.458     | 398788.625      | 50.500    | 1.400        | 600         | <div><br/>0</div>              | 0           | 2.000                   | 49.100                     | 150               |
| SW12 | 385288.858     | 398774.964      | 49.870    | 2.170        | 600         | <div><br/>1<br/>2<br/>0</div> | 1<br>2<br>0 | 2.000<br>1.010<br>1.011 | 47.871<br>47.700<br>47.721 | 150<br>300<br>300 |
| SW13 | 385275.434     | 398779.253      | 50.350    | 1.450        | 600         | <div><br/>0</div>             | 0           | 3.000                   | 48.900                     | 150               |
| SW14 | 385277.062     | 398776.279      | 50.200    | 1.450        | 600         | <div><br/>1<br/>0</div>       | 1<br>0      | 3.000<br>3.001          | 48.750<br>48.750           | 150<br>150        |
| SW15 | 385283.281     | 398764.893      | 49.700    | 2.030        | 600         | <div><br/>1<br/>2<br/>0</div> | 1<br>2<br>0 | 3.001<br>1.011<br>1.012 | 48.250<br>47.670<br>47.670 | 150<br>300<br>300 |
| SW16 | 385284.316     | 398763.023      | 49.650    | 1.989        | 600         | <div><br/>1<br/>0</div>       | 1<br>0      | 1.012<br>1.013          | 47.661<br>47.661           | 300<br>300        |
| SW17 | 385271.048     | 398751.200      | 49.670    | 2.088        | 600         | <div><br/>0</div>             | 1<br>0      | 1.013<br>1.014          | 47.582<br>47.582           | 300<br>300        |
| SW18 | 385265.627     | 398751.916      | 49.675    | 2.117        | 1200        | <div><br/>0</div>             | 1<br>0      | 1.014<br>1.015          | 47.558<br>47.558           | 300<br>300        |
| SW19 | 385262.404     | 398761.501      | 50.600    | 1.430        | 600         | <div><br/>0</div>             | 0           | 5.000                   | 49.170                     | 150               |

**Manhole Schedule**

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                          | Link | IL<br>(m) | Dia<br>(mm) |     |
|------|----------------|-----------------|-----------|--------------|-------------|--------------------------------------------------------------------------------------|------|-----------|-------------|-----|
| SW20 | 385258.052     | 398759.093      | 50.460    | 1.340        | 600         |    | 1    | 5.000     | 49.120      | 150 |
|      |                |                 |           |              |             |                                                                                      | 0    | 5.001     | 49.120      | 150 |
| SW21 | 385251.271     | 398755.334      | 50.270    | 1.228        | 600         |    | 1    | 5.001     | 49.042      | 150 |
|      |                |                 |           |              |             |                                                                                      | 0    | 5.002     | 49.048      | 150 |
| SW22 | 385245.825     | 398752.315      | 50.120    | 1.142        | 1200        |    | 1    | 6.000     | 48.978      | 150 |
|      |                |                 |           |              |             |                                                                                      | 2    | 5.002     | 48.978      | 150 |
|      |                |                 |           |              |             |                                                                                      | 0    | 5.003     | 48.978      | 150 |
| SW23 | 385241.666     | 398750.029      | 49.990    | 0.820        | 600         |    |      |           |             |     |
|      |                |                 |           |              |             |                                                                                      | 0    | 6.000     | 49.170      | 150 |
| SW24 | 385244.712     | 398739.572      | 49.750    | 1.100        | 1200        |   |      |           |             |     |
|      |                |                 |           |              |             |                                                                                      | 0    | 4.000     | 48.650      | 150 |
| SW25 | 385252.972     | 398737.591      | 49.700    | 2.237        | 1200        |  | 1    | 5.003     | 48.600      | 150 |
|      |                |                 |           |              |             |                                                                                      | 2    | 4.000     | 47.832      | 150 |
|      |                |                 |           |              |             |                                                                                      | 3    | 1.015     | 47.473      | 300 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.016     | 47.463      | 300 |
| SW27 | 385238.242     | 398725.414      | 49.650    | 2.262        | 600         |  | 1    | 1.016     | 47.388      | 300 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.017     | 47.388      | 300 |
| SW28 | 385229.948     | 398719.063      | 49.650    | 2.461        | 1200        |  | 1    | 1.017     | 47.339      | 300 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.018     | 47.189      | 450 |
| SW29 | 385225.921     | 398725.776      | 50.000    | 2.831        | 1200        |  | 1    | 1.018     | 47.169      | 450 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.019     | 47.169      | 450 |
| SW30 | 385220.577     | 398734.258      | 50.000    | 2.857        | 1200        |  | 1    | 1.019     | 47.143      | 450 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.020     | 47.143      | 450 |
| SW31 | 385212.980     | 398746.576      | 49.950    | 2.844        | 1200        |  | 1    | 7.000     | 48.342      | 150 |
|      |                |                 |           |              |             |                                                                                      | 2    | 1.020     | 47.106      | 450 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.021     | 47.106      | 450 |
| SW32 | 385222.159     | 398752.336      | 49.850    | 1.400        | 600         |  |      |           |             |     |
|      |                |                 |           |              |             |                                                                                      | 0    | 7.000     | 48.450      | 150 |
| CO1  | 385210.339     | 398752.397      | 49.950    | 2.864        | 1200        |  | 1    | 1.021     | 47.086      | 450 |
|      |                |                 |           |              |             |                                                                                      | 0    | 1.022     | 47.086      | 300 |

### Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections | Link  | IL (m) | Dia (mm) |
|------|-------------|--------------|--------|-----------|----------|-------------|-------|--------|----------|
| CO2  | 385206.807  | 398758.498   | 49.780 | 2.724     | 1200     | 1           | 1.022 | 47.056 | 300      |



### Simulation Settings

|                      |                   |                            |          |
|----------------------|-------------------|----------------------------|----------|
| Rainfall Methodology | FSR               | Analysis Speed             | Detailed |
| FSR Region           | England and Wales | Skip Steady State          | x        |
| M5-60 (mm)           | 17.000            | Drain Down Time (mins)     | 240      |
| Ratio-R              | 0.400             | Additional Storage (m³/ha) | 20.0     |
| Summer CV            | 0.750             | Check Discharge Rate(s)    | x        |
| Winter CV            | 0.840             | 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 %) |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 1                     | 0                     | 0                     | 0                     |
| 30                    | 0                     | 0                     | 0                     |
| 100                   | 40                    | 0                     | 0                     |

### Node SW31 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | ✓      | Sump Available          | ✓                              |
| Invert Level (m)         | 47.106 | Product Number          | CTL-SHE-0100-5000-1400-5000    |
| Design Depth (m)         | 1.400  | Min Outlet Diameter (m) | 0.150                          |
| Design Flow (l/s)        | 5.0    | Min Node Diameter (mm)  | 1200                           |

### Node SW25 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 1.0  | Invert Level (m)          | 47.463 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.95 | Time to half empty (mins) |        |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|-----------|-----------|---------------|-----------|-----------|---------------|-----------|-----------|---------------|
| 0.000     | 128.0     | 0.0           | 1.600     | 128.0     | 0.0           | 1.601     | 0.0       | 0.0           |

**Results for 1 year Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event       | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|--------|
| 15 minute summer | SW1     | 10          | 49.092    | 0.017     | 0.5          | 0.0058        | 0.0000     | OK     |
| 15 minute winter | SW2     | 10          | 49.041    | 0.015     | 1.5          | 0.0065        | 0.0000     | OK     |
| 15 minute winter | SW3     | 11          | 48.197    | 0.029     | 1.4          | 0.0083        | 0.0000     | OK     |
| 15 minute winter | SW4     | 11          | 48.157    | 0.034     | 1.8          | 0.0108        | 0.0000     | OK     |
| 15 minute winter | SW4A    | 11          | 48.132    | 0.032     | 1.7          | 0.0090        | 0.0000     | OK     |
| 15 minute winter | SW5     | 11          | 48.103    | 0.048     | 3.3          | 0.0214        | 0.0000     | OK     |
| 15 minute winter | SW6     | 11          | 48.099    | 0.074     | 7.6          | 0.0557        | 0.0000     | OK     |
| 15 minute winter | SW7     | 11          | 48.063    | 0.078     | 10.3         | 0.0442        | 0.0000     | OK     |
| 15 minute winter | SW8     | 11          | 48.026    | 0.105     | 12.9         | 0.0561        | 0.0000     | OK     |
| 15 minute winter | SW9     | 11          | 47.884    | 0.089     | 13.6         | 0.0309        | 0.0000     | OK     |
| 15 minute winter | SW10    | 11          | 47.848    | 0.111     | 14.5         | 0.0405        | 0.0000     | OK     |
| 15 minute winter | SW11    | 11          | 49.118    | 0.018     | 1.5          | 0.0084        | 0.0000     | OK     |
| 15 minute winter | SW12    | 11          | 47.841    | 0.141     | 19.9         | 0.0853        | 0.0000     | OK     |
| 15 minute winter | SW13    | 10          | 48.923    | 0.023     | 1.8          | 0.0110        | 0.0000     | OK     |
| 15 minute winter | SW14    | 10          | 48.780    | 0.030     | 2.9          | 0.0120        | 0.0000     | OK     |
| 15 minute winter | SW15    | 11          | 47.810    | 0.140     | 23.6         | 0.0519        | 0.0000     | OK     |
| 15 minute winter | SW16    | 11          | 47.785    | 0.124     | 23.5         | 0.0352        | 0.0000     | OK     |
| 15 minute winter | SW17    | 11          | 47.725    | 0.143     | 27.0         | 0.0841        | 0.0000     | OK     |
| 15 minute winter | SW18    | 12          | 47.689    | 0.131     | 26.7         | 0.1481        | 0.0000     | OK     |
| 15 minute winter | SW19    | 10          | 49.194    | 0.024     | 1.0          | 0.0094        | 0.0000     | OK     |
| 15 minute winter | SW20    | 10          | 49.171    | 0.051     | 4.1          | 0.0344        | 0.0000     | OK     |
| 15 minute winter | SW21    | 10          | 49.101    | 0.059     | 4.4          | 0.0194        | 0.0000     | OK     |
| 15 minute winter | SW22    | 11          | 49.037    | 0.059     | 8.4          | 0.0845        | 0.0000     | OK     |
| 15 minute winter | SW23    | 10          | 49.195    | 0.025     | 2.1          | 0.0178        | 0.0000     | OK     |
| 15 minute winter | SW24    | 11          | 48.670    | 0.020     | 1.0          | 0.0259        | 0.0000     | OK     |

| Link Event<br>(Upstream Depth) | US Node | Link  | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|-------|---------|---------------|----------------|----------|---------------|--------------------|
| 15 minute summer               | SW1     | 1.000 | SW2     | 0.5           | 0.374          | 0.011    | 0.0086        |                    |
| 15 minute winter               | SW2     | 1.001 | SW3     | 1.4           | 0.713          | 0.009    | 0.0203        |                    |
| 15 minute winter               | SW3     | 1.002 | SW4     | 1.4           | 0.421          | 0.035    | 0.0252        |                    |
| 15 minute winter               | SW4     | 1.003 | SW4A    | 1.7           | 0.491          | 0.044    | 0.0138        |                    |
| 15 minute winter               | SW4A    | 1.004 | SW5     | 1.8           | 0.373          | 0.044    | 0.0368        |                    |
| 15 minute winter               | SW5     | 1.005 | SW6     | 3.2           | 0.385          | 0.080    | 0.0431        |                    |
| 15 minute winter               | SW6     | 1.006 | SW7     | 7.6           | 0.653          | 0.191    | 0.0789        |                    |
| 15 minute winter               | SW7     | 1.007 | SW8     | 10.4          | 0.686          | 0.212    | 0.1088        |                    |
| 15 minute winter               | SW8     | 1.008 | SW9     | 12.9          | 0.767          | 0.411    | 0.2327        |                    |
| 15 minute winter               | SW9     | 1.009 | SW10    | 13.6          | 0.831          | 0.160    | 0.0768        |                    |
| 15 minute winter               | SW10    | 1.010 | SW12    | 14.5          | 0.516          | 0.170    | 0.1780        |                    |
| 15 minute winter               | SW11    | 2.000 | SW12    | 1.5           | 1.263          | 0.030    | 0.0185        |                    |
| 15 minute winter               | SW12    | 1.011 | SW15    | 19.8          | 0.678          | 0.269    | 0.3366        |                    |
| 15 minute winter               | SW13    | 3.000 | SW14    | 1.8           | 0.877          | 0.048    | 0.0069        |                    |
| 15 minute winter               | SW14    | 3.001 | SW15    | 2.8           | 1.178          | 0.081    | 0.0313        |                    |
| 15 minute winter               | SW15    | 1.012 | SW16    | 23.5          | 0.787          | 0.319    | 0.0639        |                    |
| 15 minute winter               | SW16    | 1.013 | SW17    | 23.4          | 0.772          | 0.317    | 0.5391        |                    |
| 15 minute winter               | SW17    | 1.014 | SW18    | 26.7          | 0.856          | 0.364    | 0.1706        |                    |
| 15 minute winter               | SW18    | 1.015 | SW25    | 26.7          | 0.942          | 0.362    | 0.5428        |                    |
| 15 minute winter               | SW19    | 5.000 | SW20    | 1.0           | 0.283          | 0.055    | 0.0177        |                    |
| 15 minute winter               | SW20    | 5.001 | SW21    | 4.0           | 0.687          | 0.225    | 0.0452        |                    |
| 15 minute winter               | SW21    | 5.002 | SW22    | 4.3           | 0.724          | 0.228    | 0.0370        |                    |
| 15 minute winter               | SW22    | 5.003 | SW25    | 8.3           | 1.322          | 0.307    | 0.1030        |                    |
| 15 minute winter               | SW23    | 6.000 | SW22    | 2.1           | 0.536          | 0.058    | 0.0196        |                    |
| 15 minute winter               | SW24    | 4.000 | SW25    | 0.9           | 0.633          | 0.039    | 0.0689        |                    |

**Results for 1 year Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 120 minute winter | SW25    | 92          | 47.613    | 0.150     | 16.1         | 18.4761       | 0.0000     | OK         |
| 60 minute winter  | SW27    | 50          | 47.615    | 0.227     | 16.8         | 0.0702        | 0.0000     | OK         |
| 60 minute winter  | SW28    | 50          | 47.617    | 0.428     | 14.5         | 0.5124        | 0.0000     | OK         |
| 60 minute winter  | SW29    | 50          | 47.617    | 0.448     | 12.0         | 0.5229        | 0.0000     | OK         |
| 60 minute winter  | SW30    | 50          | 47.618    | 0.474     | 9.1          | 0.5732        | 0.0000     | SURCHARGED |
| 60 minute winter  | SW31    | 50          | 47.618    | 0.512     | 7.5          | 0.6472        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW32    | 10          | 48.492    | 0.042     | 2.9          | 0.0263        | 0.0000     | OK         |
| 60 minute winter  | CO1     | 87          | 47.142    | 0.056     | 5.0          | 0.0635        | 0.0000     | OK         |
| 60 minute winter  | CO2     | 87          | 47.109    | 0.053     | 5.0          | 0.0000        | 0.0000     | OK         |

| Link Event (Upstream Depth) | US Node | Link         | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|---------|--------------|---------|---------------|----------------|----------|---------------|--------------------|
| 120 minute winter           | SW25    | 1.016        | SW27    | 12.5          | 0.679          | 0.180    | 0.8753        |                    |
| 60 minute winter            | SW27    | 1.017        | SW28    | 14.1          | 0.770          | 0.187    | 0.6550        |                    |
| 60 minute winter            | SW28    | 1.018        | SW29    | 11.7          | 0.353          | 0.073    | 1.2290        |                    |
| 60 minute winter            | SW29    | 1.019        | SW30    | 8.5           | 0.260          | 0.052    | 1.5876        |                    |
| 60 minute winter            | SW30    | 1.020        | SW31    | 5.1           | 0.145          | 0.031    | 2.2930        |                    |
| 60 minute winter            | SW31    | Hydro-Brake® | CO1     | 5.0           |                |          |               |                    |
| 15 minute winter            | SW32    | 7.000        | SW31    | 2.8           | 0.721          | 0.160    | 0.0426        |                    |
| 60 minute winter            | CO1     | 1.022        | CO2     | 5.0           | 0.573          | 0.069    | 0.0615        | 39.0               |

**Node CO2 Surcharged Outfall**

Overrides Design Area x Depression Storage Area (m<sup>2</sup>) 0 Evapo-transpiration (mm/day) 0  
 Overrides Design Additional Inflow x Depression Storage Depth (mm) 0  
 Applies to 30yr, 100yr+40% CC 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

| Time<br>(mins) | Depth<br>(m) | Time<br>(mins) | Depth<br>(m) | Time<br>(mins) | Depth<br>(m) | Time<br>(mins) | Depth<br>(m) | Time<br>(mins) | Depth<br>(m) |
|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|
| 0              | 1.400        | 300            | 1.400        | 600            | 1.400        | 900            | 1.400        | 1200           | 1.400        |
| 60             | 1.400        | 360            | 1.400        | 660            | 1.400        | 960            | 1.400        | 1260           | 1.400        |
| 120            | 1.400        | 420            | 1.400        | 720            | 1.400        | 1020           | 1.400        | 1320           | 1.400        |
| 180            | 1.400        | 480            | 1.400        | 780            | 1.400        | 1080           | 1.400        | 1380           | 1.400        |
| 240            | 1.400        | 540            | 1.400        | 840            | 1.400        | 1140           | 1.400        | 1440           | 1.400        |

**Results for 30 year Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event         | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|--------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute winter   | SW1     | 10          | 49.101    | 0.026     | 1.2          | 0.0090        | 0.0000     | OK         |
| 15 minute winter   | SW2     | 10          | 49.049    | 0.023     | 3.5          | 0.0097        | 0.0000     | OK         |
| 1440 minute winter | SW3     | 1050        | 48.519    | 0.351     | 0.2          | 0.0994        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW4     | 1050        | 48.519    | 0.396     | 0.2          | 0.1276        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW4A    | 1050        | 48.519    | 0.419     | 0.2          | 0.1186        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW5     | 1050        | 48.519    | 0.464     | 0.4          | 0.2060        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW6     | 1050        | 48.519    | 0.494     | 0.9          | 0.3739        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW7     | 1050        | 48.519    | 0.534     | 1.2          | 0.3033        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW8     | 1050        | 48.519    | 0.598     | 1.5          | 0.3193        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW9     | 1050        | 48.519    | 0.724     | 1.5          | 0.2512        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW10    | 1050        | 48.519    | 0.782     | 1.5          | 0.2862        | 0.0000     | SURCHARGED |
| 15 minute winter   | SW11    | 10          | 49.128    | 0.028     | 3.8          | 0.0130        | 0.0000     | OK         |
| 1440 minute winter | SW12    | 1050        | 48.519    | 0.819     | 2.1          | 0.4955        | 0.0000     | SURCHARGED |
| 15 minute winter   | SW13    | 10          | 48.936    | 0.036     | 4.4          | 0.0179        | 0.0000     | OK         |
| 15 minute winter   | SW14    | 10          | 48.797    | 0.047     | 7.0          | 0.0191        | 0.0000     | OK         |
| 1440 minute winter | SW15    | 1050        | 48.519    | 0.849     | 2.4          | 0.3150        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW16    | 1050        | 48.519    | 0.858     | 2.3          | 0.2428        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW17    | 1050        | 48.519    | 0.937     | 2.7          | 0.5520        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW18    | 1050        | 48.519    | 0.961     | 2.6          | 1.0870        | 0.0000     | SURCHARGED |
| 15 minute winter   | SW19    | 10          | 49.207    | 0.037     | 2.3          | 0.0144        | 0.0000     | OK         |
| 15 minute winter   | SW20    | 10          | 49.209    | 0.089     | 9.8          | 0.0596        | 0.0000     | OK         |
| 15 minute winter   | SW21    | 10          | 49.141    | 0.099     | 10.6         | 0.0329        | 0.0000     | OK         |
| 15 minute winter   | SW22    | 10          | 49.082    | 0.104     | 20.7         | 0.1491        | 0.0000     | OK         |
| 15 minute winter   | SW23    | 10          | 49.209    | 0.039     | 5.2          | 0.0278        | 0.0000     | OK         |
| 15 minute winter   | SW24    | 11          | 48.682    | 0.032     | 2.3          | 0.0402        | 0.0000     | OK         |

| Link Event<br>(Upstream Depth) | US Node | Link  | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|-------|---------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter               | SW1     | 1.000 | SW2     | 1.2           | 0.497          | 0.027    | 0.0166        |                    |
| 15 minute winter               | SW2     | 1.001 | SW3     | 3.4           | 0.894          | 0.022    | 0.0391        |                    |
| 1440 minute winter             | SW3     | 1.002 | SW4     | 0.2           | 0.258          | 0.005    | 0.2993        |                    |
| 1440 minute winter             | SW4     | 1.003 | SW4A    | 0.2           | 0.259          | 0.005    | 0.1534        |                    |
| 1440 minute winter             | SW4A    | 1.004 | SW5     | 0.2           | 0.204          | 0.005    | 0.3032        |                    |
| 1440 minute winter             | SW5     | 1.005 | SW6     | 0.4           | 0.240          | 0.010    | 0.1962        |                    |
| 1440 minute winter             | SW6     | 1.006 | SW7     | 0.9           | 0.395          | 0.023    | 0.2678        |                    |
| 1440 minute winter             | SW7     | 1.007 | SW8     | 1.2           | 0.404          | 0.024    | 0.2856        |                    |
| 1440 minute winter             | SW8     | 1.008 | SW9     | 1.4           | 0.414          | 0.046    | 0.5496        |                    |
| 1440 minute winter             | SW9     | 1.009 | SW10    | 1.4           | 0.415          | 0.017    | 0.3304        |                    |
| 1440 minute winter             | SW10    | 1.010 | SW12    | 1.4           | 0.230          | 0.017    | 0.4465        |                    |
| 15 minute winter               | SW11    | 2.000 | SW12    | 3.8           | 1.523          | 0.075    | 0.1014        |                    |
| 1440 minute winter             | SW12    | 1.011 | SW15    | 2.0           | 0.361          | 0.027    | 0.8107        |                    |
| 15 minute winter               | SW13    | 3.000 | SW14    | 4.4           | 1.096          | 0.116    | 0.0136        |                    |
| 15 minute winter               | SW14    | 3.001 | SW15    | 6.9           | 1.507          | 0.197    | 0.0594        |                    |
| 1440 minute winter             | SW15    | 1.012 | SW16    | 2.3           | 0.412          | 0.031    | 0.1505        |                    |
| 1440 minute winter             | SW16    | 1.013 | SW17    | 2.3           | 0.359          | 0.031    | 1.2514        |                    |
| 1440 minute winter             | SW17    | 1.014 | SW18    | 2.6           | 0.375          | 0.036    | 0.3851        |                    |
| 1440 minute winter             | SW18    | 1.015 | SW25    | 2.6           | 0.318          | 0.035    | 1.3460        |                    |
| 15 minute winter               | SW19    | 5.000 | SW20    | 2.2           | 0.330          | 0.125    | 0.0352        |                    |
| 15 minute winter               | SW20    | 5.001 | SW21    | 9.7           | 0.840          | 0.549    | 0.0899        |                    |
| 15 minute winter               | SW21    | 5.002 | SW22    | 10.5          | 0.855          | 0.558    | 0.0764        |                    |
| 15 minute winter               | SW22    | 5.003 | SW25    | 20.3          | 1.622          | 0.751    | 0.2051        |                    |
| 15 minute winter               | SW23    | 6.000 | SW22    | 5.2           | 0.651          | 0.144    | 0.0395        |                    |
| 15 minute winter               | SW24    | 4.000 | SW25    | 2.2           | 0.826          | 0.096    | 0.1301        |                    |

**Results for 30 year Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event         | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|--------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 1440 minute winter | SW25    | 1050        | 48.519    | 1.056     | 5.1          | 130.1330      | 0.0000     | SURCHARGED |
| 1440 minute winter | SW27    | 1050        | 48.519    | 1.131     | 1.6          | 0.3495        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW28    | 1050        | 48.519    | 1.330     | 1.6          | 1.5906        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW29    | 1050        | 48.519    | 1.350     | 1.6          | 1.5740        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW30    | 1050        | 48.519    | 1.376     | 1.6          | 1.6621        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW31    | 1050        | 48.519    | 1.413     | 1.8          | 1.7873        | 0.0000     | SURCHARGED |
| 1440 minute winter | SW32    | 1050        | 48.519    | 0.069     | 0.3          | 0.0431        | 0.0000     | OK         |
| 1440 minute winter | CO1     | 1050        | 48.456    | 1.370     | 1.8          | 1.5495        | 0.0000     | SURCHARGED |
| 15 minute summer   | CO2     | 1           | 48.456    | 1.400     | 0.0          | 0.0000        | 0.0000     | OK         |

| Link Event<br>(Upstream Depth) | US Node | Link         | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|--------------|---------|---------------|----------------|----------|---------------|--------------------|
| 1440 minute winter             | SW25    | 1.016        | SW27    | 1.6           | 0.322          | 0.023    | 1.3459        |                    |
| 1440 minute winter             | SW27    | 1.017        | SW28    | 1.6           | 0.349          | 0.021    | 0.7356        |                    |
| 1440 minute winter             | SW28    | 1.018        | SW29    | 1.6           | 0.161          | 0.010    | 1.2403        |                    |
| 1440 minute winter             | SW29    | 1.019        | SW30    | 1.6           | 0.162          | 0.010    | 1.5884        |                    |
| 1440 minute winter             | SW30    | 1.020        | SW31    | 1.6           | 0.048          | 0.010    | 2.2930        |                    |
| 1440 minute winter             | SW31    | Hydro-Brake® | CO1     | 1.8           |                |          |               |                    |
| 1440 minute winter             | SW32    | 7.000        | SW31    | 0.3           | 0.377          | 0.017    | 0.1382        |                    |
| 1440 minute winter             | CO1     | 1.022        | CO2     | 1.8           | 0.025          | 0.024    | 0.4965        | 35.3               |

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute winter  | SW1     | 10          | 49.110    | 0.035     | 2.1          | 0.0119        | 0.0000     | OK         |
| 15 minute winter  | SW2     | 10          | 49.057    | 0.031     | 6.3          | 0.0129        | 0.0000     | OK         |
| 720 minute winter | SW3     | 540         | 49.039    | 0.871     | 0.5          | 0.2464        | 0.0000     | SURCHARGED |
| 720 minute winter | SW4     | 540         | 49.039    | 0.916     | 0.5          | 0.2949        | 0.0000     | SURCHARGED |
| 720 minute winter | SW4A    | 540         | 49.039    | 0.939     | 0.5          | 0.2657        | 0.0000     | SURCHARGED |
| 720 minute winter | SW5     | 540         | 49.039    | 0.984     | 0.9          | 0.4368        | 0.0000     | SURCHARGED |
| 720 minute winter | SW6     | 540         | 49.039    | 1.014     | 2.4          | 0.7674        | 0.0000     | SURCHARGED |
| 720 minute winter | SW7     | 540         | 49.039    | 1.054     | 3.3          | 0.5985        | 0.0000     | SURCHARGED |
| 720 minute winter | SW8     | 540         | 49.039    | 1.118     | 4.1          | 0.5969        | 0.0000     | SURCHARGED |
| 720 minute winter | SW9     | 540         | 49.039    | 1.244     | 4.3          | 0.4315        | 0.0000     | SURCHARGED |
| 720 minute winter | SW10    | 540         | 49.039    | 1.302     | 4.5          | 0.4764        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW11    | 10          | 49.137    | 0.037     | 6.8          | 0.0174        | 0.0000     | OK         |
| 720 minute winter | SW12    | 540         | 49.039    | 1.339     | 6.5          | 0.8098        | 0.0000     | SURCHARGED |
| 720 minute winter | SW13    | 540         | 49.039    | 0.139     | 0.6          | 0.0679        | 0.0000     | OK         |
| 720 minute winter | SW14    | 540         | 49.039    | 0.289     | 1.0          | 0.1174        | 0.0000     | SURCHARGED |
| 720 minute winter | SW15    | 540         | 49.038    | 1.368     | 7.7          | 0.5077        | 0.0000     | SURCHARGED |
| 720 minute winter | SW16    | 540         | 49.038    | 1.377     | 7.6          | 0.3898        | 0.0000     | SURCHARGED |
| 720 minute winter | SW17    | 540         | 49.038    | 1.456     | 8.9          | 0.8578        | 0.0000     | SURCHARGED |
| 720 minute winter | SW18    | 540         | 49.038    | 1.480     | 8.8          | 1.6741        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW19    | 12          | 49.493    | 0.323     | 4.2          | 0.1277        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW20    | 12          | 49.490    | 0.370     | 16.2         | 0.2480        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW21    | 12          | 49.416    | 0.374     | 16.4         | 0.1240        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW22    | 12          | 49.339    | 0.361     | 31.9         | 0.5157        | 0.0000     | SURCHARGED |
| 15 minute winter  | SW23    | 12          | 49.353    | 0.183     | 9.5          | 0.1322        | 0.0000     | SURCHARGED |
| 720 minute winter | SW24    | 540         | 49.038    | 0.388     | 0.5          | 0.4951        | 0.0000     | SURCHARGED |

| Link Event<br>(Upstream Depth) | US Node | Link  | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|-------|---------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter               | SW1     | 1.000 | SW2     | 2.1           | 0.583          | 0.048    | 0.0249        |                    |
| 15 minute winter               | SW2     | 1.001 | SW3     | 6.2           | 1.055          | 0.040    | 0.2104        |                    |
| 720 minute winter              | SW3     | 1.002 | SW4     | 0.4           | 0.301          | 0.010    | 0.2993        |                    |
| 720 minute winter              | SW4     | 1.003 | SW4A    | 0.5           | 0.339          | 0.013    | 0.1534        |                    |
| 720 minute winter              | SW4A    | 1.004 | SW5     | 0.5           | 0.279          | 0.012    | 0.3032        |                    |
| 720 minute winter              | SW5     | 1.005 | SW6     | 0.9           | 0.294          | 0.022    | 0.1962        |                    |
| 720 minute winter              | SW6     | 1.006 | SW7     | 2.3           | 0.480          | 0.058    | 0.2678        |                    |
| 720 minute winter              | SW7     | 1.007 | SW8     | 3.2           | 0.510          | 0.065    | 0.2856        |                    |
| 720 minute winter              | SW8     | 1.008 | SW9     | 4.0           | 0.510          | 0.127    | 0.5496        |                    |
| 720 minute winter              | SW9     | 1.009 | SW10    | 4.2           | 0.508          | 0.049    | 0.3304        |                    |
| 720 minute winter              | SW10    | 1.010 | SW12    | 4.4           | 0.290          | 0.052    | 0.4465        |                    |
| 15 minute winter               | SW11    | 2.000 | SW12    | 6.8           | 1.470          | 0.134    | 0.1632        |                    |
| 720 minute winter              | SW12    | 1.011 | SW15    | 6.3           | 0.425          | 0.086    | 0.8107        |                    |
| 720 minute winter              | SW13    | 3.000 | SW14    | 0.6           | 0.659          | 0.016    | 0.0586        |                    |
| 720 minute winter              | SW14    | 3.001 | SW15    | 1.0           | 0.841          | 0.029    | 0.2284        |                    |
| 720 minute winter              | SW15    | 1.012 | SW16    | 7.6           | 0.473          | 0.103    | 0.1505        |                    |
| 720 minute winter              | SW16    | 1.013 | SW17    | 7.5           | 0.408          | 0.101    | 1.2514        |                    |
| 720 minute winter              | SW17    | 1.014 | SW18    | 8.8           | 0.444          | 0.119    | 0.3851        |                    |
| 720 minute winter              | SW18    | 1.015 | SW25    | 8.6           | 0.460          | 0.117    | 1.3460        |                    |
| 15 minute winter               | SW19    | 5.000 | SW20    | 4.1           | 0.330          | 0.231    | 0.0876        |                    |
| 15 minute winter               | SW20    | 5.001 | SW21    | 14.9          | 0.893          | 0.842    | 0.1365        |                    |
| 15 minute winter               | SW21    | 5.002 | SW22    | 16.1          | 0.916          | 0.856    | 0.1096        |                    |
| 15 minute winter               | SW22    | 5.003 | SW25    | 31.2          | 1.773          | 1.152    | 0.2871        |                    |
| 15 minute winter               | SW23    | 6.000 | SW22    | 8.8           | 0.760          | 0.245    | 0.0836        |                    |
| 720 minute winter              | SW24    | 4.000 | SW25    | 0.3           | 0.401          | 0.013    | 0.8565        |                    |

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.14%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 720 minute winter | SW25    | 540         | 49.038    | 1.575     | 15.9         | 194.0932      | 0.0000     | SURCHARGED |
| 720 minute winter | SW27    | 540         | 49.038    | 1.650     | 4.8          | 0.5097        | 0.0000     | SURCHARGED |
| 720 minute winter | SW28    | 540         | 49.037    | 1.848     | 4.8          | 2.2107        | 0.0000     | SURCHARGED |
| 720 minute winter | SW29    | 540         | 49.037    | 1.868     | 4.8          | 2.1785        | 0.0000     | SURCHARGED |
| 720 minute winter | SW30    | 540         | 49.037    | 1.894     | 4.9          | 2.2884        | 0.0000     | SURCHARGED |
| 720 minute winter | SW31    | 540         | 49.037    | 1.931     | 5.1          | 2.4431        | 0.0000     | SURCHARGED |
| 720 minute winter | SW32    | 540         | 49.037    | 0.587     | 1.0          | 0.3677        | 0.0000     | SURCHARGED |
| 120 minute winter | CO1     | 76          | 48.457    | 1.371     | 5.0          | 1.5509        | 0.0000     | SURCHARGED |
| 15 minute summer  | CO2     | 1           | 48.456    | 1.400     | 0.0          | 0.0000        | 0.0000     | OK         |

| Link Event<br>(Upstream Depth) | US Node | Link         | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|--------------------------------|---------|--------------|---------|---------------|----------------|----------|---------------|--------------------|
| 720 minute winter              | SW25    | 1.016        | SW27    | 4.8           | 0.478          | 0.069    | 1.3459        |                    |
| 720 minute winter              | SW27    | 1.017        | SW28    | 4.8           | 0.458          | 0.063    | 0.7356        |                    |
| 720 minute winter              | SW28    | 1.018        | SW29    | 4.8           | 0.190          | 0.030    | 1.2403        |                    |
| 720 minute winter              | SW29    | 1.019        | SW30    | 4.9           | 0.067          | 0.030    | 1.5884        |                    |
| 720 minute winter              | SW30    | 1.020        | SW31    | 4.9           | 0.031          | 0.030    | 2.2930        |                    |
| 720 minute winter              | SW31    | Hydro-Brake® | CO1     | 5.0           |                |          |               |                    |
| 720 minute winter              | SW32    | 7.000        | SW31    | 1.0           | 0.538          | 0.056    | 0.1908        |                    |
| 120 minute winter              | CO1     | 1.022        | CO2     | 5.0           | 0.070          | 0.069    | 0.4965        | 57.9               |

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