Drainage Technical Note

Redbank NT02 Development

for

Far East Consortium International Ltd



12 / 09 / 2025

COMPLEX CHALLENGES ...
MADE SIMPLE

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1.0 INTRODUCTION

1.1 Purpose of the Report

This drainage technical note has been prepared to present the principles of the proposed drainage design for the Redbank NT02 Development at Dantzic Street, Greater Manchester. It describes the strategy for the disposal of surface water run-off and foul flows associated with the new residential led mixed-use scheme.

Plot NT02 forms the first phase of the wider development which also comprises plots NT03 and NT04 and will provide circa 1,551 new homes alongside a clubhouse, commercial uses, S278 highway improvements, public realm and landscaping. The scheme was granted planning permission in August 2023 (Ref: 136814/FO/2023).

The document should be read in conjunction with the following reports and drawings.

79268-VICN-WSP-FRA-001	Flood Risk Assessment & Drainage Strategy Report
RDB-WSP-00-XX-DR-CV-00101	Application 5 Detailed Drainage Strategy
RDB-ROC-2B-XX-DR-C-83-0500	FW & SW Drainage General Arrangement Block 2B
RDB-ROC-2B-XX-DR-C-83-0501	FW & SW Drainage Construction Details Sheet 1
RDB-ROC-2B-XX-DR-C-83-0502	FW & SW Drainage Construction Details Sheet 2
RDB-ROC-2B-XX-DR-C-83-0503	FW & SW Drainage Construction Details Sheet 3
RDB-ROC-2B-XX-DR-C-83-0504	FW & SW Drainage Construction Details Sheet 4
RDB-ROC-2B-XX-DR-C-83-0505	FW & SW Drainage Construction Details Sheet 5
RDB-ROC-00-XX-SK-C-83-0500	SW Drainage Catchment Plan
RDB-ROC-XX-XX-DR-C-83-0500	S104 Location Plan
RDB-ROC-XX-XX-DR-C-83-0501	S104 General Arrangement
RDB-ROC-XX-XX-DR-C-83-0502	S104 Long Section & Schedules
RDB-ROC-XX-XX-DR-C-83-0503	S104 Construction Details Sheet 1
RDB-ROC-XX-XX-DR-C-83-0504	S104 Construction Details Sheet 2

1.2 Proposed Development

This Drainage Technical Note has been produced by RoC on behalf of the Far East Consortium International Ltd in respect of a proposed residential led mixed-use development off Dantzic Street, Greater Manchester.

The scheme comprises new build residential apartments and townhouses, in a number of mid-rise and high-rise buildings ranging in height from 8 to 34 storeys, plus associated amenity and commercial space, external communal terrace, plant space and undercroft parking at ground floor.

The first phase of development, to which this report primarily relates, is defined as Plot NT02 and is located to the west of the overall site, adjacent to the ongoing Victoria Riverside scheme.

The overall site area, excluding S278 works, extends to around 2.1ha with the NT02 plot comprising approximately 0.32ha.

The site can be accessed from both Dantzic Street to the north and Dalton Street to the east.

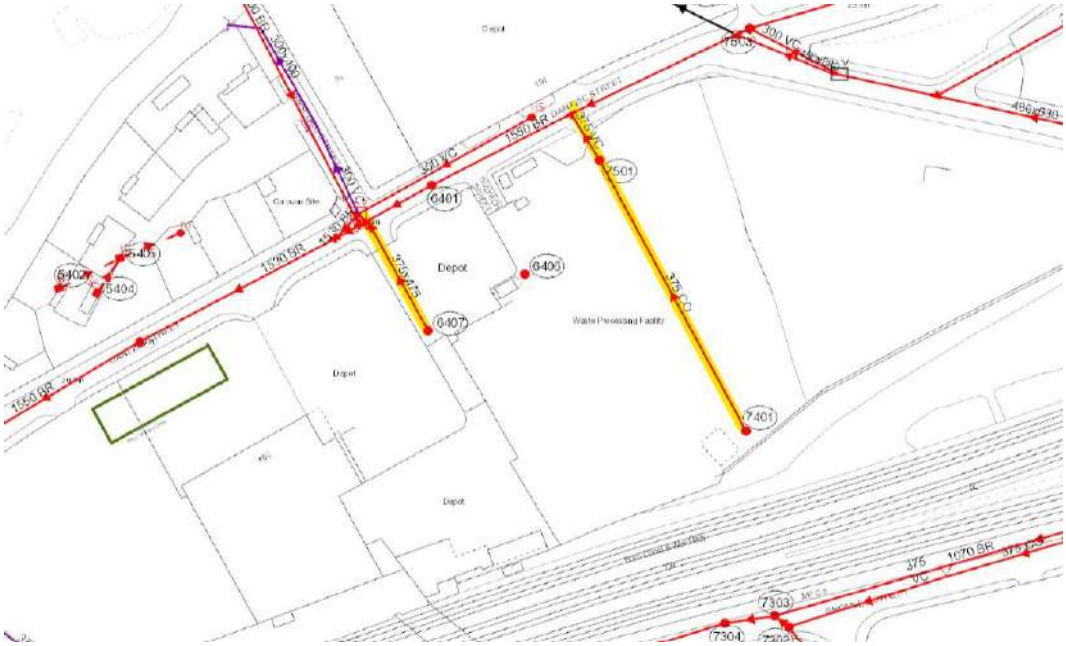
The table below provides key site information.

Site Name	Plot NT02-04 Redbank
Location	Dantzic Street, Greater Manchester, M4 4DD
Grid Ref	389565E, 264612N
Site Area	2.1ha
Lead Local Flood Authority	Manchester City Council
Local Planning Authority	Manchester City Council
Environment Agency Area	Greater Manchester, Merseyside, Cheshire
Sewerage Undertaker	United Utilities

2.0 DRAINAGE STRATEGY

2.1 Existing Drainage

United Utilities records indicate a number of sewers within and in the vicinity if the site.



Two separate 375mm combined sewers, both flowing from south to north, are located within the development boundary. These have been subject to a S116 abandonment application with United Utilities under an Enabling Works phase and will be removed prior to commencement of the main development phase.

A 1550 brick sewer runs along Dantzic Street which forms the northern boundary. A CSO shown at the junction with Warford Street which flows northward via a 300mm connection and discharges to the River Irk.

2.2 Private Drainage

Limited information pertaining to the existing drainage within the site boundary is available. However, any existing private drainage present is to be grubbed out under the Enabling Works phase to facilitate the proposed development.

2.3 Watercourses & Other Features

The River Irk runs broadly parallel to Dantzic Street to the north of the site and is classed as a main river by the EA. There are no known ordinary watercourses within the immediate vicinity of the site. The Rochdale Canal is located over 950m to the south of the site.

2.4 Geology & Hydrogeology

The following information has been extracted from the ARUP Ground Investigation Interpretative Report (Ref: VNIF-ARP-ZZ-YYY-RP-CG-0009, January 2022).

With specific reference to the geology, the report states: *'The solid geology varies from east to west across the site, with the Chester Pebble Beds Formation in the west, Manchester Marls Formation in the centre of the site and the Collyhurst Sandstone Formation in the north-east.'*

RoC undertook a Phase 2 Site Investigation for the development site, the findings of which are presented in report 4328-ROC-ZZ-XX-RP-ES-P2-101. A summary of the findings is provided below:

- Plot NT02: Made ground of thickness 0.2m to 1.7m characterised as 'demolition fill' overlying Devensian (Glacial) Till upon solid geology of Chester Formation layered upon the Manchester Marls Formation.
- Plot NT03: Made ground of thickness 0.6m to 2.0m described as a 'demolition fill' overlying Devensian Till up to 7.65mbgl which in turn is upon the Chester Formation and Manchester Marls Formation.
- Plot NT04: Made ground across the site of thickness 1.0m to 3.0m overlying Devensian Till that exists up to 10mbgl and sits upon the Manchester Marls Formation

The ARUP report indicates the following aquifer designations:

- The superficial deposits are classed as a Secondary A Aquifer
- The Manchester Marls Formation is classed as a Secondary B Aquifer
- Chester Pebble Beds Formation and Collyhurst Sandstone Formation are classed as Principal Aquifers

There are three registered groundwater abstractions within 500m of the site.

- Packaging Products Ltd, Collyhurst; 270m north-east; For General Cooling
- Derby Brewery, Cheetham; 400m north-west; For General Cooling
- Derby Brewery, Cheetham; 400m north-west; For Process Water

Groundwater was encountered at various depths across the proposed site at a depth of around 4.65mbgl at RBH201 which is located at the intersection of Dantzic Street and Dulwich Street.

Groundwater was also observed at 12.52mbgl at RBH210, located at Dulwich Street's interface with Dalton Street.

2.5 Surface Water Drainage

2.5.1. Surface Water Discharge Rate

Discharge rates for the development site are based on consultation between ARUP and the LLFA as part of the Victoria North Housing Infrastructure Fund (HIF) Outline Consent (133143/VO/2022).

This HIF drainage strategy proposed a new surface water drainage system which ultimately discharges into the River Irk via a new outfall at a rate not exceeding 22l/s/ha. A copy of these indicative proposals, with specific reference to the Redbank development site, can be found in Appendix D.

This discharge rate was subsequently used by WSP when preparing the drainage strategy which accompanied application 136814/FO/2023. A copy of the WSP strategy for the NT02-04 site is provided in Appendix E.

It should be noted that the discharge figures quoted on the above drawings are indicative only and based on assumed impermeable drained areas. The notable figure for setting discharge rates for the development is the agreed 22 l/s/ha restriction for storms events up to an including the 100 year return period with an allowance for climate change in line with the NPPF.

Based on the above, the following discharge rates are proposed across the NT02-04 development.

Plot	Gross Area (ha)	Drained Area (ha)	Discharge (l/s)
NT02	0.32	0.32	7.04
NT03	0.81	0.73	16.06
NT04	1.04	0.94	20.68

It is intended that both NT02 and NT03 will utilise the same outfall and flow control device, therefore the total flow restriction serving this part of the development will be 23.1 l/s.

The NT04 plot will have a separate outfall and flow control.

2.6 Methods of Surface Water Management

There are three methods that have been reviewed for the management and discharge of surface water which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed.

- Discharge via infiltration;
- Discharge to watercourse;
- Discharge to public sewerage system.

Discharge via Infiltration
Based on the previous site investigations, including the Phase 1 and Phase 2 Geo-Environmental work undertaken by RoC, the encountered ground conditions (as described in Section 2.4 above) at the site are considered to preclude the use of infiltration-based drainage solutions.

In particular, Plot NT02 has strong evidence of contamination that was observed across numerous exploratory boreholes and the site generally is underlain by significant depths of clay down to 7.5mbgl.

Taking the above into consideration, the disposal of surface water from the development by soakaway or other infiltration-based SuDS proposal has been discounted.

Discharge to Watercourse or other Water Feature
The nearest available water feature to the site is the River Irk. Both the drainage strategy developed by ARUP under consent 133143/VO/2022 and that developed by WSP under 136814/FO/2023, propose a new adoptable surface water carrier drain along Dalton Street and Dantzic Street which discharges to the River Irk. The proposal for this new adoptable carrier drain has been discussed and agreed in principle with United Utilities, the Environment Agency and the LLFA.

A S104 application is to be submitted to United Utilities for formal approval as part of the Stage 4 design process along with the Flood Risk Consent application to the EA for the River Outfall. A copy of the current S104 design drawings is included in Appendix O

Discharge to Public Sewer
As noted in Section 2., all public sewers within and in the vicinity of the site are combined. On the basis that a direct connection to the River Irk is feasible, and no existing surface water sewer is available for discharge, this option has not been considered further.

2.7 SuDs Measures

Current policy and best practice encourage the use of Sustainable Drainage Systems (SuDS) and in particular, infiltration systems.

The Environment Agency recommends that surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

This approach involves using a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site.

This can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements.

An assessment of potential SuDS measures has been undertaken based on the site investigation data and the constraints of the proposed development site; this is presented below.

SUDS MATRIX		
SUDS Technique	**Description**	**Commentary**
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds.	Considered not viable due to urban nature of site
Ponds	Depressions used for storing and treating water. They have a permanent pool and bankside emergent and aquatic vegetation.	Considered not viable due to urban nature of site
Bioretention Areas	Vegetated areas for collecting and treating water before discharge downstream, or to the ground via infiltration.	Considered not viable due to landscaping surrounding the site containing existing trees with root protection zones.
Green Roofs	Vegetation roofs that reduce run off volume and rate.	Considered not viable due to siphonic roof drainage
Permeable Pavements	Allow inflow of rainwater into underlying construction / soil.	Ground conditions preclude infiltration. However, permeable pavements to be utilised across the site to drain podium areas, pedestrian areas and Dulwich Street with conveyance to the below ground attenuation systems.
Swales Shallow	Vegetated channels that conduct and / or retain water (and can permit infiltration when un-lined). The vegetation filters particulates.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Infiltration Basins	Depressions that store and dispose of water via infiltration.	Considered not viable due to urban nature of site and anticipated ground conditions
Filter Strips	Vegetated steps of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and other particulates.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Detention Basin	Dry depressions designed to store water for a specified retention time.	Considered not viable due to urban nature of site and constraints imposed by existing landscaping
Infiltration Trenches	As filters drain, but allowing infiltration through trench base and sides.	Considered not viable due to anticipated ground conditions and constraints imposed by existing landscaping
Filter Drain	Linear drains / trenches filled with a permeable material, often with a perforated pipe in the base of the trench.	Considered not viable due to anticipated ground conditions and constraints imposed by existing landscaping
Sand Filters	Treatment devices using sand beds as filter media.	Considered not viable due to urban nature of site
Soakaways	Sub-surface structures that store and dispose of water via infiltration.	Considered not viable due to anticipated ground conditions
Pipes, Subsurface Storage	Conduits and their accessories as conveyance measures and / or storage. Water quality can be targeted using sedimentation and filter media.	Incorporated as part of drainage design for conveyance and volumetric storage of attenuation volumes
Silt Removal Devices	Manhole and / or proprietary devices to remove silt.	Incorporated to help meet Water Quality requirements prior to discharge
Based on 'The SUDS Manual' CIRIA Guidance		

2.8 Surface Water Treatment

The table below indicates the pollution hazard indices for each of the three distinct areas within the site which is based on Table 26.2 from the SuDS Manual.

Pollution Hazard Indices				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Residential Roofs	Low	0.2	0.2	0.05
Access Roads	Low	0.5	0.4	0.4
Footways	Low	0.5	0.4	0.4

The use of permeable pavements alongside catchpits and a hydrodynamic separator are considered sufficient to mitigate the above prior to discharge to the River Irk.

2.9 Performance Criteria

The surface water drainage network has been designed to satisfy the following performance criteria.

- No surcharging for the critical 2-year return period storm event;
- No flooding of the network for the critical 30-year return period storm event;
- No significant surface flooding for the critical 100-year plus climate change return period due to potential difficulties in retaining any flood water within the site.

2.10 Hydraulic design

Microdrainage software by Innovyze has been used to design the proposed piped network and attenuation storage.

The system has been designed to ensure the performance criteria identified above are satisfied and that all surface water is retained below ground for storm events up to and including the 100-year return period plus climate change.

Whilst it is considered acceptable in planning terms to permit some surface flooding for events beyond the 30-year return period, it was considered impracticable to allow significant areas of flooding due to the level change across the site and difficulty in retaining it on site.

A copy of the calculations are provided in Appendix G.

This demonstrates that the surface water drainage system is able to operate satisfactorily for all return periods up to the 100 year + climate change return period without any surface flooding.

2.11 Surcharged Outfall

In addition to the above, the drainage system has been designed to ensure it operates satisfactorily when the outfall is surcharged

United Utilities requirements for new outfalls into watercourses is that they should be set at a level of 300mm above the 30 year river level however, this is not feasible due to the level of the river in relation to the site.

The 30-year river level, taken from the FEC Baseline plus NT02 to NT04 model and is 30.40mAOD and 100-year +35% level around 30.88m (see extract below). The currently proposed outfall level

is 27.25mAOD which is a similar level as the outfall which has been installed to serve the adjacent Victoria Riverside development.

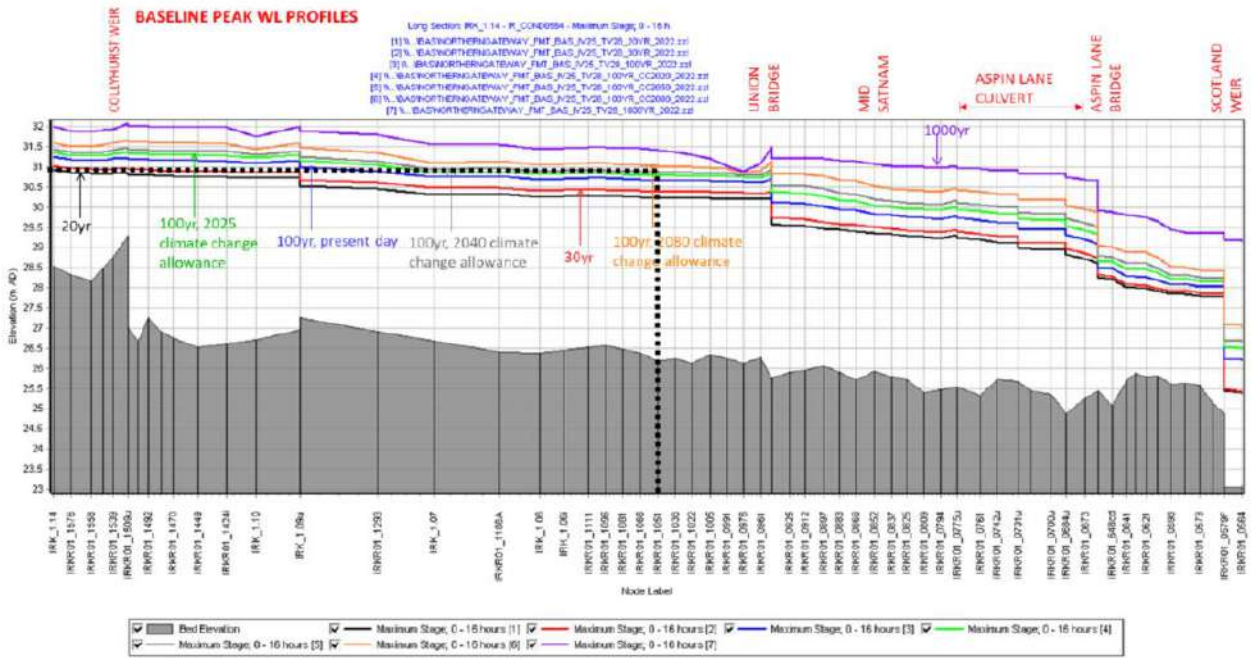


Figure 38: Long section from the 2022 Baseline model, illustrating maximum water level for a range of return periods, run using the 2022 hydrology

Based on the above, the proposed outfall is below the 30-year river level and therefore the drainage system has been checked to ensure that this impact is recognised within the design through additional attenuation where necessary.

A check has also been made against the 100year +35% level to ensure that no flooding to buildings or property occur.

Calculations for these scenarios are provided in Appendix H & J.

Flooding is shown at the outfall with the River Irk, due to the surcharge level being higher than the proposed cover levels however, the drainage system on-site is shown to still operate satisfactorily without any flooding occurring.

3.0 FOUL WATER DRAINAGE

It is proposed to install a new foul drainage system to serve the proposed development.

The foul water system has been designed in accordance with the current Building Regulations, BS EN:752 'Drainage and Sewer Systems Outside Buildings', the Local Authority Building Control specifications and requirements, Sewerage Sector Guidance (Appendix C) and the Civil Engineering Specification for the Water Industry

3.1 Foul Water Capacity

WSP consulted with United Utilities regarding foul water capacity as part of the drainage strategy developed under consent 136814/FO/2023.It is understood that they did not raise any concerns with the discharge of foul water from the development to the existing combined sewer network.

3.2 Point of Connection

The existing combined sewer within Dantzic street is of brick construction and sited at a depth of around 5.85m. To avoid installing a new connection to this sewer, the drainage system will utilise the existing 375x475 combined sewer which is located within the site and is being partially abandoned under the enabling works contract.

This connection will be subject to a S106 application with United Utilities at the appropriate time.

4.0 PLANNING CONDITION DISCHARGE

This section of the report has been prepared to support the discharge of the pre-commencement drainage related planning conditions associated with planning consent 136814/FO/2023.

Each relevant condition is outlined below with the appropriate RoC response to each specific request below in blue.

Condition 26

Notwithstanding the details submitted on the ES Volume 4 Appendix V Flood Risk Assessment and Drainage Strategy prepared by WSP received by the City Council, as Local Planning Authority, on the 13 July 2023, (a) a Construction Phase of the development shall not commence until a scheme for the drainage of surface water from that phase of the new development shall be submitted for approval in writing by the City Council as the Local Planning Authority. This shall include:

- A finalised drainage layout showing all components, outfalls, levels and connectivity.
  Refer to RoC drainage General Arrangement drawing for NT02 in Appendix K

- Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable.
  As noted in Section 2.7, there are limited opportunities for green SuDS components and infiltration is not feasible due to the ground conditions. Notwithstanding, permeable pavements have been employed across the site which will be used as a first stage of surface water run-off treatment and attenuation.

- Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates with the aim of reducing to the Greenfield runoff rates, as the site is located within Conurbation Core Critical Drainage Area;
  Surface water discharge rates are presented in Section 2.5.1. Plots NT02 and NT03 will utilise the same outfall which will have a combined discharge restriction of 23.1 l/s. This is based on the agreed 22 l/s/ha rate that was agreed at planning stage with the LLFA and Environment Agency.

- An existing and proposed impermeable areas drawing to accompany all discharge rate calculations.
  Existing impermeable areas drawing is irrelevant as surface water discharge rates have already been agreed with the LLFA as part of the planning process. A proposed impermeable areas drawing, which has been used as the basis for the surface water drainage calculations, is contained in Appendix K

- Breakdown of discharge rate per plot

Surface water discharge rates are presented in Section 2.5.1. Plots NT02 and NT03 will utilise the same outfall which will have a combined discharge restriction of 23.1 l/s. This is based on the agreed 22 l/s/ha rate that was agreed at planning stage with the LLFA and Environment Agency.

- Runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonable practicable to the greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;
  It is simply not practicable to comply with this criterion within the constraints of the site as there is no space available for any secondary storage and a brownfield discharge rate has been agreed with the LLFA. It is also not possible to accurately calculate the pre-development brownfield discharge volume given the site has been largely undeveloped for a number of years and a survey of the existing on-site drainage systems was largely unsuccessful due to blockages and access difficulties.

  Notwithstanding, as the site discharge has been restricted to a level well below the pre-development rate, the post development run-off volume will be lower than the pre-development scenario.

- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for 45% climate change;
  Refer to section 2.10 and 2.11 above along with the associated Microdrainage calculations appended to this Technical Note. These demonstrate that there is no flooding on site for all storm events up to and including the 100 year return period with 45% climate change allowance.

- Assessment of overland flow routes for extreme events. Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site.
  Refer to the exceedance flood routing plan in Appendix L As noted above, there is no flooding on site for storm events up to the 100 year return period plus 45% climate change allowance. Any events larger than this, that exceed the capacity of the drainage system, are able to follow the site topography and exit onto Dantzic Street.

- Progression through the drainage hierarchy shall be evidence based and supported by site investigation. Results of ground investigation carried out under Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Proposal of the attenuation that is achieving half emptying time within 24 hours. If no ground investigations are possible or infiltration is not feasible on site, evidence of alternative surface water disposal routes (as follows) is required.

Refer to Section 2.6 above which details the drainage hierarchy. Whilst no site specific infiltration testing is undertaken, the RoC Phase 1 and Phase 2 Geo-Environmental investigations and reporting details evidence of contamination along with significant depths of clay down to 7.5mbgl. Infiltration is therefore not considered suitable.

- Where surface water is connected to a Main River, any works within or adjacent to the river that would affect it would require consent from Environment Agency. An email of acceptance of the proposed new connections will suffice.
  Please refer to Flood Risk Activity Permit in Appendix P

- Where alterations are proposed to the Main River, any works within or adjacent to the river that would affect it would require consent from the Environment Agency.
  No alterations to the Main River, other than the installation of the outfall through the River Wall are proposed. Therefore, please refer to the Flood Risk Activity Permit in Appendix P

- An email of acceptance is required from the EA, confirming that the proposed works to the existing channel and flood plain areas are acceptable.
  No works to the existing channel or flood plain, over and above the installation of the outfall as noted above, are proposed as part of the NT02 phase works. Please therefore refer to the Flood Risk Activity Permit in Appendix P

- Confirmation that the EA approve of the 'precautionary approach' flood model to be used for the scheme.
  Please refer to the EA consultation which formed part of the Flood Risk Assessment undertaken by WSP. For reference, this is provided in Appendix F

- Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.
  There is no discharge of surface water to the public sewer network other than modifications to existing road gully locations as part of the Dantzic Street S278 works

- Where a public sewer diversion is required, an agreement in principle from United Utilities is required. An email of acceptance will suffice.
  No diversion of existing public sewers is proposed.

- Hydraulic calculation of the proposed drainage system;
  Please refer to section 2.10 and 2.11 above along with the associated Microdrainage calculations appended to this Technical Note. These demonstrate that there is no flooding on site for all storm events up to and including the 100 year return period with 45% climate change allowance.

- Construction details of flow control and SuDS elements.

Refer to Appendix N for drainage construction details.

- For sites where proposed development would cause pollution risk to surface water, evidence of pollution control measures (preferably through SuDS) is required.
  Refer to Section 2.8 which details proposed surface water treatment measures in line with the SuDS Manual.

A Construction Phase shall be carried out in accordance with the agree drainage strategy which shall be implemented prior to the first occupation of the residential element of a Construction Phase.

Reason - To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution pursuant to policies SP1, EN14 and DM1 of the Manchester Core Strategy (2012).

4.0 MANAGEMENT PLAN

The proposed drainage system for the development adopts a series or SuDS measures alongside traditional drainage techniques. It is important that these are maintained to ensure that all elements operate effectively for their lifetime.

Like any drainage system maintenance is a necessary and important consideration of Sustainable Drainage System (SUDS) design. If systems are properly monitored and maintained, any deterioration in performance can often be managed out.

Effective maintenance will help to ensure that the SUDS features continue to function as they were intended and keep hydraulic capacity and pollutant removal efficiency of the systems at design levels.

Pipework, Manholes, Inspection Chambers & General Maintenance

The following maintenance schedules are recommended.

- Local repair or local replacement of damaged pipes or other structures in order to maintain the functionality of the drainage system.
- Cleaning and removal of sediments, obstructions etc. to restore / maintain hydraulic capacity.
- Jetting / vacuum of sewers to be undertaken as often as necessary to remove silts and/or ordinary debris.
- In the event that any extraordinary issues are encountered during an inspection, further investigation in the form of a CCTV survey may be required.
- Maintenance to be undertaken on a six-monthly schedule.
- All manhole covers should be lifted and the manholes visually inspected for silt, debris and signs of blockages within the drainage system. Check manhole covers and frames for damage and ensure correctly bolted together. This should be undertaken on a six-monthly basis.
- Should any debris or blockages be detected, the manholes should be cleaned along with associated pipe runs using high pressure jetting equipment. On completion a CCTV survey should be undertaken to verify / identify that no further remedial works are required.
- To avoid damaging the pipe, PSI pressures should be verified before jetting of any plastic twin wall drainage. Cleaning of drainage systems may require the temporary sealing of the system and careful collection of the effluent for disposal off site.

Control Manhole Maintenance

The proposed drainage system incorporates the use of a flow control to restrict pass forward flows from the main site drainage system. This takes the form of a Hydrobrake Vortex device the location of which are identified on the drainage general arrangement drawing in Appendix K.

The controls do not have any moving parts and therefore require very little in the way of maintenance other than an inspection for debris / blockage. In particular, the orifice control devices used across the permeable pavement systems are potentially prone to blockage due to the orifice size being less than 75mm in places.

Attenuation Tank Maintenance

Regular inspection and maintenance are required to ensure the effective long-term operation of below-ground attenuation systems. The attenuation tank will be maintained in accordance with advice provided by the manufacturer, while the responsibility for this maintenance will be placed with the sites facilities management team and/or appointed maintenance company.

The maintenance tasks of the attenuation tank generally include the inspection of the inlets, outlets, air vents and overflows to identify silt build-up and/or structural damage to determine if remedial actions are required. If allowed to develop, these issues can severely reduce the effectiveness of the tank.

Permeable Paving Maintenance

Permeable pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. In this instance, the water is temporarily stored before passed forward to the site wide drainage system.

Regular inspection and maintenance are important for the effective operation of permeable pavements. They should be inspected for clogging, litter, weeds and water ponding and all failures should be rectified. Inspections should be undertaken regularly, preferably after heavy rainfall to check effective operation and to identify any areas of ponding.

Permeable surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability.

The areas of permeable paving are either provided with a number of permavoid geocellular units or a perforated underdrain pipe. These help with the onward transmission of surface water flows to the wider drainage system. Both the upstream and downstream access chambers should be inspected for siltation and cleaned as necessary.

APPENDIX A – Location Plan



JOB NO	4328	SKETCH NO	SK-100	DRAWN BY
PROJECT TITLE	NT02-04 Redbank Development	SKETCH TITLE	Location Plan	ARJ. 18/12/24

COMPLEX CHALLENGES ... MADE SIMPLE

APPENDIX B - Masterplan



LEGEND

P01 - STONE FLAGS
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Sandstone
SIZE: 600mm (W), 400mm (L) x 63mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
BOND: Stretcher
DETAIL: Refer to detail 47-0001

P02 - STONE PAVERS (vehicular)
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Yorkstone
SIZE: 150mm (W), 300mm (L) x 80mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
BOND: Stretcher
DETAIL: Refer to detail 47-0001

P03 - STONE SETTS (vehicular)
PRODUCT: Whitworth
SUPPLIER: Hardscape or equal & approved
MATERIALS: Sandstone
SIZE: 95mm (W), 95mm (L) 95mm (D)
FINISH: Diamond sawn all sides
COLOUR: Greyish Buff
DETAIL: Refer to detail 47-0001

P04: BLISTER HAZARD WARNING PAVING
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
SIZE: W400mm x L400mm x D80mm
FINISH: Flamed
COLOUR: Mist
DETAIL: Refer to detail 47-0001

P05 - BITUMINOUS MACADAM (vehicular)
SPECIFICATION: To engineer's detail and specification
NOTES: Road to include thermoplastic markings to highway's specification and design
COLOUR: Black
DETAIL: Refer to detail 47-0002

P06 - BITUMINOUS MACADAM (pedestrian)
SPECIFICATION: To engineer's detail and specification
NOTES: Road to include thermoplastic markings to highway's specification and design
COLOUR: Black
DETAIL: Refer to detail 47-0002

P07 - BITUMINOUS MACADAM: CYCLEWAY
SPECIFICATION: To engineer's detail and specification
NOTES: To include thermoplastic markings to highway's specification and design. Colour green to designate carriageway level cycle route as per Manchester City Council requirements.
COLOUR: Green
DETAIL: Refer to detail 47-0002

P08 - CRUSHED STONE
PRODUCT: Granite dust and stone
SUPPLIER: Hardscape or equal & approved
MATERIALS: Decomposed crushed granite
SIZE: Dust to 10mm
COLOUR: Buff
SUB BASE: To Engineers specification and detail
DETAIL: Refer to detail 47-0002

P09 - POROUS RESIN BOUND GRAVEL
PRODUCT: Flexistone
SUPPLIER: KBI or equal & approved
MATERIALS: Dry stone aggregate
COLOUR: Light grey
SUB BASE: To Engineers specification and detail
NOTES: Material to match Planit-ie design for Victoria Riverside
DETAIL: Refer to detail 47-0002

P11 - CONCRETE SETTS (vehicular)
PRODUCT: Kellen Breccia
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast concrete
SIZE: 150mm (W), 130mm (L) 95mm (D)
FINISH: 80/20% mix of Grigio Nero / Anthracite 618 Breccia To Dulwich Street Carriage way
DETAIL: Refer to detail 47-0003

P12 - PAVING : CONCRETE PAVERS
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast Concrete
SIZE: 600 x 400 x 80mm
FINISH: 20/80% mix of Giallo Liscio (ground finish) / Giallo Breccia (etched finish).
To Dulwich Street Pavement
DETAIL: Refer to detail 47-0003

P16 - TEAR - CONCRETE PAVERS & STONE MIX
PRODUCT: Kellen Breccia, Kellen Liscio & Granite mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: P12 & Magma flamed, Shiraz flamed, Darton flamed
SIZE: Random Mix
DETAIL: Refer to detail 47-0004 & Refer to RDB-OPN-ZZ-L00-DR-L-47-0501

P17 - PAVING : CONCRETE PAVERS
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast Concrete
SIZE: 200 x 200 x 80mm
FINISH: 20 / 80% mix of Gialpi Liscio (ground finish) / Antracite 618 Breccia (etched finish).
DETAIL: Refer to detail 47-0004

P19- CONCRETE SETTS (Building Threshold)
PRODUCT: Kellen Breccia
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precaste Concrete
SIZE: 95mm (W), 95mm (L) 95mm (D)
FINISH: Magma Flamed
To building thresholds
DETAIL: Refer to detail 47-0004 TO BE UPDATED AT STAGE 4

P20 - ENTRANCE AREA PAVING
PRODUCT: Kellen Breccia & Kellen Liscio mix
SUPPLIER: Hardscape or equal & approved
MATERIALS: Precast concrete
SIZE: 300mm (W), 150mm (L) 80mm (D)
20 /80% mix of Gialio Liscio (ground finish) / Giallo Breccia (etched finish).
To building entrance areas
DETAIL: Refer to detail 47-0005

P21 - CORDUROY HAZARD WARNING PAVING
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
SIZE: W400mm x L400mm x D80mm
FINISH: Flamed
COLOUR: Mist
SUB BASE: To Engineers specification and detail
To top and bottom of steps
DETAIL: Refer to detail 47-0005

S02 - STEPS (150mm risers)
SUPPLIER: Hardscape or equal & approved
MATERIAL: Granite
DETAIL: Refer to detail 47-0016

NOTES

1. This drawing is to be read in conjunction with all other drawings and specifications.
2. Do not scale off this drawing. Written dimensions to be taken only.
3. Any discrepancies found between this drawing and other drawings and specifications in the construction documents must be referred to the Landscape Architect prior to work commencing.
4. This drawing must not be copied in whole or in part without prior written consent of Optimised Environments Ltd.

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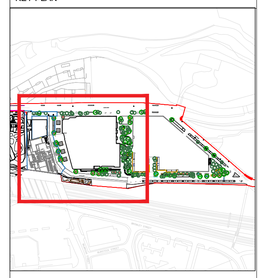
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Topographical Survey: Please reference surveyor's survey.

CDM INFORMATION

CDM REGULATIONS 2015. All current drawings and specifications for the project must be read in conjunction with the Designer's Hazard and Environment Assessment Record

KEY PLAN



Issue	Revision	Initial	Date
P01	Stage 4 Initial Issue.	MY	20.12.2024

open
optimised environments
PART OF SLR

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Client
Far East Consortium

Project
NT02 - 03

Dantzic Street, Manchester

Drawing Title
General Arrangement NT02

Public Realm Hard Landscape Drawing

Scale Bar: 2.5m 5.0m 7.5m 10m 12.5m
North

Scale: **1:250@A1** Date: **23.05.23**

By: **MY** Status: **S1**

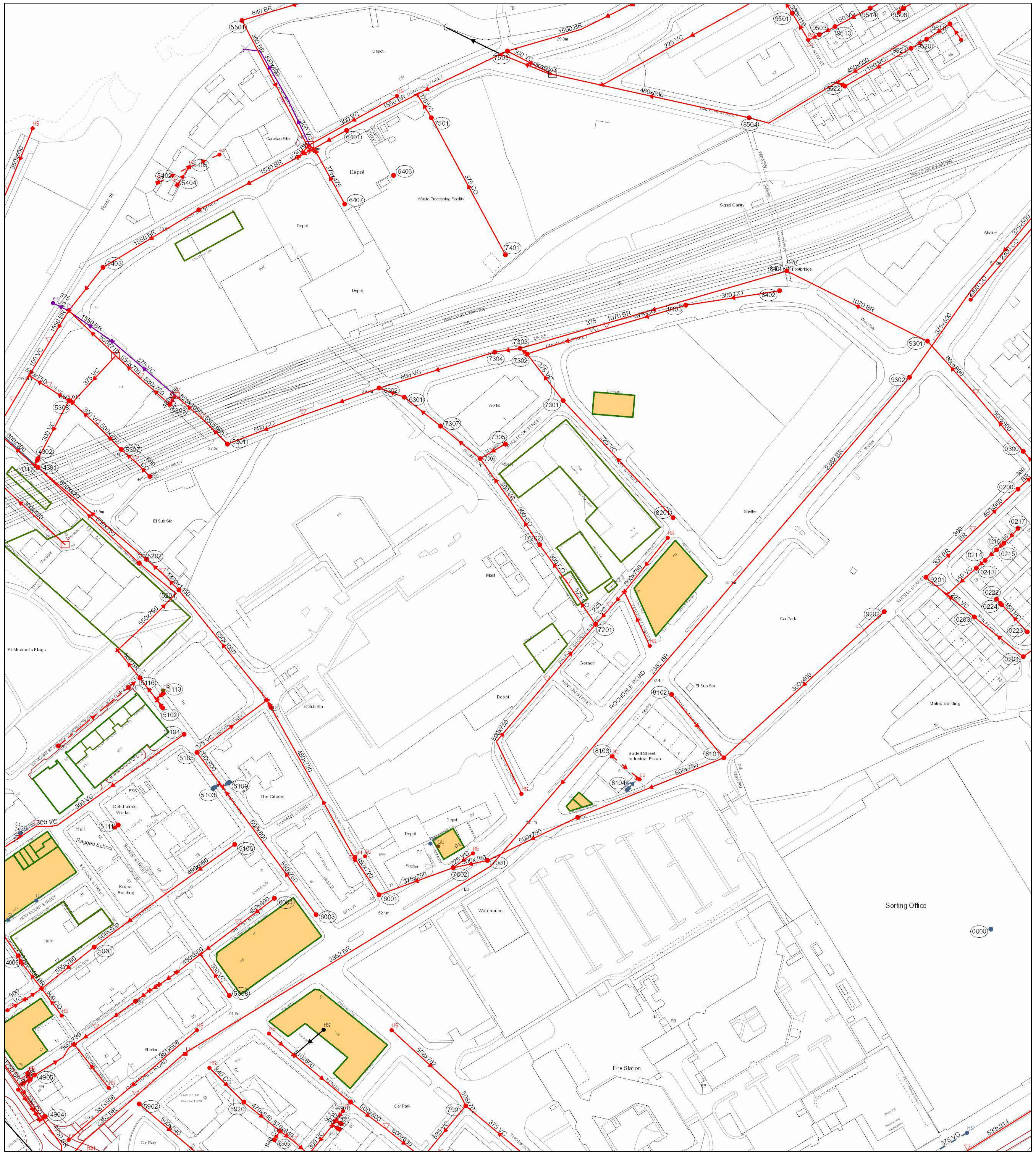
Checked: **AW** Approved: **AW**

Drawing Number
RDB-OPN-2B-L00-DR-L-03-0001

Rev
P01

Computer File: R:\Projects\2021\M10394_NT02DantzicSt\CAD\AUTOCAD\SHEETS\Stage 4

APPENDIX C – Sewer Records



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

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
7303	46.04	CO	42.86	1070			BR	14.14214	1 in 236
0213		CO		150			VC	21.88563	
5306	34.57	CO	30.4	600			CO	11.31371	1 in 12
5920		CO	0	470			BR	25.6125	
6902	51.34	CO	48.72	300			VC	4.472136	
0203	53.35	CO	50.97	225			VC	34.82815	1 in 10
7001	52.02	CO	44.38	500			BR	19.41649	
5401	30.55	CO	24.7	1550			BR	61.91123	
5401	30.55	CO	24.7	1550			BR	61.91123	
7101	52.5	CO	46	500			BR	55.4617	1 in 35
7201	50.66	CO	45.9	525			CO	26.62705	1 in 21
5201	39.28	CO	28.45	1400			CSB	12.72792	1 in 40
9503	44.61	CO	43.24	150			VC	6.708204	
9503	44.61	CO	43.24	150			VC	6.708204	
7302	46	CO	43.23	375			VC	5	
8101	53	CO	48.5	500			BR	87.46428	
6302	39.89	CO	37.25	600			VC	44.59821	1 in 22
5403		CO	0	1550			BR	30.61046	
5403		CO	0	1550			BR	30.61046	
4005	47.34	CO	0	450			BR	33.01515	
4005	47.34	CO	0	450			BR	33.01515	
7305	46.61	CO	43.77	225			VC	16.12452	1 in 10
7002	51.92	CO	0	375			BR	43.65776	
5501		CO		300			BR	81.51928	
5501		CO		300			BR	81.51928	
0215		CO		150			VC	8.758789	
6905	51.09	CO	0	840			CO	5.830952	
8403	49.01	CO	46.64	375			CO	45.88028	1 in 27
9508		CO		150			VC	3.465536	
9508		CO		150			VC	3.465536	
5307	32.1	CO	28.44	500			BR	18.38478	
5307	32.1	CO	28.44	500			BR	18.38478	
5007	49.99	CO	46.28	450			BR	27.20294	
5308	30.08	CO	27.5	375			VC	13.0384	
5308	30.08	CO	27.5	375			VC	13.0384	
0300	53.4	CO	45.92	500			BR	40.45986	
6301	41.01	CO	38.13	300			VC	14.86607	1 in 26
0216		CO		150			VC	5.270839	
7401		CO	0	375			CO	86.35392	
6903	51.34	CO	0	300			VC	3.605551	
9301	53.6	CO	44.64	1070			BR	87.20665	
8102	52.4	CO	49.28	500			CO	45.45327	1 in 253
6101	45.7	CO	38.65	480			BR	4.472136	
8201		CO	0	225			VC	89.14034	
8401		CO	0	1070			BR	154.1201	
7301	48.08	CO	43.43	375			VC	32.80244	1 in 182
9509		CO		150			VC	18.71178	
9514		CO		150			VC	22.10397	
9514		CO		150			VC	22.10397	
5303	33.27	CO	28.83	580			BR	21.26029	1 in 44
4904	49.62	CO	0	939			CO	3.605551	
4904	49.62	CO	0	939			CO	3.605551	
5301	36.74	CO	32.93	550			BR	19.79899	1 in 13
6401	31.29	CO	24.77	1530			BR	23.22471	
6401	31.29	CO	24.77	1530			BR	23.22471	
7306	45.48	CO	42.07	300			VC	28.42534	1 in 47
6004	50.54	CO	48.03	450			BR	25	
4905	49.07	CO	0	500			BR	28.30447	
4905	49.07	CO	0	500			BR	28.30447	
0214		CO		150			VC	6.519656	
5902	50.46	CO	46.96	500			BR	44.68781	1 in 73
7307	43.35	CO	41.46	300			VC	25.6125	1 in 12
9201	53.13	CO	47.48	300			BR	36.06938	1 in 82
7202	48.7	CO	43.3	300			CO	28.84441	1 in 48
9302		CO	0	2362			BR	592.1557	
5001	48.51	CO	45.07	500			BR	37.01351	
5001	48.51	CO	45.07	500			BR	37.01351	
9513		CO		150			VC	9.752625	
9513		CO		150			VC	9.752625	
6901	51.35	CO	46.31	500			BR	25	
7304	45.38	CO	42.78	600			VC	67.05222	1 in 12
9202	53	CO	49.62	300			CO	120.3412	1 in 167
0217		CO		150			VC	11.55683	
5308	30.08	CO	27.3	300			VC	36.23534	
5308	30.08	CO	27.3	300			VC	36.23534	
8402	50.89	CO	47.93	300			CO	52.61179	
0200	53.43	CO	46.59	300			BR	17.14061	
5106	49	CO	46.25	480			BR	48.01041	1 in 83
5111		CO		150			VC	2.231356	
5111		CO		150			VC	2.231356	
6001	51.68	CO	42.44	480			BR	120.1335	1 in 32
7901	51.21	CO	44.19	525			VC	36.31802	
6003	51.36	CO	48.22	550			BR	55.80323	1 in 21
5104	44.8	CO	42.51	300			VC	98.22868	
9519		CO		150			VC	15.5569	
9519		CO		150			VC	15.5569	
0501	48.85	CO	0	450			VC	27.29469	
9501	42.64	CO	38.9	300			CO	10.81665	1 in 7
9501	42.64	CO	38.9	300			CO	10.81665	1 in 7
9522		CO		150			VC	4.785507	
9522		CO		150			VC	4.785507	
4301	31.14	CO	26.64	600			CO	30.55567	
4301	31.14	CO	26.64	600			CO	30.55567	
5203	36.71	CO	31.7	550			BR	77.10383	1 in 15
9521		CO		150			VC	42.23491	
9521		CO		150			VC	42.23491	
8504	41.79	CO	37.42	480			BR	111.4201	1 in 13
8504	41.79	CO	37.42	480			BR	111.4201	1 in 13
9520		CO		150			VC	9.927451	
9520		CO		150			VC	9.927451	
0204	53.35	CO	51.43	225			VC	34.82815	1 in 76
5116	42.35	CO	40.25	550			BR	19.69717	
4302	30.81	CO	28.25	300			VC	4.472136	
4302	30.81	CO	28.25	300			VC	4.472136	
4312	31.02	SW	26.48	600			BR	31.14482	
4312	31.02	SW	26.48	600			BR	31.14482	
5202	36.82	CO	27.75	600			CO	78.74643	1 in 72
5101	42.45	CO	40.75	225			VC	8.314363	1 in 139
5101	42.45	CO	40.75	225			VC	8.314363	1 in 139
7501	31.57	CO	29.36	375			VC	15.26434	
7501	31.57	CO	29.36	375			VC	15.26434	
0224		CO		150			VC	4.226566	
7503	30.16	CO	25	1550			BR	99.29091	1 in 473
7503	30.16	CO	25	1550			BR	99.29091	1 in 473
5008	51.32	CO	48.13	300			VC	28.01785	
5102	43.81	CO	40.27	550			BR	5.096149	
5105	45.55	CO	39.3	375			VC	48.60041	
6407	32	CO	28.2	375			CO	33.12099	
6407	32	CO	28.2	375			CO	33.12099	
0223		CO		150			VC	20.76079	
4109	42.86	CO	41.14	225			VC	50.51596	1 in 130
4109	42.86	CO	41.14	225			VC	50.51596	1 in 130
8503	40.57	CO	38.15	225			VC	114.0305	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned	Foul	Surface Water	Combined	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main
				Sludge Main
				Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- CA Catchpit
- VC Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- ST Septic Tank
- CK Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

CI Circular TR Trapezoidal
EG Egg AR Arch
OV Oval BA Barrel
FT Flat Top HO HorseShoe
RE Rectangular UN Unspecified
SQ Square

SEWER MATERIAL

AC Asbestos Cement
BR Brick
PE Polyethylene
RP Reinforced Plastic Matrix
CO Concrete
CSB Concrete Segment Bolted
CSU Concrete Segment Unbolted
CC Concrete Box Culverted
PSC Plastic / Steel Composite
GRC Glass Reinforecd Plastic
DI Ductile Iron
PVC Polyvinyl Chloride
CI Cast Iron
SI Spun Iron
ST Steel
VC Vitrified Clay
PP Polypropylene
PF Pitch Fibre
MAC Masonry, Coursed
MAR Masonry, Random
U Unspecified

Address or Site Reference:

97079 - A1,

OS sheet Number: SJ8499SE
Scale: 1:1250 **Date:** 01/07/2021
Nodes: 123
Sheet: 1 of 4

Printed by: Property Searches

SEWER RECORDS

United Utilities
Water for the North West

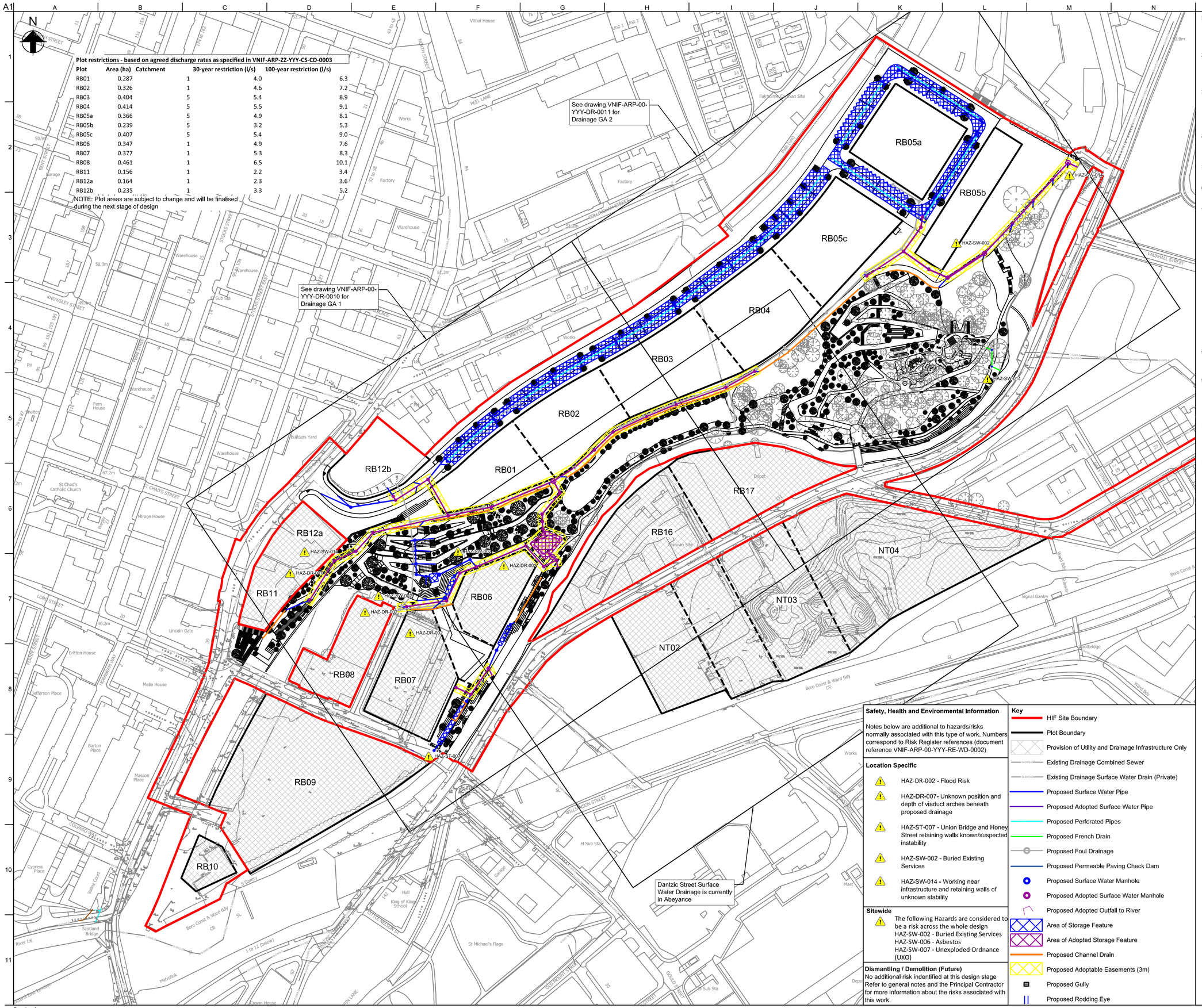
APPENDIX D – ARUP Drainage Strategy

A1

Plot restrictions - based on agreed discharge rates as specified in VNIF-ARP-ZZ-YYY-CS-CD-0003

Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
RB01	0.287	1	4.0	6.3
RB02	0.326	1	4.6	7.2
RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4
RB12a	0.164	1	2.3	3.6
RB12b	0.235	1	3.3	5.2

NOTE: Plot areas are subject to change and will be finalised during the next stage of design



Notes

1. All dimensions are in m, all levels in mAOD, unless specified otherwise.
2. This map is reproduced from Ordnance Survey Material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office (c) Crown Copyright. License Number 100019568 (2021).
3. Layout is based on:
   - Landscape Architect masterplan drawing VNIF-PLA-ZZ-YYY-DR-L-1011 Rev P06 received 04/08/2022 by Planit.
   - Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Infrastructure Specification refer to VNIF-ARP-ZZ-YYY-SP-C-0001.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

Located Service Classification	Certainty/Risk
Type A Verification + Visual Identification	
Type B Detection + Typically GPR and EML techniques are used	Data
Type C Site reconnaissance + Physical surface features identified	
Type D Desktop utility records search	

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point has been provided for each plot within the HIF Boundary at a minimum depth of 2.0m to plot level (assuming FFL will be 0.5m above plot levels) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Polypropylene and PVC in accordance with BS 13476
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. As RB09/10 are outside the HIF Red Line Boundary, it has been agreed that a connection to the River Irk will be provided/constructed as part of the Plot construction. Discharge rates have been agreed as part of the HIF delivery.
11. For all schedules, refer to drawings VNIF-ARP-00-YYY-DR-CD-0009 and VNIF-ARP-00-YYY-DR-CD-0054.
12. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-DR-007- Unknown position and depth of viaduct arches beneath proposed drainage
- HAZ-ST-007 - Union Bridge and Honey Street retaining walls known/suspected instability
- HAZ-SW-002 - Buried Existing Services
- HAZ-SW-014 - Working near infrastructure and retaining walls of unknown stability

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Surface Water Drain (Private)
- Proposed Surface Water Pipe
- Proposed Adopted Surface Water Pipe
- Proposed Perforated Pipes
- Proposed French Drain
- Proposed Foul Drainage
- Proposed Permeable Paving Check Dam
- Proposed Surface Water Manhole
- Proposed Adopted Surface Water Manhole
- Proposed Adopted Outfall to River
- Area of Storage Feature
- Area of Adopted Storage Feature
- Proposed Channel Drain
- Proposed Adoptable Easements (3m)
- Proposed Gully
- Proposed Rodding Eye

Rev	Date	Description	By	Chkd	Appd	Auth
P03	01/02/22		DH	RG	RG	---
P04	17/02/22	Amended for Planning Comments	DH	DH	RG	---
P05	28/02/22		DH	DH	RG	---
P06	21/03/22	Updated for Costing	ES	RG	RG	---
P07	04/04/22	Updated for Costing	DH	DH	RG	---
P08	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
P09	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P10	10/10/22	Full WS4 Issue	ES	DH	RG	---
P11	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

ARUP

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www.arup.com

Client

MANCHESTER CITY COUNCIL

bam nuttall

Project Title

Victoria North HIF Infrastructure & Enabling Works

Drawing Title

Proposed Site Wide Surface Water Drainage General Arrangement

Scale at A1	1:1250	Arup Job No	282022-00
Role	Civil - Drainage		
Suitability	A - Fit for Construction		

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name

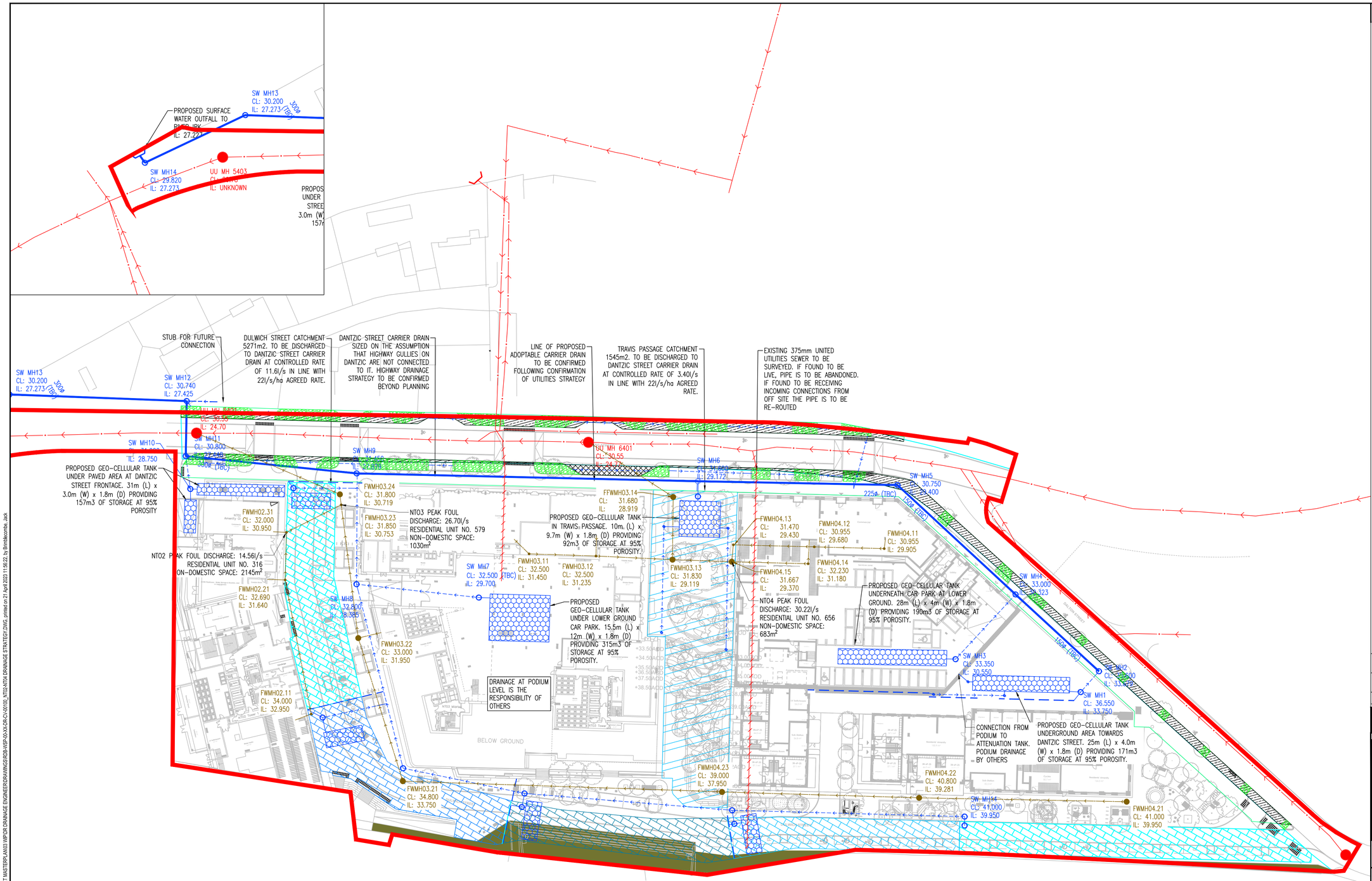
VNIF - ARP - 00 - YYY - DR - CD - 0002

Project | Originator | Volume | Location | Type | Role | Number

Do not scale

© Arup

APPENDIX E – WSP Drainage Strategy



Plot		Area (Assumed 100% Impermeable)	Permitted Discharge (l/s)	Storage (m^3)
NT02	2B	0.23	5.06	156
NT03	2C	0.54	11.88	315
NT04	2D	0.63	13.86	360

DO NOT SCALE

NOTES:

1. THIS DRAINAGE STRATEGY HAS BEEN PRODUCED USING THE FLOOD STUDIES REPORT RAINFALL DATA.

KEY:

- PRIVATE SURFACE WATER DRAIN
- ADOPTABLE SURFACE WATER CARRIER DRAIN
- CHANNEL DRAIN
- EXISTING UNITED UTILITIES COMBINED SEWER
- EXISTING UU COMBINED SEWER TO BE ABANDONED
- SURFACE WATER MANHOLE
- FOUL WATER MANHOLE
- SURFACE WATER HEADWALL
- COMBINED SEWER OVERFLOW HEADWALL
- SURFACE WATER ATTENUATION
- DULWICH STREET PERMEABLE PAVEMENT
- TRAVIS PASSAGE CATCHMENT AREA
- EXISTING HIGHWAY LAND TO REMAIN UNATTENUATED (2880m^2)
- EXISTING HIGHWAY LAND TO BE ATTENUATED (800m^2)
- PROPOSED NEW HIGHWAY LAND TO BE ATTENUATED (1535m^2)
- PROPOSED NEW HIGHWAY LAND TO BE UNATTENUATED (50m^2)

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	21/04/2023	JEB	UPDATED FOR PLANNING	SM	SM
P01	31/03/2023	JEB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

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T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FAR EAST CONSORTIUM

ARCHITECT: HAWKINS BROWN / MACREANOR LAVINGTON

SITE/PROJECT: REDBANK & DANTZIC STREET

TITLE: APPLICATION 5
DETAILED DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:500	SM	S

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JEB	JEB	April 23

DRAWING No: RDB-WSP-00-XX-DR-CV-00101 REV: P02

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File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XXX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 WIP\DR DRAINAGE ENGINEER\DRAWINGS\RDB-WSP-00-XX-DR-CV-00100_NT02#2T04 DRAINAGE STRATEGY.DWG, printed on 21 April 2023 11:49:22, by Brenda.coombe, Jack

COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX F – EA Flood Risk Correspondence

Brimblecombe, Jack

To: Mostyn, Stephen
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

[redacted]

Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Many thanks for circulating the summary.

See few amendments in chain below to fully capture EA perspective. However, nothing I believe which alters the 'status-quo' from conversations held last week.

Happy to discuss further if required.

Kind regards,
Andy

Andy Davies
Project Manager, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk

[redacted]



[redacted]

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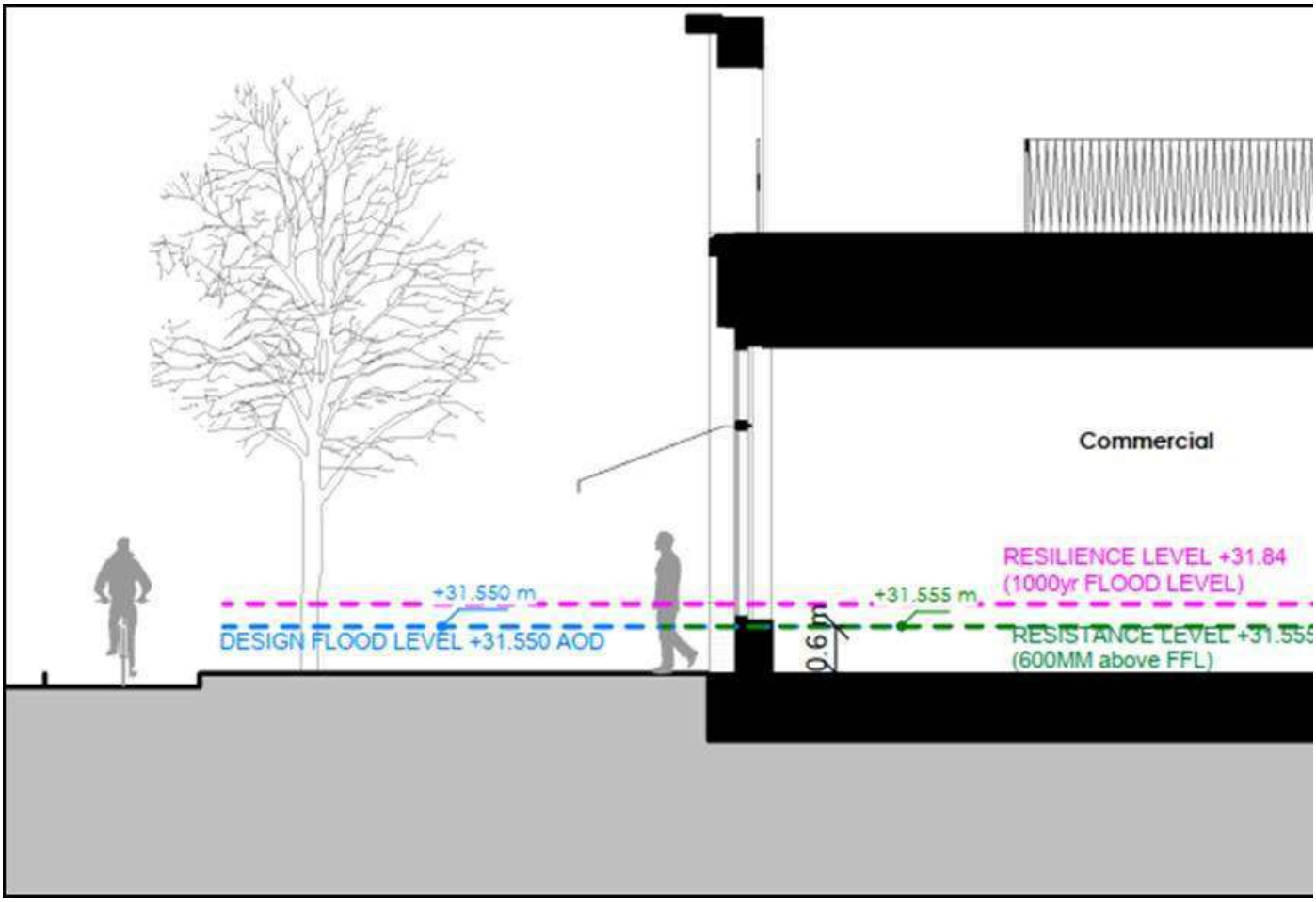
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Andy,

Following on from yesterday's call, here is a record of main points discussed and agreed with respect to flood risk assessment.

- **Omission of freeboard:** The EA have reviewed the justification provided by masterplan architect and are comfortable with the approach taken to the omission of freeboard where necessary given the constraints. The EA advises that the architectural design detail/justification for this approach will need to be provided as part of the associated FRA (evidence base/narrative). However, the EA would also advocate/welcome, where possible, potential at the detailed design stage for consideration to be given as to whether FFLS can be raised further i.e. above the 'design flood event' .

- **Flood Resistance / Resilience:** The EA confirmed that flood resistance / resilience measures are required up to 600mm above the design flood level but indicated that the FRA should leave a degree of flexibility for the level at which resistance should be included up to and the level which resilience should be included up to, reflective of the fact that detail design of the development/plots currently remains undetermined/unknown to the EA. This can then be agreed on a plot by plot basis as each plot is brought forward for development taking into account the 1000-year flood level.
- **Emergency Plan:** The FRA will include details on flood levels, flood mitigation measures and safe access and egress routes including flood hazard mapping and recommends that the end user of the site subscribes to the EA Automated Flood Warning System and that a detailed Emergency Plan is produced. The FRA will set out the parameters / requirements for a detailed Emergency Plan but the key information listed above is included in the FRA. We understand that the EA accept this approach for planning.
- **Application 5 (NT04):** See section below. The FFL of commercial units along Dantzic Street will be set below the design flood level. Flood resistance will be provided to 600mm above FFL. Flood resilience will be provided up to the 1000-year flood level. Demountable flood barriers or similar will be provided at door thresholds. Safe egress will be provided to land above the design flood level. We understand that this approach is acceptable to the EA. – In association with this, it understood that 'dry' safe/access can be provided from all development plots.
- **Application 5 (NT03):** Commercial unit in NT03 with FFL of 31.72m AOD should have flood resilience measures up to a minimum of the 1000-year flood level which is 31.84m AOD



Please let us know if you have any comments on the summary above or would like to discuss any of the items in further detail.

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

[redacted]

Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Andy,

Apologies I've not been able to send the below earlier but here are the key agenda items for today's meeting from a Flood Risk Assessment perspective:

'we advise that further explanation is needed as to why the minimum 300mm freeboard is not appropriate / needed. We understand all residential accommodation will be from the 1st floor level and above but 'less vulnerable' uses at ground floor level should still be afforded some freeboard allowance.'

Please see below justification provided by the masterplan architect for your review and consideration:

General approach
The project aims to deliver a rich mix of commercial and community uses, particularly so around RB06, Rb07, RB10, RB16 and RB17, as these plots directly adjoin the River Irk and are the nearest to Central Manchester. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

RB06 and RB07
The existing levels around these two plots along the River edge and Roger Street are approximately +30.0 AOD. The Union Waterfront needs to remains at +30.0 AOD to provide sufficient flood storage. The design flood level on both the plots is +31.2, therefore approximately 1.2 metres above the existing public realm. Setting FFL at flood level would lead to a 1.2 metre difference between public realm and building ground floor, which careful design could incorporate without detrimental impact on active ground floors. A 300mm freeboard would lead to a 1.5 metre difference in levels, which would have detrimental impact on the quality of the scheme.

RB10
The existing levels around the plots are approximately +29.0 AOD. The public realm around the plot cannot be raised above the flood level as it provides flood storage as well as access to existing Network Rail and other arch uses. The flood level is approximately +30.35, therefore approximately 1.35 metres above the public realm. The illustrative masterplan suggests an outdoor covered market use and residential ancillary use such as bin storage or cycle storage sitting underneath an elevated building. Only the residential lobby and the residential core of the building are proposed to be raised above the flood level. A 1.35 metre difference between public realm and the FFL would at least maintain visual connectivity between the two. A 300mm freeboard would lead to an approximate 1.65 metre difference in levels, which would substantially affect the design quality and legibility of a building entrance and prevent visual surveyance from the building to the public realm.

RB16/17
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground and potentially first floor commercial and community uses. Active frontage is not sought to Travis Island Wetlands as substantial level difference will be required to maximise flood storage within them. The existing levels around these two plots along Dantzic Street are approximately +31.0 to +31.5 AOD. The flood level is approximately +31.36 AOD and +31.66 with a 300mm freeboard. As such, there may be instances where freeboard may be achieved for some or the majority of the plots, subject to detailed public realm and building design. However, we would seek flexibility at this stage to ensure that quality active frontages can be achieved along this key high street location.

NT02 – NT04 General approach
The project aims to deliver a rich mix of commercial and community uses, with a focus on the frontages of NT02-04 on Dantzic Street. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm, and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

NT04
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground floor commercial and community uses. NT04 completes this high street at the eastern end. The existing levels to the frontage onto Dantzic Street are approximately 30.5m+ AOD to 31.0m+ AOD. It is proposed to adjust the levels in the public realm at the back of pavement to the proposed FFL level of the commercial units at 30.955m+AOD consistently along the frontage to facilitate level access.

The design flood level for NT04 is 31.55+ AOD, which is 595mm above the proposed FFL. It is proposed to

provide flood resistance measures to the façade up to 600mm above the proposed FFL (i.e. up to 31.555m+ AOD) in order to mitigate any potential flooding whilst maintaining level access into the active uses.

'We welcome the inclusion of flood resistance (water exclusion) / resilience (water ingress) measures to be provided at a minimum 600mm above 'flood levels'. We advise such measures are designed to consider the 0.1% AEP to ensure mitigation for residual flood risk is implemented.'

Agreement of the level that flood resistance should be provided up to and agreement of the level that flood resilience should be provided up to.

'The FRA must show how users of the development will remain safe. Therefore, safe access / egress routes must be identified and linked to flood warning and evacuation plans where necessary.'

The FRA will recommend emergency evacuation plans are put in place and the requirement for flood warnings. Confirmation required that the provision of emergency evacuation plans will be conditioned as a pre occupation requirement.

Apart from the above, the outstanding items to discuss were the approach being taken for Application 5, and in particular plot NT04. FFL is below design flood level - what level should flood resistant construction be provided. Current approach is aligned with that of Victoria Riverside (flood resistance to 600mm above FFL).

NT03 lowest FFL is actually 31.72m AOD (commercial). Where FFL's of NT03 are not 300mm above design flood level should same approach be taken as agreed for Application 4 ?

[redacted]

Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Afternoon Stephen,

Many thanks for your email below – I've just tried to give you a call to discuss this. However, both my calls to your mob and office phone went through to voicemail.

More than happy to discuss matters over the phone if easier. However, cognisant to current internal resource pressures please would it be possible for you to outline exactly you / WSP would like to achieve via a meeting this week? I.e. the key agenda items.

As context to this ask…

Noting your email in chain primarily to matters associated with Application 5, please see attached email which advises the wider FEC/VN project team that we (the EA) are still awaiting the submission of an updated iteration of 'Application 5' flood model and in association with this detailed plans (*preferentially those which will be sought for planning approval*) enabling confirmation/confidence that the flood model submitted to the EA is an accurate representation of the intended development and, in turn, any assessment of development flood risk derived from this is appropriate.

As per our recent written correspondence / letter (SO/2023/122923/01-L01) relating primarily to assessment of flood intervention principles for 'Application 4', until we are able to gain confirmation that flood modelling presented is an accurate/representation of intended end-development design, in turn, we will be unable to confidently conclude/advise as to whether planned flood resistance/resilience proposals are appropriate due to the potential for variations to flood risk and it's management to still occur e.g. an uplift in design flood level as a result of intervention on Dantzic Street. However, that said, echoing our recent correspondence/letter, the general principles intended to employed for determining how development plot fluvial flood risk is to managed as part of 'Application 5' appear to be sound from our current understanding of the likely level of risk /fluvial flood impact the 'Application 5' development could experience within an 1:100 + CC% /Design Flood event. My only additional remark to this would be that whereby FFL are to be below the 1:1000 year event (*potentially only Plot NT04 based on the node data you present),* consideration/narrative is provided (within the forthcoming FRA) as to how this residual risk can be appropriately managed.

@Chambers, Julia – I note from Stephen's email below the reference to an impermeable concrete upstand offering protection to the NT04 development plot which I would presume based on prior reviewed modelling outputs / understanding of general fluvial flood risk for the area is situated on/in immediate proximity to Dantzic Street . Design elements such as, with the potential to alter local floodwater levels /floodwater distribution are the type of details we are seeking to understand further as part of efforts to determine flood model appropriateness. Please can it be ensured that details on the impermeable concrete upstand are provided as part of forthcoming updated 'Application 5' / flood model review submissions.

Happy to discuss any of the above further as required.

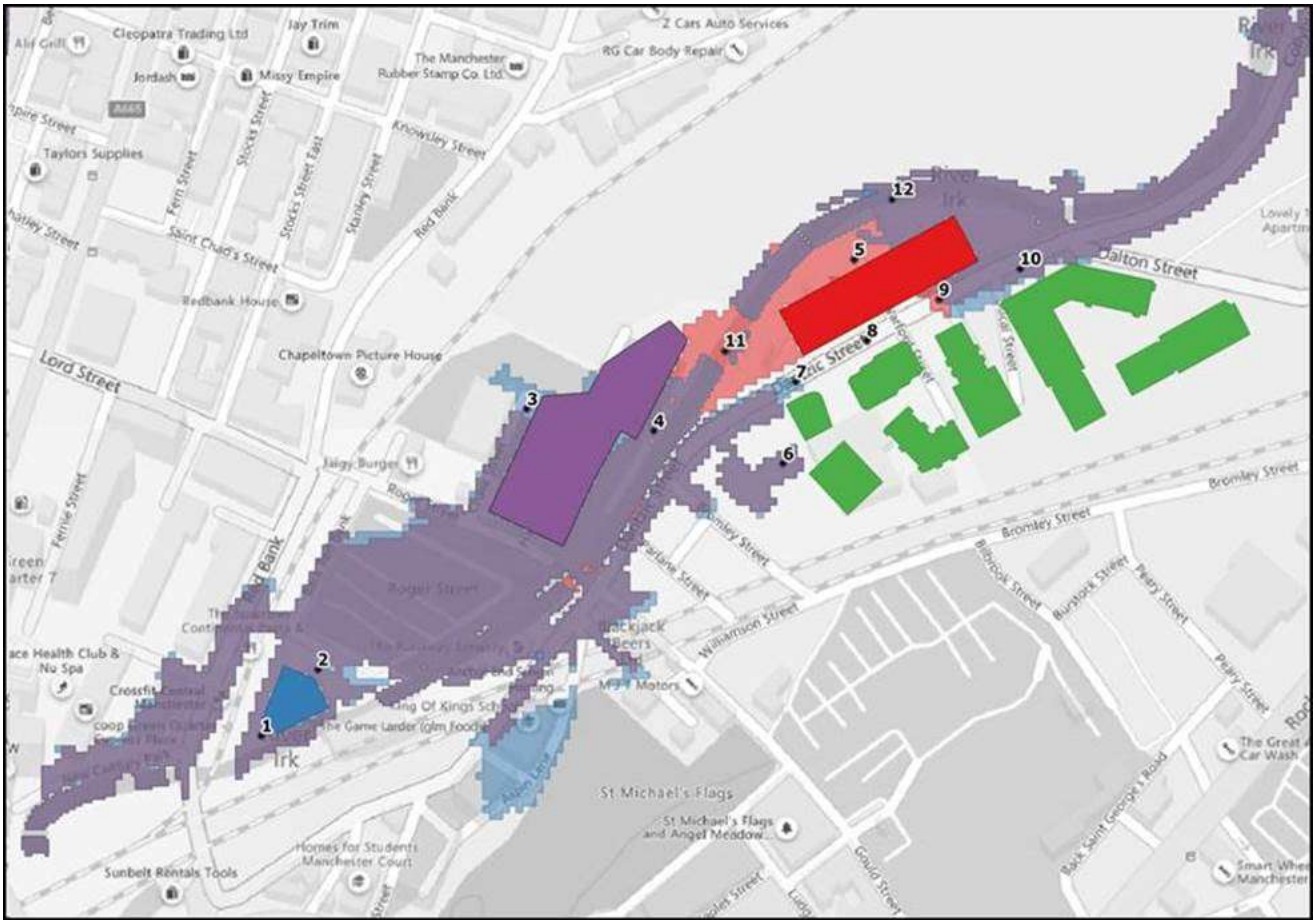
Kind regards
Andy

[redacted]

Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Anne-Marie,

Thank you for sending through the attached initial comments on outline flood strategy that was put forward. Please see below an update related to the Application 5 flood strategy. This



The standard that we are seeking to achieve for setting of FFL's is for them to be at or above the design flood level plus 300mm of freeboard. We can confirm that there will be no 'more vulnerable' uses below the design flood level plus 300mm. All more vulnerable uses will be at first floor level or above. Safe routes of access are provided to all residential areas. See above flood level Nodes map and attached spreadsheet to show flood level info taken from the WSP modelling and below updated strategy for Application 5 only:

NT02:

- The FFL for plot NT02 is set above the design flood level.
- NT02 design Flood Level is 30.88m (Node 7). The finished floor level (FFL) of NT02 is 31.55m AOD which is more than 300mm above the design flood level and is also above the 1000 yr flood level which is 31.31m AOD. This is in line with previous discussions.
- Flood resistance or resilience measures are therefore not considered to be required for NT02.

NT03:

- The FFL for plot NT03 is set above the design flood level.
- The FFL of NT03 is 32.00m and the design flood Levels for Nodes 7 and 10 are 30.88m and 31.51m respectively- for the purpose of this exercise the worst case flood level at Node 10 has been used. The FFL of NT03 is therefore 490mm above the worst case design flood level and is also above the 1000yr flood level for Node 10 which is 31.84m.
- Flood resistance or resilience measures are therefore not considered to be required for NT03.

NT04:

- The lowest FFL for plot NT04 is shown to be 30.955m – this is associated with the less vulnerable commercial usages along Dantzic Street. The design flood level at Node 10 is 31.51m – this is 555mm above the FFL

- With respect to mitigation for NT04, the proposals are that flood resistance in the form of an impermeable concrete upstand will be provided to 600mm above FFL which is 31.555m, and that resilience measures up to 300mm above this level which is 31.855m. Flood doors or retractable flood barriers will be provided at door thresholds. This is aligned with the approach taken for the neighbouring consented Victoria Riverside development. Please can the EA confirm whether this approach is acceptable for ground floor commercial usages at plot NT04? Note that residential access lobbies are set above the design flood level.
- It will be recommended as a mitigation measure in the FRA that the end user of plot NT04 is to sign up to the EA Automate Flood Warning system and an Emergency Evacuation Plan (EEP) is put in place so that users know the procedure to follow in the event of a flood warning and so that they can evacuate before the onset of a flood or escape to a safe refuge above the flood level if required.
- Safe access and egress for the commercial plots will be provided via a ramped corridor to the rear of the units which emerges along Dalton Street at a level of approximately 31.70m so roughly 200mm above design flood level. A plan to show this route and levels will be provided.

Please note that the flood strategy that i provided you with for your initial review still applies fully to Application 4 but the above is the position for Application 5 and this is consistent with the pre-app discussions between the EA and the wider FEC team. We note your request for a clear distinction in the FRA report between the flood strategies applied to Application 4 and 5 and we will make sure that this is clear in the report but for the avoidance of doubt, the strategy for Application 5 is as set out above (plots NT02 to NT04) and the original strategy submitted and which you have commented on applies to Application 4.

We will forward further information and drawings to illustrate the above approach with greater clarity but think it would be useful to have a Teams call to discuss your initial flood strategy comments in more detail during w/c commencing 13th March. Can you confirm your availability please?

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

[redacted]

Subject: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Please find attached our preliminary commentary of the overview provided of the ‘Application 4’ and ‘Application 5’ Flood Risk Mitigation Strategy as outlined in your email dated 14th February 2023.

As previously highlighted, this review is subject to the approval of the EA’s acceptance of the ‘Application 4’ and ‘Application 5’ flood models, where we understand further flood models are intended to be issued to us by Monday (6th March), and confirmation of detailed plans intended to submitted for each planning submission.

We advise at this time that if it is the intention to produce one FRA / Flood Risk Mitigation Strategy report, a clear distinction is made on the assessment and intended mitigation measures for each individual application. This is to ensure determination of the suitability and acceptability of the assessment / mitigation proposals for each individual planning application is clearly identified / recognised.

Further to the above, our commentary includes advice for your consideration on the forthcoming FRA / Flood Risk Mitigation Strategy where we would welcome discussions and / or further technical review of the full FRA / Flood Risk Mitigation Strategy once the above matters have been addressed.

Should you have any queries and wish to discuss the contents of our response, then please feel free to contact me.

Many thanks,

Anne-Marie

Anne-Marie McLaughlin
Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk

[redacted]



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APPENDIX G – SW Calcs No Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	79.8	0.028	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.056	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.043	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.014	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.073	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.000	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	1.990	22.5	0.063	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.050	140.0	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
S6.001	20.393	0.690	29.6	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.320	38.7	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.550	25.2	0.022	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.046	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.034	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	64.23	4.15	32.300	0.028	0.0	0.0	0.0	1.13	19.9	4.9
S1.001	63.12	4.34	32.175	0.028	0.0	0.0	0.0	1.12	19.9	4.9
S1.002	61.06	4.73	32.009	0.042	0.0	0.0	0.0	1.30	23.0	6.9
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.049	0.0	0.0	0.0	2.21	39.0	8.0
S1.004	60.01	4.94	28.550	0.049	0.0	0.0	0.0	2.46	97.8	8.0
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.043	0.0	0.0	0.0	2.69	47.6	7.5
S3.002	63.55	4.27	32.230	0.099	0.0	0.0	0.0	2.08	82.5	17.0
S3.003	63.25	4.32	31.958	0.099	0.0	0.0	0.0	3.88	154.4	17.0
S4.000	64.97	4.02	31.000	0.043	0.0	0.0	0.0	1.69	67.0	7.6
S4.001	64.71	4.06	30.964	0.057	0.0	0.0	0.0	1.62	64.3	10.0
S3.004	62.18	4.52	30.900	0.167	0.0	0.0	0.0	2.65	105.6	28.1
S3.005	61.24	4.70	28.820	0.240	0.0	0.0	0.0	2.63	418.0	39.8
S5.000	64.68	4.07	28.396	0.000	0.0	0.0	0.0	1.67	265.0	0.0
S6.000	61.40	4.67	37.005	0.063	0.0	0.0	0.0	1.12	704.1	10.5
S7.000	64.29	4.14	35.015	0.018	0.0	0.0	0.0	0.85	15.0	3.1
S6.001	59.66	5.01	34.965	0.104	0.0	0.0	0.0	0.98	613.8	16.8
S6.002	58.51	5.26	34.275	0.117	0.0	0.0	0.0	0.85	536.3	18.5
S6.003	57.52	5.47	33.955	0.139	0.0	0.0	0.0	1.06	664.2	21.7
S6.004	55.00	6.07	33.405	0.185	0.0	0.0	0.0	1.01	633.0	27.6
S6.005	53.42	6.48	32.105	0.219	0.0	0.0	0.0	1.13	709.4	31.7
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	60.78	4.79	27.682	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.007	57.22	5.54	27.510	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.008	56.25	5.77	27.330	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.009	55.94	5.84	27.277	0.000	24.5	0.0	0.0	0.99	70.0	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.595	Open Manhole	600	S6.000	37.005					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.595	Open Manhole	600	S6.001	34.965		S6.000	35.015		50
								S7.000	34.965	150	
S3.03	34.870	0.595	Open Manhole	600	S6.002	34.275		S6.001	34.275		
S2.15	34.550	0.595	Open Manhole	600	S6.003	33.955		S6.002	33.955		
S2.16	34.000	0.595	Open Manhole	600	S6.004	33.405		S6.003	33.405		
S2.17	32.700	0.595	Open Manhole	600	S6.005	32.105		S6.004	32.105		
STANK	31.754	2.954	Open Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2400	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.855		2726
								S8.000	28.349	450	
S5.08	31.250	3.568	Open Manhole	1350	S1.006	27.682	300	S1.005	27.757	225	
S5.09	30.350	2.840	Open Manhole	1350	S1.007	27.510	300	S1.006	27.510	300	
S5.10	29.750	2.420	Open Manhole	1200	S1.008	27.330	300	S1.007	27.330	300	
S5.11	29.630	2.353	Open Manhole	1350	S1.009	27.277	300	S1.008	27.277	300	
S	31.000	3.741	Open Manhole	0		OUTFALL		S1.009	27.259	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106	384601.360	399450.106	Required	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5.08	384591.210	399465.019	384591.210	399465.019	Required	
S5.09	384553.441	399444.356	384553.441	399444.356	Required	
S5.10	384514.464	399422.066	384514.464	399422.066	Required	
S5.11	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	



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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.028	0.028	0.028
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.014	0.014	0.014
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.014	0.014	0.014
3.002	-	-	100	0.056	0.056	0.056
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.043	0.043	0.043
4.001	-	-	100	0.014	0.014	0.014
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.073	0.073	0.073
5.000	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.063	0.063	0.063
7.000	-	-	100	0.018	0.018	0.018
6.001	-	-	100	0.023	0.023	0.023
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.022	0.022	0.022
6.004	-	-	100	0.046	0.046	0.046
6.005	-	-	100	0.034	0.034	0.034
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.508	0.508	0.508

Free Flowing Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	31.000	27.259	0.000	0	0

Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 36.4

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.5
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	37.005		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.965		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	38.7
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.275		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	25.2
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.955		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.405		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30
Membrane Percolation (mm/hr)	10000	Invert Level (m)	32.105
Max Percolation (l/s)	345.7	Width (m)	4.5

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Porous Car Park Pipe: S6.005

Length (m) 27.7 Evaporation (mm/day) 3
Slope (1:X) 22.1 Membrane Depth (mm) 150
Depression Storage (mm) 5

Under Drain Details
Depth above Invert Level (m) 0.000 Number of Pipes 1
Diameter (m) 0.225 Manning's N 0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m) 28.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%					32.352	-0.098
S1.001	S2.01	15 Summer	2	+0%					32.227	-0.098
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.064	-0.094
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.553	-0.104
S1.004	S2.05	15 Winter	2	+0%	2/15 Summer				29.160	0.385
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Winter	2	+0%					32.844	-0.109
S3.002	S2.08	15 Winter	2	+0%					32.299	-0.156
S3.003	S2.09	15 Winter	2	+0%					32.007	-0.176
S4.000	S2.10	15 Winter	2	+0%					31.074	-0.151
S4.001	S2.11	15 Winter	2	+0%					31.041	-0.148
S3.004	S2.12	15 Winter	2	+0%					30.976	-0.149
S3.005	S2.13	15 Winter	2	+0%	30/15 Summer				29.164	-0.106
S5.000	S2.14	15 Winter	2	+0%	2/15 Summer				29.157	0.311
S6.000	S3.00	15 Winter	2	+0%					37.031	-0.419
S7.000	S3.01	15 Summer	2	+0%					35.064	-0.101
S6.001	S3.02	15 Winter	2	+0%					35.002	-0.408
S6.002	S3.03	15 Winter	2	+0%					34.317	-0.403
S6.003	S2.15	15 Winter	2	+0%					33.995	-0.405
S6.004	S2.16	15 Winter	2	+0%					33.453	-0.397
S6.005	S2.17	15 Winter	2	+0%					32.153	-0.397
S8.000	STANK	30 Winter	2	+0%	30/30 Winter				28.915	-0.335
S1.005	S2.18	15 Winter	2	+0%	2/15 Summer				29.157	0.583
S1.006	S5.08	60 Winter	2	+0%					27.804	-0.178
S1.007	S5.09	60 Winter	2	+0%					27.631	-0.178
S1.008	S5.10	60 Winter	2	+0%					27.463	-0.167
S1.009	S5.11	60 Winter	2	+0%					27.422	-0.154

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.26			4.7	OK	
S1.001	S2.01	0.000	0.26			4.7	OK	
S1.002	S2.02	0.000	0.29			6.4	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.20			7.5	OK	
S1.004	S2.05	0.000	0.09			5.5	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.16			6.7	OK	
S3.002	S2.08	0.000	0.20			14.1	OK	
S3.003	S2.09	0.000	0.11			14.0	OK	
S4.000	S2.10	0.000	0.24			7.2	OK	
S4.001	S2.11	0.000	0.25			9.0	OK	
S3.004	S2.12	0.000	0.25			24.4	OK	
S3.005	S2.13	0.000	0.09			33.7	OK	
S5.000	S2.14	0.000	0.01			2.4	SURCHARGED	

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S3.00	0.000	0.02		5	10.5	OK	
S7.000	S3.01	0.000	0.24			3.0	OK	
S6.001	S3.02	0.000	0.03		5	16.1	OK	
S6.002	S3.03	0.000	0.03		6	17.9	OK	
S6.003	S2.15	0.000	0.03		6	20.5	OK	
S6.004	S2.16	0.000	0.04		7	25.8	OK	
S6.005	S2.17	0.000	0.04		7	29.3	OK	
S8.000	STANK	0.000	0.05		9	13.8	OK	
S1.005	S2.18	0.000	0.22			22.7	SURCHARGED	
S1.006	S5.08	0.000	0.35			22.7	OK	
S1.007	S5.09	0.000	0.35			22.7	OK	
S1.008	S5.10	0.000	0.39			22.7	OK	
S1.009	S5.11	0.000	0.48			22.7	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%					32.375	-0.075
S1.001	S2.01	15 Summer	30	+0%					32.249	-0.076
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.093	-0.066
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.574	-0.083
S1.004	S2.05	15 Summer	30	+0%	2/15 Summer				29.354	0.579
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.863	-0.090
S3.002	S2.08	15 Summer	30	+0%					32.336	-0.119
S3.003	S2.09	15 Summer	30	+0%					32.032	-0.151
S4.000	S2.10	15 Winter	30	+0%					31.106	-0.119
S4.001	S2.11	15 Summer	30	+0%					31.077	-0.112
S3.004	S2.12	15 Summer	30	+0%					31.018	-0.107
S3.005	S2.13	15 Summer	30	+0%	30/15 Summer				29.374	0.104
S5.000	S2.14	15 Summer	30	+0%	2/15 Summer				29.341	0.495
S6.000	S3.00	15 Winter	30	+0%					37.043	-0.407
S7.000	S3.01	15 Winter	30	+0%					35.085	-0.080
S6.001	S3.02	15 Summer	30	+0%					35.021	-0.389
S6.002	S3.03	15 Winter	30	+0%					34.337	-0.383
S6.003	S2.15	15 Winter	30	+0%					34.016	-0.384
S6.004	S2.16	15 Winter	30	+0%					33.478	-0.372
S6.005	S2.17	15 Winter	30	+0%					32.178	-0.372
S8.000	STANK	60 Winter	30	+0%	30/30 Winter				29.297	0.047
S1.005	S2.18	15 Summer	30	+0%	2/15 Summer				29.340	0.766
S1.006	S5.08	240 Winter	30	+0%					27.804	-0.178
S1.007	S5.09	240 Winter	30	+0%					27.631	-0.178
S1.008	S5.10	240 Winter	30	+0%					27.464	-0.167
S1.009	S5.11	240 Winter	30	+0%					27.422	-0.154

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.50			8.8	OK	
S1.001	S2.01	0.000	0.49			8.8	OK	
S1.002	S2.02	0.000	0.59			13.1	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.41			15.2	OK	
S1.004	S2.05	0.000	0.24			15.0	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.33			13.6	OK	
S3.002	S2.08	0.000	0.45			31.2	OK	
S3.003	S2.09	0.000	0.24			31.2	OK	
S4.000	S2.10	0.000	0.45			13.6	OK	
S4.001	S2.11	0.000	0.50			18.0	OK	
S3.004	S2.12	0.000	0.53			52.6	OK	
S3.005	S2.13	0.000	0.20			69.9	SURCHARGED	
S5.000	S2.14	0.000	0.01			2.3	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S3.00	0.000	0.03		5	19.9	OK	
S7.000	S3.01	0.000	0.44			5.7	OK	
S6.001	S3.02	0.000	0.05		4	31.6	OK	
S6.002	S3.03	0.000	0.07		6	34.8	OK	
S6.003	S2.15	0.000	0.06		6	40.1	OK	
S6.004	S2.16	0.000	0.08		6	52.1	OK	
S6.005	S2.17	0.000	0.08		6	58.5	OK	
S8.000	STANK	0.000	0.06		32	18.3	SURCHARGED	
S1.005	S2.18	0.000	0.22			22.7	SURCHARGED	
S1.006	S5.08	0.000	0.35			22.7	OK	
S1.007	S5.09	0.000	0.35			22.7	OK	
S1.008	S5.10	0.000	0.39			22.7	OK	
S1.009	S5.11	0.000	0.48			22.7	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%					32.431	-0.019
S1.001	S2.01	15 Winter	100	+45%					32.325	0.000
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.205	0.046
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.603	-0.054
S1.004	S2.05	60 Winter	100	+45%	2/15 Summer				30.239	1.464
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.889	-0.064
S3.002	S2.08	15 Summer	100	+45%					32.389	-0.066
S3.003	S2.09	15 Summer	100	+45%					32.063	-0.120
S4.000	S2.10	15 Winter	100	+45%					31.160	-0.065
S4.001	S2.11	15 Summer	100	+45%					31.141	-0.048
S3.004	S2.12	15 Summer	100	+45%					31.085	-0.040
S3.005	S2.13	60 Winter	100	+45%	30/15 Summer				30.241	0.971
S5.000	S2.14	60 Winter	100	+45%	2/15 Summer				30.237	1.391
S6.000	S3.00	15 Winter	100	+45%					37.060	-0.390
S7.000	S3.01	15 Winter	100	+45%					35.120	-0.045
S6.001	S3.02	15 Summer	100	+45%					35.046	-0.364
S6.002	S3.03	15 Winter	100	+45%					34.366	-0.354
S6.003	S2.15	15 Winter	100	+45%					34.044	-0.356
S6.004	S2.16	15 Winter	100	+45%					33.512	-0.338
S6.005	S2.17	15 Winter	100	+45%					32.213	-0.337
S8.000	STANK	60 Winter	100	+45%	30/30 Winter				30.235	0.985
S1.005	S2.18	60 Winter	100	+45%	2/15 Summer				30.237	1.663
S1.006	S5.08	720 Winter	100	+45%					27.804	-0.178
S1.007	S5.09	720 Winter	100	+45%					27.631	-0.178
S1.008	S5.10	720 Winter	100	+45%					27.464	-0.167
S1.009	S5.11	720 Winter	100	+45%					27.422	-0.154

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.93			16.4	OK	
S1.001	S2.01	0.000	0.86			15.6	OK	
S1.002	S2.02	0.000	1.05			23.0	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.73			26.8	OK	
S1.004	S2.05	0.000	0.21			13.4	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.63			25.4	OK	
S3.002	S2.08	0.000	0.84			58.4	OK	
S3.003	S2.09	0.000	0.44			58.4	OK	
S4.000	S2.10	0.000	0.85			25.4	OK	
S4.001	S2.11	0.000	0.94			33.6	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.004	S2.12	0.000	1.00			98.4	OK	
S3.005	S2.13	0.000	0.19			68.3	SURCHARGED	
S5.000	S2.14	0.000	0.00			0.5	SURCHARGED	
S6.000	S3.00	0.000	0.05		5	37.2	OK	
S7.000	S3.01	0.000	0.83			10.6	OK	
S6.001	S3.02	0.000	0.10		4	59.5	OK	
S6.002	S3.03	0.000	0.13		6	65.7	OK	
S6.003	S2.15	0.000	0.12		5	75.9	OK	
S6.004	S2.16	0.000	0.16		6	98.6	OK	
S6.005	S2.17	0.000	0.16		6	110.3	OK	
S8.000	STANK	0.000	0.06			18.4	SURCHARGED	
S1.005	S2.18	0.000	0.22			22.6	SURCHARGED	
S1.006	S5.08	0.000	0.35			22.7	OK	
S1.007	S5.09	0.000	0.35			22.7	OK	
S1.008	S5.10	0.000	0.39			22.7	OK	
S1.009	S5.11	0.000	0.48			22.7	OK	

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APPENDIX H – SW Calcs 30year Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	79.8	0.028	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.056	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.043	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.014	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.073	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.000	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	1.990	22.5	0.063	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.050	140.0	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
S6.001	20.393	0.690	29.6	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.320	38.7	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.550	25.2	0.022	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.046	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.034	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	64.23	4.15	32.300	0.028	0.0	0.0	0.0	1.13	19.9	4.9
S1.001	63.12	4.34	32.175	0.028	0.0	0.0	0.0	1.12	19.9	4.9
S1.002	61.06	4.73	32.009	0.042	0.0	0.0	0.0	1.30	23.0	6.9
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.049	0.0	0.0	0.0	2.21	39.0	8.0
S1.004	60.01	4.94	28.550	0.049	0.0	0.0	0.0	2.46	97.8	8.0
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.043	0.0	0.0	0.0	2.69	47.6	7.5
S3.002	63.55	4.27	32.230	0.099	0.0	0.0	0.0	2.08	82.5	17.0
S3.003	63.25	4.32	31.958	0.099	0.0	0.0	0.0	3.88	154.4	17.0
S4.000	64.97	4.02	31.000	0.043	0.0	0.0	0.0	1.69	67.0	7.6
S4.001	64.71	4.06	30.964	0.057	0.0	0.0	0.0	1.62	64.3	10.0
S3.004	62.18	4.52	30.900	0.167	0.0	0.0	0.0	2.65	105.6	28.1
S3.005	61.24	4.70	28.820	0.240	0.0	0.0	0.0	2.63	418.0	39.8
S5.000	64.68	4.07	28.396	0.000	0.0	0.0	0.0	1.67	265.0	0.0
S6.000	61.40	4.67	37.005	0.063	0.0	0.0	0.0	1.12	704.1	10.5
S7.000	64.29	4.14	35.015	0.018	0.0	0.0	0.0	0.85	15.0	3.1
S6.001	59.66	5.01	34.965	0.104	0.0	0.0	0.0	0.98	613.8	16.8
S6.002	58.51	5.26	34.275	0.117	0.0	0.0	0.0	0.85	536.3	18.5
S6.003	57.52	5.47	33.955	0.139	0.0	0.0	0.0	1.06	664.2	21.7
S6.004	55.00	6.07	33.405	0.185	0.0	0.0	0.0	1.01	633.0	27.6
S6.005	53.42	6.48	32.105	0.219	0.0	0.0	0.0	1.13	709.4	31.7
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	60.78	4.79	27.682	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.007	57.22	5.54	27.510	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.008	56.25	5.77	27.330	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.009	55.94	5.84	27.277	0.000	24.5	0.0	0.0	0.99	70.0	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.595	Open Manhole	600	S6.000	37.005					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.595	Open Manhole	600	S6.001	34.965		S6.000	35.015		50
								S7.000	34.965	150	
S3.03	34.870	0.595	Open Manhole	600	S6.002	34.275		S6.001	34.275		
S2.15	34.550	0.595	Open Manhole	600	S6.003	33.955		S6.002	33.955		
S2.16	34.000	0.595	Open Manhole	600	S6.004	33.405		S6.003	33.405		
S2.17	32.700	0.595	Open Manhole	600	S6.005	32.105		S6.004	32.105		
STANK	31.754	2.954	Open Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2400	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.855		2726
								S8.000	28.349	450	
S5.08	31.250	3.568	Open Manhole	1350	S1.006	27.682	300	S1.005	27.757	225	
S5.09	30.350	2.840	Open Manhole	1350	S1.007	27.510	300	S1.006	27.510	300	
S5.10	29.750	2.420	Open Manhole	1200	S1.008	27.330	300	S1.007	27.330	300	
S5.11	29.630	2.353	Open Manhole	1350	S1.009	27.277	300	S1.008	27.277	300	
S	31.000	3.741	Open Manhole	0		OUTFALL		S1.009	27.259	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106	384601.360	399450.106	Required	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5.08	384591.210	399465.019	384591.210	399465.019	Required	
S5.09	384553.441	399444.356	384553.441	399444.356	Required	
S5.10	384514.464	399422.066	384514.464	399422.066	Required	
S5.11	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	



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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.028	0.028	0.028
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.014	0.014	0.014
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.014	0.014	0.014
3.002	-	-	100	0.056	0.056	0.056
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.043	0.043	0.043
4.001	-	-	100	0.014	0.014	0.014
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.073	0.073	0.073
5.000	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.063	0.063	0.063
7.000	-	-	100	0.018	0.018	0.018
6.001	-	-	100	0.023	0.023	0.023
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.022	0.022	0.022
6.004	-	-	100	0.046	0.046	0.046
6.005	-	-	100	0.034	0.034	0.034
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.508	0.508	0.508

Surcharged Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	31.000	27.259	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	30.400	33	30.400	65	30.400	97	30.400	129	30.400	161	30.400	193	30.400
2	30.400	34	30.400	66	30.400	98	30.400	130	30.400	162	30.400	194	30.400
3	30.400	35	30.400	67	30.400	99	30.400	131	30.400	163	30.400	195	30.400
4	30.400	36	30.400	68	30.400	100	30.400	132	30.400	164	30.400	196	30.400
5	30.400	37	30.400	69	30.400	101	30.400	133	30.400	165	30.400	197	30.400
6	30.400	38	30.400	70	30.400	102	30.400	134	30.400	166	30.400	198	30.400
7	30.400	39	30.400	71	30.400	103	30.400	135	30.400	167	30.400	199	30.400
8	30.400	40	30.400	72	30.400	104	30.400	136	30.400	168	30.400	200	30.400
9	30.400	41	30.400	73	30.400	105	30.400	137	30.400	169	30.400	201	30.400
10	30.400	42	30.400	74	30.400	106	30.400	138	30.400	170	30.400	202	30.400
11	30.400	43	30.400	75	30.400	107	30.400	139	30.400	171	30.400	203	30.400
12	30.400	44	30.400	76	30.400	108	30.400	140	30.400	172	30.400	204	30.400
13	30.400	45	30.400	77	30.400	109	30.400	141	30.400	173	30.400	205	30.400
14	30.400	46	30.400	78	30.400	110	30.400	142	30.400	174	30.400	206	30.400
15	30.400	47	30.400	79	30.400	111	30.400	143	30.400	175	30.400	207	30.400
16	30.400	48	30.400	80	30.400	112	30.400	144	30.400	176	30.400	208	30.400
17	30.400	49	30.400	81	30.400	113	30.400	145	30.400	177	30.400	209	30.400
18	30.400	50	30.400	82	30.400	114	30.400	146	30.400	178	30.400	210	30.400
19	30.400	51	30.400	83	30.400	115	30.400	147	30.400	179	30.400	211	30.400
20	30.400	52	30.400	84	30.400	116	30.400	148	30.400	180	30.400	212	30.400
21	30.400	53	30.400	85	30.400	117	30.400	149	30.400	181	30.400	213	30.400
22	30.400	54	30.400	86	30.400	118	30.400	150	30.400	182	30.400	214	30.400
23	30.400	55	30.400	87	30.400	119	30.400	151	30.400	183	30.400	215	30.400
24	30.400	56	30.400	88	30.400	120	30.400	152	30.400	184	30.400	216	30.400
25	30.400	57	30.400	89	30.400	121	30.400	153	30.400	185	30.400	217	30.400
26	30.400	58	30.400	90	30.400	122	30.400	154	30.400	186	30.400	218	30.400
27	30.400	59	30.400	91	30.400	123	30.400	155	30.400	187	30.400	219	30.400
28	30.400	60	30.400	92	30.400	124	30.400	156	30.400	188	30.400	220	30.400
29	30.400	61	30.400	93	30.400	125	30.400	157	30.400	189	30.400	221	30.400
30	30.400	62	30.400	94	30.400	126	30.400	158	30.400	190	30.400	222	30.400
31	30.400	63	30.400	95	30.400	127	30.400	159	30.400	191	30.400	223	30.400
32	30.400	64	30.400	96	30.400	128	30.400	160	30.400	192	30.400	224	30.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
225	30.400	303	30.400	381	30.400	459	30.400	537	30.400	615	30.400	693	30.400
226	30.400	304	30.400	382	30.400	460	30.400	538	30.400	616	30.400	694	30.400
227	30.400	305	30.400	383	30.400	461	30.400	539	30.400	617	30.400	695	30.400
228	30.400	306	30.400	384	30.400	462	30.400	540	30.400	618	30.400	696	30.400
229	30.400	307	30.400	385	30.400	463	30.400	541	30.400	619	30.400	697	30.400
230	30.400	308	30.400	386	30.400	464	30.400	542	30.400	620	30.400	698	30.400
231	30.400	309	30.400	387	30.400	465	30.400	543	30.400	621	30.400	699	30.400
232	30.400	310	30.400	388	30.400	466	30.400	544	30.400	622	30.400	700	30.400
233	30.400	311	30.400	389	30.400	467	30.400	545	30.400	623	30.400	701	30.400
234	30.400	312	30.400	390	30.400	468	30.400	546	30.400	624	30.400	702	30.400
235	30.400	313	30.400	391	30.400	469	30.400	547	30.400	625	30.400	703	30.400
236	30.400	314	30.400	392	30.400	470	30.400	548	30.400	626	30.400	704	30.400
237	30.400	315	30.400	393	30.400	471	30.400	549	30.400	627	30.400	705	30.400
238	30.400	316	30.400	394	30.400	472	30.400	550	30.400	628	30.400	706	30.400
239	30.400	317	30.400	395	30.400	473	30.400	551	30.400	629	30.400	707	30.400
240	30.400	318	30.400	396	30.400	474	30.400	552	30.400	630	30.400	708	30.400
241	30.400	319	30.400	397	30.400	475	30.400	553	30.400	631	30.400	709	30.400
242	30.400	320	30.400	398	30.400	476	30.400	554	30.400	632	30.400	710	30.400
243	30.400	321	30.400	399	30.400	477	30.400	555	30.400	633	30.400	711	30.400
244	30.400	322	30.400	400	30.400	478	30.400	556	30.400	634	30.400	712	30.400
245	30.400	323	30.400	401	30.400	479	30.400	557	30.400	635	30.400	713	30.400
246	30.400	324	30.400	402	30.400	480	30.400	558	30.400	636	30.400	714	30.400
247	30.400	325	30.400	403	30.400	481	30.400	559	30.400	637	30.400	715	30.400
248	30.400	326	30.400	404	30.400	482	30.400	560	30.400	638	30.400	716	30.400
249	30.400	327	30.400	405	30.400	483	30.400	561	30.400	639	30.400	717	30.400
250	30.400	328	30.400	406	30.400	484	30.400	562	30.400	640	30.400	718	30.400
251	30.400	329	30.400	407	30.400	485	30.400	563	30.400	641	30.400	719	30.400
252	30.400	330	30.400	408	30.400	486	30.400	564	30.400	642	30.400	720	30.400
253	30.400	331	30.400	409	30.400	487	30.400	565	30.400	643	30.400	721	30.400
254	30.400	332	30.400	410	30.400	488	30.400	566	30.400	644	30.400	722	30.400
255	30.400	333	30.400	411	30.400	489	30.400	567	30.400	645	30.400	723	30.400
256	30.400	334	30.400	412	30.400	490	30.400	568	30.400	646	30.400	724	30.400
257	30.400	335	30.400	413	30.400	491	30.400	569	30.400	647	30.400	725	30.400
258	30.400	336	30.400	414	30.400	492	30.400	570	30.400	648	30.400	726	30.400
259	30.400	337	30.400	415	30.400	493	30.400	571	30.400	649	30.400	727	30.400
260	30.400	338	30.400	416	30.400	494	30.400	572	30.400	650	30.400	728	30.400
261	30.400	339	30.400	417	30.400	495	30.400	573	30.400	651	30.400	729	30.400
262	30.400	340	30.400	418	30.400	496	30.400	574	30.400	652	30.400	730	30.400
263	30.400	341	30.400	419	30.400	497	30.400	575	30.400	653	30.400	731	30.400
264	30.400	342	30.400	420	30.400	498	30.400	576	30.400	654	30.400	732	30.400
265	30.400	343	30.400	421	30.400	499	30.400	577	30.400	655	30.400	733	30.400
266	30.400	344	30.400	422	30.400	500	30.400	578	30.400	656	30.400	734	30.400
267	30.400	345	30.400	423	30.400	501	30.400	579	30.400	657	30.400	735	30.400
268	30.400	346	30.400	424	30.400	502	30.400	580	30.400	658	30.400	736	30.400
269	30.400	347	30.400	425	30.400	503	30.400	581	30.400	659	30.400	737	30.400
270	30.400	348	30.400	426	30.400	504	30.400	582	30.400	660	30.400	738	30.400
271	30.400	349	30.400	427	30.400	505	30.400	583	30.400	661	30.400	739	30.400
272	30.400	350	30.400	428	30.400	506	30.400	584	30.400	662	30.400	740	30.400
273	30.400	351	30.400	429	30.400	507	30.400	585	30.400	663	30.400	741	30.400
274	30.400	352	30.400	430	30.400	508	30.400	586	30.400	664	30.400	742	30.400
275	30.400	353	30.400	431	30.400	509	30.400	587	30.400	665	30.400	743	30.400
276	30.400	354	30.400	432	30.400	510	30.400	588	30.400	666	30.400	744	30.400
277	30.400	355	30.400	433	30.400	511	30.400	589	30.400	667	30.400	745	30.400
278	30.400	356	30.400	434	30.400	512	30.400	590	30.400	668	30.400	746	30.400
279	30.400	357	30.400	435	30.400	513	30.400	591	30.400	669	30.400	747	30.400
280	30.400	358	30.400	436	30.400	514	30.400	592	30.400	670	30.400	748	30.400
281	30.400	359	30.400	437	30.400	515	30.400	593	30.400	671	30.400	749	30.400
282	30.400	360	30.400	438	30.400	516	30.400	594	30.400	672	30.400	750	30.400
283	30.400	361	30.400	439	30.400	517	30.400	595	30.400	673	30.400	751	30.400
284	30.400	362	30.400	440	30.400	518	30.400	596	30.400	674	30.400	752	30.400
285	30.400	363	30.400	441	30.400	519	30.400	597	30.400	675	30.400	753	30.400
286	30.400	364	30.400	442	30.400	520	30.400	598	30.400	676	30.400	754	30.400
287	30.400	365	30.400	443	30.400	521	30.400	599	30.400	677	30.400	755	30.400
288	30.400	366	30.400	444	30.400	522	30.400	600	30.400	678	30.400	756	30.400
289	30.400	367	30.400	445	30.400	523	30.400	601	30.400	679	30.400	757	30.400
290	30.400	368	30.400	446	30.400	524	30.400	602	30.400	680	30.400	758	30.400
291	30.400	369	30.400	447	30.400	525	30.400	603	30.400	681	30.400	759	30.400
292	30.400	370	30.400	448	30.400	526	30.400	604	30.400	682	30.400	760	30.400
293	30.400	371	30.400	449	30.400	527	30.400	605	30.400	683	30.400	761	30.400
294	30.400	372	30.400	450	30.400	528	30.400	606	30.400	684	30.400	762	30.400
295	30.400	373	30.400	451	30.400	529	30.400	607	30.400	685	30.400	763	30.400
296	30.400	374	30.400	452	30.400	530	30.400	608	30.400	686	30.400	764	30.400
297	30.400	375	30.400	453	30.400	531	30.400	609	30.400	687	30.400	765	30.400
298	30.400	376	30.400	454	30.400	532	30.400	610	30.400	688	30.400	766	30.400
299	30.400	377	30.400	455	30.400	533	30.400	611	30.400	689	30.400	767	30.400
300	30.400	378	30.400	456	30.400	534	30.400	612	30.400	690	30.400	768	30.400
301	30.400	379	30.400	457	30.400	535	30.400	613	30.400	691	30.400	769	30.400
302	30.400	380	30.400	458	30.400	536	30.400	614	30.400	692	30.400	770	30.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
771	30.400	849	30.400	927	30.400	1005	30.400	1083	30.400	1161	30.400	1239	30.400
772	30.400	850	30.400	928	30.400	1006	30.400	1084	30.400	1162	30.400	1240	30.400
773	30.400	851	30.400	929	30.400	1007	30.400	1085	30.400	1163	30.400	1241	30.400
774	30.400	852	30.400	930	30.400	1008	30.400	1086	30.400	1164	30.400	1242	30.400
775	30.400	853	30.400	931	30.400	1009	30.400	1087	30.400	1165	30.400	1243	30.400
776	30.400	854	30.400	932	30.400	1010	30.400	1088	30.400	1166	30.400	1244	30.400
777	30.400	855	30.400	933	30.400	1011	30.400	1089	30.400	1167	30.400	1245	30.400
778	30.400	856	30.400	934	30.400	1012	30.400	1090	30.400	1168	30.400	1246	30.400
779	30.400	857	30.400	935	30.400	1013	30.400	1091	30.400	1169	30.400	1247	30.400
780	30.400	858	30.400	936	30.400	1014	30.400	1092	30.400	1170	30.400	1248	30.400
781	30.400	859	30.400	937	30.400	1015	30.400	1093	30.400	1171	30.400	1249	30.400
782	30.400	860	30.400	938	30.400	1016	30.400	1094	30.400	1172	30.400	1250	30.400
783	30.400	861	30.400	939	30.400	1017	30.400	1095	30.400	1173	30.400	1251	30.400
784	30.400	862	30.400	940	30.400	1018	30.400	1096	30.400	1174	30.400	1252	30.400
785	30.400	863	30.400	941	30.400	1019	30.400	1097	30.400	1175	30.400	1253	30.400
786	30.400	864	30.400	942	30.400	1020	30.400	1098	30.400	1176	30.400	1254	30.400
787	30.400	865	30.400	943	30.400	1021	30.400	1099	30.400	1177	30.400	1255	30.400
788	30.400	866	30.400	944	30.400	1022	30.400	1100	30.400	1178	30.400	1256	30.400
789	30.400	867	30.400	945	30.400	1023	30.400	1101	30.400	1179	30.400	1257	30.400
790	30.400	868	30.400	946	30.400	1024	30.400	1102	30.400	1180	30.400	1258	30.400
791	30.400	869	30.400	947	30.400	1025	30.400	1103	30.400	1181	30.400	1259	30.400
792	30.400	870	30.400	948	30.400	1026	30.400	1104	30.400	1182	30.400	1260	30.400
793	30.400	871	30.400	949	30.400	1027	30.400	1105	30.400	1183	30.400	1261	30.400
794	30.400	872	30.400	950	30.400	1028	30.400	1106	30.400	1184	30.400	1262	30.400
795	30.400	873	30.400	951	30.400	1029	30.400	1107	30.400	1185	30.400	1263	30.400
796	30.400	874	30.400	952	30.400	1030	30.400	1108	30.400	1186	30.400	1264	30.400
797	30.400	875	30.400	953	30.400	1031	30.400	1109	30.400	1187	30.400	1265	30.400
798	30.400	876	30.400	954	30.400	1032	30.400	1110	30.400	1188	30.400	1266	30.400
799	30.400	877	30.400	955	30.400	1033	30.400	1111	30.400	1189	30.400	1267	30.400
800	30.400	878	30.400	956	30.400	1034	30.400	1112	30.400	1190	30.400	1268	30.400
801	30.400	879	30.400	957	30.400	1035	30.400	1113	30.400	1191	30.400	1269	30.400
802	30.400	880	30.400	958	30.400	1036	30.400	1114	30.400	1192	30.400	1270	30.400
803	30.400	881	30.400	959	30.400	1037	30.400	1115	30.400	1193	30.400	1271	30.400
804	30.400	882	30.400	960	30.400	1038	30.400	1116	30.400	1194	30.400	1272	30.400
805	30.400	883	30.400	961	30.400	1039	30.400	1117	30.400	1195	30.400	1273	30.400
806	30.400	884	30.400	962	30.400	1040	30.400	1118	30.400	1196	30.400	1274	30.400
807	30.400	885	30.400	963	30.400	1041	30.400	1119	30.400	1197	30.400	1275	30.400
808	30.400	886	30.400	964	30.400	1042	30.400	1120	30.400	1198	30.400	1276	30.400
809	30.400	887	30.400	965	30.400	1043	30.400	1121	30.400	1199	30.400	1277	30.400
810	30.400	888	30.400	966	30.400	1044	30.400	1122	30.400	1200	30.400	1278	30.400
811	30.400	889	30.400	967	30.400	1045	30.400	1123	30.400	1201	30.400	1279	30.400
812	30.400	890	30.400	968	30.400	1046	30.400	1124	30.400	1202	30.400	1280	30.400
813	30.400	891	30.400	969	30.400	1047	30.400	1125	30.400	1203	30.400	1281	30.400
814	30.400	892	30.400	970	30.400	1048	30.400	1126	30.400	1204	30.400	1282	30.400
815	30.400	893	30.400	971	30.400	1049	30.400	1127	30.400	1205	30.400	1283	30.400
816	30.400	894	30.400	972	30.400	1050	30.400	1128	30.400	1206	30.400	1284	30.400
817	30.400	895	30.400	973	30.400	1051	30.400	1129	30.400	1207	30.400	1285	30.400
818	30.400	896	30.400	974	30.400	1052	30.400	1130	30.400	1208	30.400	1286	30.400
819	30.400	897	30.400	975	30.400	1053	30.400	1131	30.400	1209	30.400	1287	30.400
820	30.400	898	30.400	976	30.400	1054	30.400	1132	30.400	1210	30.400	1288	30.400
821	30.400	899	30.400	977	30.400	1055	30.400	1133	30.400	1211	30.400	1289	30.400
822	30.400	900	30.400	978	30.400	1056	30.400	1134	30.400	1212	30.400	1290	30.400
823	30.400	901	30.400	979	30.400	1057	30.400	1135	30.400	1213	30.400	1291	30.400
824	30.400	902	30.400	980	30.400	1058	30.400	1136	30.400	1214	30.400	1292	30.400
825	30.400	903	30.400	981	30.400	1059	30.400	1137	30.400	1215	30.400	1293	30.400
826	30.400	904	30.400	982	30.400	1060	30.400	1138	30.400	1216	30.400	1294	30.400
827	30.400	905	30.400	983	30.400	1061	30.400	1139	30.400	1217	30.400	1295	30.400
828	30.400	906	30.400	984	30.400	1062	30.400	1140	30.400	1218	30.400	1296	30.400
829	30.400	907	30.400	985	30.400	1063	30.400	1141	30.400	1219	30.400	1297	30.400
830	30.400	908	30.400	986	30.400	1064	30.400	1142	30.400	1220	30.400	1298	30.400
831	30.400	909	30.400	987	30.400	1065	30.400	1143	30.400	1221	30.400	1299	30.400
832	30.400	910	30.400	988	30.400	1066	30.400	1144	30.400	1222	30.400	1300	30.400
833	30.400	911	30.400	989	30.400	1067	30.400	1145	30.400	1223	30.400	1301	30.400
834	30.400	912	30.400	990	30.400	1068	30.400	1146	30.400	1224	30.400	1302	30.400
835	30.400	913	30.400	991	30.400	1069	30.400	1147	30.400	1225	30.400	1303	30.400
836	30.400	914	30.400	992	30.400	1070	30.400	1148	30.400	1226	30.400	1304	30.400
837	30.400	915	30.400	993	30.400	1071	30.400	1149	30.400	1227	30.400	1305	30.400
838	30.400	916	30.400	994	30.400	1072	30.400	1150	30.400	1228	30.400	1306	30.400
839	30.400	917	30.400	995	30.400	1073	30.400	1151	30.400	1229	30.400	1307	30.400
840	30.400	918	30.400	996	30.400	1074	30.400	1152	30.400	1230	30.400	1308	30.400
841	30.400	919	30.400	997	30.400	1075	30.400	1153	30.400	1231	30.400	1309	30.400
842	30.400	920	30.400	998	30.400	1076	30.400	1154	30.400	1232	30.400	1310	30.400
843	30.400	921	30.400	999	30.400	1077	30.400	1155	30.400	1233	30.400	1311	30.400
844	30.400	922	30.400	1000	30.400	1078	30.400	1156	30.400	1234	30.400	1312	30.400
845	30.400	923	30.400	1001	30.400	1079	30.400	1157	30.400	1235	30.400	1313	30.400
846	30.400	924	30.400	1002	30.400	1080	30.400	1158	30.400	1236	30.400	1314	30.400
847	30.400	925	30.400	1003	30.400	1081	30.400	1159	30.400	1237	30.400	1315	30.400
848	30.400	926	30.400	1004	30.400	1082	30.400	1160	30.400	1238	30.400	1316	30.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1317	30.400	1395	30.400	1473	30.400	1551	30.400	1629	30.400	1707	30.400	1785	30.400
1318	30.400	1396	30.400	1474	30.400	1552	30.400	1630	30.400	1708	30.400	1786	30.400
1319	30.400	1397	30.400	1475	30.400	1553	30.400	1631	30.400	1709	30.400	1787	30.400
1320	30.400	1398	30.400	1476	30.400	1554	30.400	1632	30.400	1710	30.400	1788	30.400
1321	30.400	1399	30.400	1477	30.400	1555	30.400	1633	30.400	1711	30.400	1789	30.400
1322	30.400	1400	30.400	1478	30.400	1556	30.400	1634	30.400	1712	30.400	1790	30.400
1323	30.400	1401	30.400	1479	30.400	1557	30.400	1635	30.400	1713	30.400	1791	30.400
1324	30.400	1402	30.400	1480	30.400	1558	30.400	1636	30.400	1714	30.400	1792	30.400
1325	30.400	1403	30.400	1481	30.400	1559	30.400	1637	30.400	1715	30.400	1793	30.400
1326	30.400	1404	30.400	1482	30.400	1560	30.400	1638	30.400	1716	30.400	1794	30.400
1327	30.400	1405	30.400	1483	30.400	1561	30.400	1639	30.400	1717	30.400	1795	30.400
1328	30.400	1406	30.400	1484	30.400	1562	30.400	1640	30.400	1718	30.400	1796	30.400
1329	30.400	1407	30.400	1485	30.400	1563	30.400	1641	30.400	1719	30.400	1797	30.400
1330	30.400	1408	30.400	1486	30.400	1564	30.400	1642	30.400	1720	30.400	1798	30.400
1331	30.400	1409	30.400	1487	30.400	1565	30.400	1643	30.400	1721	30.400	1799	30.400
1332	30.400	1410	30.400	1488	30.400	1566	30.400	1644	30.400	1722	30.400	1800	30.400
1333	30.400	1411	30.400	1489	30.400	1567	30.400	1645	30.400	1723	30.400	1801	30.400
1334	30.400	1412	30.400	1490	30.400	1568	30.400	1646	30.400	1724	30.400	1802	30.400
1335	30.400	1413	30.400	1491	30.400	1569	30.400	1647	30.400	1725	30.400	1803	30.400
1336	30.400	1414	30.400	1492	30.400	1570	30.400	1648	30.400	1726	30.400	1804	30.400
1337	30.400	1415	30.400	1493	30.400	1571	30.400	1649	30.400	1727	30.400	1805	30.400
1338	30.400	1416	30.400	1494	30.400	1572	30.400	1650	30.400	1728	30.400	1806	30.400
1339	30.400	1417	30.400	1495	30.400	1573	30.400	1651	30.400	1729	30.400	1807	30.400
1340	30.400	1418	30.400	1496	30.400	1574	30.400	1652	30.400	1730	30.400	1808	30.400
1341	30.400	1419	30.400	1497	30.400	1575	30.400	1653	30.400	1731	30.400	1809	30.400
1342	30.400	1420	30.400	1498	30.400	1576	30.400	1654	30.400	1732	30.400	1810	30.400
1343	30.400	1421	30.400	1499	30.400	1577	30.400	1655	30.400	1733	30.400	1811	30.400
1344	30.400	1422	30.400	1500	30.400	1578	30.400	1656	30.400	1734	30.400	1812	30.400
1345	30.400	1423	30.400	1501	30.400	1579	30.400	1657	30.400	1735	30.400	1813	30.400
1346	30.400	1424	30.400	1502	30.400	1580	30.400	1658	30.400	1736	30.400	1814	30.400
1347	30.400	1425	30.400	1503	30.400	1581	30.400	1659	30.400	1737	30.400	1815	30.400
1348	30.400	1426	30.400	1504	30.400	1582	30.400	1660	30.400	1738	30.400	1816	30.400
1349	30.400	1427	30.400	1505	30.400	1583	30.400	1661	30.400	1739	30.400	1817	30.400
1350	30.400	1428	30.400	1506	30.400	1584	30.400	1662	30.400	1740	30.400	1818	30.400
1351	30.400	1429	30.400	1507	30.400	1585	30.400	1663	30.400	1741	30.400	1819	30.400
1352	30.400	1430	30.400	1508	30.400	1586	30.400	1664	30.400	1742	30.400	1820	30.400
1353	30.400	1431	30.400	1509	30.400	1587	30.400	1665	30.400	1743	30.400	1821	30.400
1354	30.400	1432	30.400	1510	30.400	1588	30.400	1666	30.400	1744	30.400	1822	30.400
1355	30.400	1433	30.400	1511	30.400	1589	30.400	1667	30.400	1745	30.400	1823	30.400
1356	30.400	1434	30.400	1512	30.400	1590	30.400	1668	30.400	1746	30.400	1824	30.400
1357	30.400	1435	30.400	1513	30.400	1591	30.400	1669	30.400	1747	30.400	1825	30.400
1358	30.400	1436	30.400	1514	30.400	1592	30.400	1670	30.400	1748	30.400	1826	30.400
1359	30.400	1437	30.400	1515	30.400	1593	30.400	1671	30.400	1749	30.400	1827	30.400
1360	30.400	1438	30.400	1516	30.400	1594	30.400	1672	30.400	1750	30.400	1828	30.400
1361	30.400	1439	30.400	1517	30.400	1595	30.400	1673	30.400	1751	30.400	1829	30.400
1362	30.400	1440	30.400	1518	30.400	1596	30.400	1674	30.400	1752	30.400	1830	30.400
1363	30.400	1441	30.400	1519	30.400	1597	30.400	1675	30.400	1753	30.400	1831	30.400
1364	30.400	1442	30.400	1520	30.400	1598	30.400	1676	30.400	1754	30.400	1832	30.400
1365	30.400	1443	30.400	1521	30.400	1599	30.400	1677	30.400	1755	30.400	1833	30.400
1366	30.400	1444	30.400	1522	30.400	1600	30.400	1678	30.400	1756	30.400	1834	30.400
1367	30.400	1445	30.400	1523	30.400	1601	30.400	1679	30.400	1757	30.400	1835	30.400
1368	30.400	1446	30.400	1524	30.400	1602	30.400	1680	30.400	1758	30.400	1836	30.400
1369	30.400	1447	30.400	1525	30.400	1603	30.400	1681	30.400	1759	30.400	1837	30.400
1370	30.400	1448	30.400	1526	30.400	1604	30.400	1682	30.400	1760	30.400	1838	30.400
1371	30.400	1449	30.400	1527	30.400	1605	30.400	1683	30.400	1761	30.400	1839	30.400
1372	30.400	1450	30.400	1528	30.400	1606	30.400	1684	30.400	1762	30.400	1840	30.400
1373	30.400	1451	30.400	1529	30.400	1607	30.400	1685	30.400	1763	30.400	1841	30.400
1374	30.400	1452	30.400	1530	30.400	1608	30.400	1686	30.400	1764	30.400	1842	30.400
1375	30.400	1453	30.400	1531	30.400	1609	30.400	1687	30.400	1765	30.400	1843	30.400
1376	30.400	1454	30.400	1532	30.400	1610	30.400	1688	30.400	1766	30.400	1844	30.400
1377	30.400	1455	30.400	1533	30.400	1611	30.400	1689	30.400	1767	30.400	1845	30.400
1378	30.400	1456	30.400	1534	30.400	1612	30.400	1690	30.400	1768	30.400	1846	30.400
1379	30.400	1457	30.400	1535	30.400	1613	30.400	1691	30.400	1769	30.400	1847	30.400
1380	30.400	1458	30.400	1536	30.400	1614	30.400	1692	30.400	1770	30.400	1848	30.400
1381	30.400	1459	30.400	1537	30.400	1615	30.400	1693	30.400	1771	30.400	1849	30.400
1382	30.400	1460	30.400	1538	30.400	1616	30.400	1694	30.400	1772	30.400	1850	30.400
1383	30.400	1461	30.400	1539	30.400	1617	30.400	1695	30.400	1773	30.400	1851	30.400
1384	30.400	1462	30.400	1540	30.400	1618	30.400	1696	30.400	1774	30.400	1852	30.400
1385	30.400	1463	30.400	1541	30.400	1619	30.400	1697	30.400	1775	30.400	1853	30.400
1386	30.400	1464	30.400	1542	30.400	1620	30.400	1698	30.400	1776	30.400	1854	30.400
1387	30.400	1465	30.400	1543	30.400	1621	30.400	1699	30.400	1777	30.400	1855	30.400
1388	30.400	1466	30.400	1544	30.400	1622	30.400	1700	30.400	1778	30.400	1856	30.400
1389	30.400	1467	30.400	1545	30.400	1623	30.400	1701	30.400	1779	30.400	1857	30.400
1390	30.400	1468	30.400	1546	30.400	1624	30.400	1702	30.400	1780	30.400	1858	30.400
1391	30.400	1469	30.400	1547	30.400	1625	30.400	1703	30.400	1781	30.400	1859	30.400
1392	30.400	1470	30.400	1548	30.400	1626	30.400	1704	30.400	1782	30.400	1860	30.400
1393	30.400	1471	30.400	1549	30.400	1627	30.400	1705	30.400	1783	30.400	1861	30.400
1394	30.400	1472	30.400	1550	30.400	1628	30.400	1706	30.400	1784	30.400	1862	30.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1863	30.400	1941	30.400	2019	30.400	2097	30.400	2175	30.400	2253	30.400	2331	30.400
1864	30.400	1942	30.400	2020	30.400	2098	30.400	2176	30.400	2254	30.400	2332	30.400
1865	30.400	1943	30.400	2021	30.400	2099	30.400	2177	30.400	2255	30.400	2333	30.400
1866	30.400	1944	30.400	2022	30.400	2100	30.400	2178	30.400	2256	30.400	2334	30.400
1867	30.400	1945	30.400	2023	30.400	2101	30.400	2179	30.400	2257	30.400	2335	30.400
1868	30.400	1946	30.400	2024	30.400	2102	30.400	2180	30.400	2258	30.400	2336	30.400
1869	30.400	1947	30.400	2025	30.400	2103	30.400	2181	30.400	2259	30.400	2337	30.400
1870	30.400	1948	30.400	2026	30.400	2104	30.400	2182	30.400	2260	30.400	2338	30.400
1871	30.400	1949	30.400	2027	30.400	2105	30.400	2183	30.400	2261	30.400	2339	30.400
1872	30.400	1950	30.400	2028	30.400	2106	30.400	2184	30.400	2262	30.400	2340	30.400
1873	30.400	1951	30.400	2029	30.400	2107	30.400	2185	30.400	2263	30.400	2341	30.400
1874	30.400	1952	30.400	2030	30.400	2108	30.400	2186	30.400	2264	30.400	2342	30.400
1875	30.400	1953	30.400	2031	30.400	2109	30.400	2187	30.400	2265	30.400	2343	30.400
1876	30.400	1954	30.400	2032	30.400	2110	30.400	2188	30.400	2266	30.400	2344	30.400
1877	30.400	1955	30.400	2033	30.400	2111	30.400	2189	30.400	2267	30.400	2345	30.400
1878	30.400	1956	30.400	2034	30.400	2112	30.400	2190	30.400	2268	30.400	2346	30.400
1879	30.400	1957	30.400	2035	30.400	2113	30.400	2191	30.400	2269	30.400	2347	30.400
1880	30.400	1958	30.400	2036	30.400	2114	30.400	2192	30.400	2270	30.400	2348	30.400
1881	30.400	1959	30.400	2037	30.400	2115	30.400	2193	30.400	2271	30.400	2349	30.400
1882	30.400	1960	30.400	2038	30.400	2116	30.400	2194	30.400	2272	30.400	2350	30.400
1883	30.400	1961	30.400	2039	30.400	2117	30.400	2195	30.400	2273	30.400	2351	30.400
1884	30.400	1962	30.400	2040	30.400	2118	30.400	2196	30.400	2274	30.400	2352	30.400
1885	30.400	1963	30.400	2041	30.400	2119	30.400	2197	30.400	2275	30.400	2353	30.400
1886	30.400	1964	30.400	2042	30.400	2120	30.400	2198	30.400	2276	30.400	2354	30.400
1887	30.400	1965	30.400	2043	30.400	2121	30.400	2199	30.400	2277	30.400	2355	30.400
1888	30.400	1966	30.400	2044	30.400	2122	30.400	2200	30.400	2278	30.400	2356	30.400
1889	30.400	1967	30.400	2045	30.400	2123	30.400	2201	30.400	2279	30.400	2357	30.400
1890	30.400	1968	30.400	2046	30.400	2124	30.400	2202	30.400	2280	30.400	2358	30.400
1891	30.400	1969	30.400	2047	30.400	2125	30.400	2203	30.400	2281	30.400	2359	30.400
1892	30.400	1970	30.400	2048	30.400	2126	30.400	2204	30.400	2282	30.400	2360	30.400
1893	30.400	1971	30.400	2049	30.400	2127	30.400	2205	30.400	2283	30.400	2361	30.400
1894	30.400	1972	30.400	2050	30.400	2128	30.400	2206	30.400	2284	30.400	2362	30.400
1895	30.400	1973	30.400	2051	30.400	2129	30.400	2207	30.400	2285	30.400	2363	30.400
1896	30.400	1974	30.400	2052	30.400	2130	30.400	2208	30.400	2286	30.400	2364	30.400
1897	30.400	1975	30.400	2053	30.400	2131	30.400	2209	30.400	2287	30.400	2365	30.400
1898	30.400	1976	30.400	2054	30.400	2132	30.400	2210	30.400	2288	30.400	2366	30.400
1899	30.400	1977	30.400	2055	30.400	2133	30.400	2211	30.400	2289	30.400	2367	30.400
1900	30.400	1978	30.400	2056	30.400	2134	30.400	2212	30.400	2290	30.400	2368	30.400
1901	30.400	1979	30.400	2057	30.400	2135	30.400	2213	30.400	2291	30.400	2369	30.400
1902	30.400	1980	30.400	2058	30.400	2136	30.400	2214	30.400	2292	30.400	2370	30.400
1903	30.400	1981	30.400	2059	30.400	2137	30.400	2215	30.400	2293	30.400	2371	30.400
1904	30.400	1982	30.400	2060	30.400	2138	30.400	2216	30.400	2294	30.400	2372	30.400
1905	30.400	1983	30.400	2061	30.400	2139	30.400	2217	30.400	2295	30.400	2373	30.400
1906	30.400	1984	30.400	2062	30.400	2140	30.400	2218	30.400	2296	30.400	2374	30.400
1907	30.400	1985	30.400	2063	30.400	2141	30.400	2219	30.400	2297	30.400	2375	30.400
1908	30.400	1986	30.400	2064	30.400	2142	30.400	2220	30.400	2298	30.400	2376	30.400
1909	30.400	1987	30.400	2065	30.400	2143	30.400	2221	30.400	2299	30.400	2377	30.400
1910	30.400	1988	30.400	2066	30.400	2144	30.400	2222	30.400	2300	30.400	2378	30.400
1911	30.400	1989	30.400	2067	30.400	2145	30.400	2223	30.400	2301	30.400	2379	30.400
1912	30.400	1990	30.400	2068	30.400	2146	30.400	2224	30.400	2302	30.400	2380	30.400
1913	30.400	1991	30.400	2069	30.400	2147	30.400	2225	30.400	2303	30.400	2381	30.400
1914	30.400	1992	30.400	2070	30.400	2148	30.400	2226	30.400	2304	30.400	2382	30.400
1915	30.400	1993	30.400	2071	30.400	2149	30.400	2227	30.400	2305	30.400	2383	30.400
1916	30.400	1994	30.400	2072	30.400	2150	30.400	2228	30.400	2306	30.400	2384	30.400
1917	30.400	1995	30.400	2073	30.400	2151	30.400	2229	30.400	2307	30.400	2385	30.400
1918	30.400	1996	30.400	2074	30.400	2152	30.400	2230	30.400	2308	30.400	2386	30.400
1919	30.400	1997	30.400	2075	30.400	2153	30.400	2231	30.400	2309	30.400	2387	30.400
1920	30.400	1998	30.400	2076	30.400	2154	30.400	2232	30.400	2310	30.400	2388	30.400
1921	30.400	1999	30.400	2077	30.400	2155	30.400	2233	30.400	2311	30.400	2389	30.400
1922	30.400	2000	30.400	2078	30.400	2156	30.400	2234	30.400	2312	30.400	2390	30.400
1923	30.400	2001	30.400	2079	30.400	2157	30.400	2235	30.400	2313	30.400	2391	30.400
1924	30.400	2002	30.400	2080	30.400	2158	30.400	2236	30.400	2314	30.400	2392	30.400
1925	30.400	2003	30.400	2081	30.400	2159	30.400	2237	30.400	2315	30.400	2393	30.400
1926	30.400	2004	30.400	2082	30.400	2160	30.400	2238	30.400	2316	30.400	2394	30.400
1927	30.400	2005	30.400	2083	30.400	2161	30.400	2239	30.400	2317	30.400	2395	30.400
1928	30.400	2006	30.400	2084	30.400	2162	30.400	2240	30.400	2318	30.400	2396	30.400
1929	30.400	2007	30.400	2085	30.400	2163	30.400	2241	30.400	2319	30.400	2397	30.400
1930	30.400	2008	30.400	2086	30.400	2164	30.400	2242	30.400	2320	30.400	2398	30.400
1931	30.400	2009	30.400	2087	30.400	2165	30.400	2243	30.400	2321	30.400	2399	30.400
1932	30.400	2010	30.400	2088	30.400	2166	30.400	2244	30.400	2322	30.400	2400	30.400
1933	30.400	2011	30.400	2089	30.400	2167	30.400	2245	30.400	2323	30.400	2401	30.400
1934	30.400	2012	30.400	2090	30.400	2168	30.400	2246	30.400	2324	30.400	2402	30.400
1935	30.400	2013	30.400	2091	30.400	2169	30.400	2247	30.400	2325	30.400	2403	30.400
1936	30.400	2014	30.400	2092	30.400	2170	30.400	2248	30.400	2326	30.400	2404	30.400
1937	30.400	2015	30.400	2093	30.400	2171	30.400	2249	30.400	2327	30.400	2405	30.400
1938	30.400	2016	30.400	2094	30.400	2172	30.400	2250	30.400	2328	30.400	2406	30.400
1939	30.400	2017	30.400	2095	30.400	2173	30.400	2251	30.400	2329	30.400	2407	30.400
1940	30.400	2018	30.400	2096	30.400	2174	30.400	2252	30.400	2330	30.400	2408	30.400

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2409	30.400	2477	30.400	2545	30.400	2613	30.400	2681	30.400	2749	30.400	2817	30.400
2410	30.400	2478	30.400	2546	30.400	2614	30.400	2682	30.400	2750	30.400	2818	30.400
2411	30.400	2479	30.400	2547	30.400	2615	30.400	2683	30.400	2751	30.400	2819	30.400
2412	30.400	2480	30.400	2548	30.400	2616	30.400	2684	30.400	2752	30.400	2820	30.400
2413	30.400	2481	30.400	2549	30.400	2617	30.400	2685	30.400	2753	30.400	2821	30.400
2414	30.400	2482	30.400	2550	30.400	2618	30.400	2686	30.400	2754	30.400	2822	30.400
2415	30.400	2483	30.400	2551	30.400	2619	30.400	2687	30.400	2755	30.400	2823	30.400
2416	30.400	2484	30.400	2552	30.400	2620	30.400	2688	30.400	2756	30.400	2824	30.400
2417	30.400	2485	30.400	2553	30.400	2621	30.400	2689	30.400	2757	30.400	2825	30.400
2418	30.400	2486	30.400	2554	30.400	2622	30.400	2690	30.400	2758	30.400	2826	30.400
2419	30.400	2487	30.400	2555	30.400	2623	30.400	2691	30.400	2759	30.400	2827	30.400
2420	30.400	2488	30.400	2556	30.400	2624	30.400	2692	30.400	2760	30.400	2828	30.400
2421	30.400	2489	30.400	2557	30.400	2625	30.400	2693	30.400	2761	30.400	2829	30.400
2422	30.400	2490	30.400	2558	30.400	2626	30.400	2694	30.400	2762	30.400	2830	30.400
2423	30.400	2491	30.400	2559	30.400	2627	30.400	2695	30.400	2763	30.400	2831	30.400
2424	30.400	2492	30.400	2560	30.400	2628	30.400	2696	30.400	2764	30.400	2832	30.400
2425	30.400	2493	30.400	2561	30.400	2629	30.400	2697	30.400	2765	30.400	2833	30.400
2426	30.400	2494	30.400	2562	30.400	2630	30.400	2698	30.400	2766	30.400	2834	30.400
2427	30.400	2495	30.400	2563	30.400	2631	30.400	2699	30.400	2767	30.400	2835	30.400
2428	30.400	2496	30.400	2564	30.400	2632	30.400	2700	30.400	2768	30.400	2836	30.400
2429	30.400	2497	30.400	2565	30.400	2633	30.400	2701	30.400	2769	30.400	2837	30.400
2430	30.400	2498	30.400	2566	30.400	2634	30.400	2702	30.400	2770	30.400	2838	30.400
2431	30.400	2499	30.400	2567	30.400	2635	30.400	2703	30.400	2771	30.400	2839	30.400
2432	30.400	2500	30.400	2568	30.400	2636	30.400	2704	30.400	2772	30.400	2840	30.400
2433	30.400	2501	30.400	2569	30.400	2637	30.400	2705	30.400	2773	30.400	2841	30.400
2434	30.400	2502	30.400	2570	30.400	2638	30.400	2706	30.400	2774	30.400	2842	30.400
2435	30.400	2503	30.400	2571	30.400	2639	30.400	2707	30.400	2775	30.400	2843	30.400
2436	30.400	2504	30.400	2572	30.400	2640	30.400	2708	30.400	2776	30.400	2844	30.400
2437	30.400	2505	30.400	2573	30.400	2641	30.400	2709	30.400	2777	30.400	2845	30.400
2438	30.400	2506	30.400	2574	30.400	2642	30.400	2710	30.400	2778	30.400	2846	30.400
2439	30.400	2507	30.400	2575	30.400	2643	30.400	2711	30.400	2779	30.400	2847	30.400
2440	30.400	2508	30.400	2576	30.400	2644	30.400	2712	30.400	2780	30.400	2848	30.400
2441	30.400	2509	30.400	2577	30.400	2645	30.400	2713	30.400	2781	30.400	2849	30.400
2442	30.400	2510	30.400	2578	30.400	2646	30.400	2714	30.400	2782	30.400	2850	30.400
2443	30.400	2511	30.400	2579	30.400	2647	30.400	2715	30.400	2783	30.400	2851	30.400
2444	30.400	2512	30.400	2580	30.400	2648	30.400	2716	30.400	2784	30.400	2852	30.400
2445	30.400	2513	30.400	2581	30.400	2649	30.400	2717	30.400	2785	30.400	2853	30.400
2446	30.400	2514	30.400	2582	30.400	2650	30.400	2718	30.400	2786	30.400	2854	30.400
2447	30.400	2515	30.400	2583	30.400	2651	30.400	2719	30.400	2787	30.400	2855	30.400
2448	30.400	2516	30.400	2584	30.400	2652	30.400	2720	30.400	2788	30.400	2856	30.400
2449	30.400	2517	30.400	2585	30.400	2653	30.400	2721	30.400	2789	30.400	2857	30.400
2450	30.400	2518	30.400	2586	30.400	2654	30.400	2722	30.400	2790	30.400	2858	30.400
2451	30.400	2519	30.400	2587	30.400	2655	30.400	2723	30.400	2791	30.400	2859	30.400
2452	30.400	2520	30.400	2588	30.400	2656	30.400	2724	30.400	2792	30.400	2860	30.400
2453	30.400	2521	30.400	2589	30.400	2657	30.400	2725	30.400	2793	30.400	2861	30.400
2454	30.400	2522	30.400	2590	30.400	2658	30.400	2726	30.400	2794	30.400	2862	30.400
2455	30.400	2523	30.400	2591	30.400	2659	30.400	2727	30.400	2795	30.400	2863	30.400
2456	30.400	2524	30.400	2592	30.400	2660	30.400	2728	30.400	2796	30.400	2864	30.400
2457	30.400	2525	30.400	2593	30.400	2661	30.400	2729	30.400	2797	30.400	2865	30.400
2458	30.400	2526	30.400	2594	30.400	2662	30.400	2730	30.400	2798	30.400	2866	30.400
2459	30.400	2527	30.400	2595	30.400	2663	30.400	2731	30.400	2799	30.400	2867	30.400
2460	30.400	2528	30.400	2596	30.400	2664	30.400	2732	30.400	2800	30.400	2868	30.400
2461	30.400	2529	30.400	2597	30.400	2665	30.400	2733	30.400	2801	30.400	2869	30.400
2462	30.400	2530	30.400	2598	30.400	2666	30.400	2734	30.400	2802	30.400	2870	30.400
2463	30.400	2531	30.400	2599	30.400	2667	30.400	2735	30.400	2803	30.400	2871	30.400
2464	30.400	2532	30.400	2600	30.400	2668	30.400	2736	30.400	2804	30.400	2872	30.400
2465	30.400	2533	30.400	2601	30.400	2669	30.400	2737	30.400	2805	30.400	2873	30.400
2466	30.400	2534	30.400	2602	30.400	2670	30.400	2738	30.400	2806	30.400	2874	30.400
2467	30.400	2535	30.400	2603	30.400	2671	30.400	2739	30.400	2807	30.400	2875	30.400
2468	30.400	2536	30.400	2604	30.400	2672	30.400	2740	30.400	2808	30.400	2876	30.400
2469	30.400	2537	30.400	2605	30.400	2673	30.400	2741	30.400	2809	30.400	2877	30.400
2470	30.400	2538	30.400	2606	30.400	2674	30.400	2742	30.400	2810	30.400	2878	30.400
2471	30.400	2539	30.400	2607	30.400	2675	30.400	2743	30.400	2811	30.400	2879	30.400
2472	30.400	2540	30.400	2608	30.400	2676	30.400	2744	30.400	2812	30.400	2880	30.400
2473	30.400	2541	30.400	2609	30.400	2677	30.400	2745	30.400	2813	30.400		
2474	30.400	2542	30.400	2610	30.400	2678	30.400	2746	30.400	2814	30.400		
2475	30.400	2543	30.400	2611	30.400	2679	30.400	2747	30.400	2815	30.400		
2476	30.400	2544	30.400	2612	30.400	2680	30.400	2748	30.400	2816	30.400		

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Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 36.4

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.5
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	37.005		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.965		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	38.7
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.275		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	25.2
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.955		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.405		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30
Membrane Percolation (mm/hr)	10000	Invert Level (m)	32.105
Max Percolation (l/s)	345.7	Width (m)	4.5

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Porous Car Park Pipe: S6.005

Length (m) 27.7 Evaporation (mm/day) 3
Slope (1:X) 22.1 Membrane Depth (mm) 150
Depression Storage (mm) 5

Under Drain Details
Depth above Invert Level (m) 0.000 Number of Pipes 1
Diameter (m) 0.225 Manning's N 0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m) 28.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%					32.352	-0.098
S1.001	S2.01	15 Summer	2	+0%					32.227	-0.098
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.064	-0.094
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.553	-0.104
S1.004	S2.05	2880 Winter	2	+0%	2/15 Summer				29.707	0.932
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Winter	2	+0%					32.844	-0.109
S3.002	S2.08	15 Winter	2	+0%					32.299	-0.156
S3.003	S2.09	15 Winter	2	+0%					32.007	-0.176
S4.000	S2.10	15 Winter	2	+0%					31.074	-0.151
S4.001	S2.11	15 Winter	2	+0%					31.041	-0.148
S3.004	S2.12	15 Winter	2	+0%					30.976	-0.149
S3.005	S2.13	2880 Winter	2	+0%	2/120 Winter				29.707	0.437
S5.000	S2.14	2880 Winter	2	+0%	2/15 Summer				29.707	0.861
S6.000	S3.00	15 Winter	2	+0%					37.031	-0.419
S7.000	S3.01	15 Summer	2	+0%					35.064	-0.101
S6.001	S3.02	15 Winter	2	+0%					35.002	-0.408
S6.002	S3.03	15 Winter	2	+0%					34.317	-0.403
S6.003	S2.15	15 Winter	2	+0%					33.995	-0.405
S6.004	S2.16	15 Winter	2	+0%					33.453	-0.397
S6.005	S2.17	15 Winter	2	+0%					32.153	-0.397
S8.000	STANK	2880 Winter	2	+0%	2/120 Winter				29.707	0.457
S1.005	S2.18	2880 Winter	2	+0%	2/15 Summer				29.707	1.133
S1.006	S5.08	2880 Winter	2	+0%	2/15 Summer				29.703	1.721
S1.007	S5.09	2880 Winter	2	+0%	2/15 Summer				29.703	1.893
S1.008	S5.10	2880 Winter	2	+0%	2/15 Summer	30/960 Winter			29.703	2.073
S1.009	S5.11	2880 Winter	2	+0%	2/15 Summer	2/480 Winter			29.703	2.127

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.26			4.7	OK	
S1.001	S2.01	0.000	0.26			4.7	OK	
S1.002	S2.02	0.000	0.29			6.4	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.20			7.5	OK	
S1.004	S2.05	0.000	0.02			1.0	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.16			6.7	OK	
S3.002	S2.08	0.000	0.20			14.1	OK	
S3.003	S2.09	0.000	0.11			14.0	OK	
S4.000	S2.10	0.000	0.24			7.2	OK	
S4.001	S2.11	0.000	0.25			9.0	OK	
S3.004	S2.12	0.000	0.25			24.4	OK	
S3.005	S2.13	0.000	0.00			1.3	SURCHARGED	
S5.000	S2.14	0.000	0.01			2.3	SURCHARGED	

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S3.00	0.000	0.02		5	10.5	OK	
S7.000	S3.01	0.000	0.24			3.0	OK	
S6.001	S3.02	0.000	0.03		5	16.1	OK	
S6.002	S3.03	0.000	0.03		6	17.9	OK	
S6.003	S2.15	0.000	0.03		6	20.5	OK	
S6.004	S2.16	0.000	0.04		7	25.8	OK	
S6.005	S2.17	0.000	0.04		7	29.3	OK	
S8.000	STANK	0.000	0.07		154	18.7	SURCHARGED	
S1.005	S2.18	0.000	0.22			22.7	SURCHARGED	
S1.006	S5.08	0.000	0.67			43.9	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.2	SURCHARGED	
S1.008	S5.10	0.000	1.13			65.2	FLOOD RISK	29
S1.009	S5.11	73.220	7.65			364.8	FLOOD	63

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%					32.375	-0.075
S1.001	S2.01	15 Summer	30	+0%					32.249	-0.076
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.093	-0.066
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.574	-0.083
S1.004	S2.05	360 Winter	30	+0%	2/15 Summer				29.845	1.070
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.863	-0.090
S3.002	S2.08	15 Summer	30	+0%					32.336	-0.119
S3.003	S2.09	15 Summer	30	+0%					32.032	-0.151
S4.000	S2.10	15 Winter	30	+0%					31.106	-0.119
S4.001	S2.11	15 Summer	30	+0%					31.077	-0.112
S3.004	S2.12	15 Summer	30	+0%					31.018	-0.107
S3.005	S2.13	360 Winter	30	+0%	2/120 Winter				29.847	0.577
S5.000	S2.14	360 Winter	30	+0%	2/15 Summer				29.844	0.998
S6.000	S3.00	15 Winter	30	+0%					37.043	-0.407
S7.000	S3.01	15 Winter	30	+0%					35.085	-0.080
S6.001	S3.02	15 Summer	30	+0%					35.021	-0.389
S6.002	S3.03	15 Winter	30	+0%					34.337	-0.383
S6.003	S2.15	15 Winter	30	+0%					34.016	-0.384
S6.004	S2.16	15 Winter	30	+0%					33.478	-0.372
S6.005	S2.17	15 Winter	30	+0%					32.178	-0.372
S8.000	STANK	360 Winter	30	+0%	2/120 Winter				29.844	0.594
S1.005	S2.18	360 Winter	30	+0%	2/15 Summer				29.844	1.270
S1.006	S5.08	2880 Winter	30	+0%	2/15 Summer				29.788	1.806
S1.007	S5.09	2880 Winter	30	+0%	2/15 Summer				29.787	1.978
S1.008	S5.10	2880 Winter	30	+0%	2/15 Summer	30/960 Winter			29.788	2.157
S1.009	S5.11	2880 Winter	30	+0%	2/15 Summer	2/480 Winter			29.788	2.211

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.50			8.8	OK	
S1.001	S2.01	0.000	0.49			8.8	OK	
S1.002	S2.02	0.000	0.59			13.1	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.41			15.2	OK	
S1.004	S2.05	0.000	0.03			2.0	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.33			13.6	OK	
S3.002	S2.08	0.000	0.45			31.2	OK	
S3.003	S2.09	0.000	0.24			31.2	OK	
S4.000	S2.10	0.000	0.45			13.6	OK	
S4.001	S2.11	0.000	0.50			18.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.004	S2.12	0.000	0.53			52.6	OK	
S3.005	S2.13	0.000	0.03			10.1	SURCHARGED	
S5.000	S2.14	0.000	0.00			0.1	SURCHARGED	
S6.000	S3.00	0.000	0.03		5	19.9	OK	
S7.000	S3.01	0.000	0.44			5.7	OK	
S6.001	S3.02	0.000	0.05		4	31.6	OK	
S6.002	S3.03	0.000	0.07		6	34.8	OK	
S6.003	S2.15	0.000	0.06		6	40.1	OK	
S6.004	S2.16	0.000	0.08		6	52.1	OK	
S6.005	S2.17	0.000	0.08		6	58.5	OK	
S8.000	STANK	0.000	0.01			2.2	SURCHARGED	
S1.005	S2.18	0.000	0.12			11.9	SURCHARGED	
S1.006	S5.08	0.000	0.55			35.7	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.3	SURCHARGED	
S1.008	S5.10	37.503	2.36			136.3	FLOOD	29
S1.009	S5.11	157.513	7.80			372.0	FLOOD	63

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%					32.431	-0.019
S1.001	S2.01	15 Winter	100	+45%					32.325	0.000
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.205	0.046
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.603	-0.054
S1.004	S2.05	180 Winter	100	+45%	2/15 Summer				30.593	1.818
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.889	-0.064
S3.002	S2.08	15 Summer	100	+45%					32.389	-0.066
S3.003	S2.09	15 Summer	100	+45%					32.063	-0.120
S4.000	S2.10	15 Winter	100	+45%					31.160	-0.065
S4.001	S2.11	15 Summer	100	+45%					31.141	-0.048
S3.004	S2.12	15 Summer	100	+45%					31.085	-0.040
S3.005	S2.13	180 Winter	100	+45%	2/120 Winter				30.596	1.326
S5.000	S2.14	180 Winter	100	+45%	2/15 Summer				30.591	1.745
S6.000	S3.00	15 Winter	100	+45%					37.060	-0.390
S7.000	S3.01	15 Winter	100	+45%					35.120	-0.045
S6.001	S3.02	15 Summer	100	+45%					35.046	-0.364
S6.002	S3.03	15 Winter	100	+45%					34.366	-0.354
S6.003	S2.15	15 Winter	100	+45%					34.044	-0.356
S6.004	S2.16	15 Winter	100	+45%					33.512	-0.338
S6.005	S2.17	15 Winter	100	+45%					32.213	-0.337
S8.000	STANK	180 Winter	100	+45%	2/120 Winter				30.590	1.340
S1.005	S2.18	180 Winter	100	+45%	2/15 Summer				30.591	2.017
S1.006	S5.08	2880 Winter	100	+45%	2/15 Summer				29.915	1.933
S1.007	S5.09	2880 Winter	100	+45%	2/15 Summer				29.914	2.104
S1.008	S5.10	2880 Winter	100	+45%	2/15 Summer	30/960 Winter			29.913	2.283
S1.009	S5.11	2880 Winter	100	+45%	2/15 Summer	2/480 Winter			29.913	2.337

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.93			16.4	OK	
S1.001	S2.01	0.000	0.86			15.6	OK	
S1.002	S2.02	0.000	1.05			23.0	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.73			26.8	OK	
S1.004	S2.05	0.000	0.10			6.4	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.63			25.4	OK	
S3.002	S2.08	0.000	0.84			58.4	OK	
S3.003	S2.09	0.000	0.44			58.4	OK	
S4.000	S2.10	0.000	0.85			25.4	OK	
S4.001	S2.11	0.000	0.94			33.6	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.004	S2.12	0.000	1.00			98.4	OK	
S3.005	S2.13	0.000	0.09			32.2	FLOOD RISK	
S5.000	S2.14	0.000	0.00			0.6	SURCHARGED	
S6.000	S3.00	0.000	0.05		5	37.2	OK	
S7.000	S3.01	0.000	0.83			10.6	OK	
S6.001	S3.02	0.000	0.10		4	59.5	OK	
S6.002	S3.03	0.000	0.13		6	65.7	OK	
S6.003	S2.15	0.000	0.12		5	75.9	OK	
S6.004	S2.16	0.000	0.16		6	98.6	OK	
S6.005	S2.17	0.000	0.16		6	110.3	OK	
S8.000	STANK	0.000	0.07			19.2	SURCHARGED	
S1.005	S2.18	0.000	0.23			23.0	SURCHARGED	
S1.006	S5.08	0.000	0.69			45.0	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.3	SURCHARGED	
S1.008	S5.10	163.236	4.61			265.4	FLOOD	29
S1.009	S5.11	283.231	8.02			382.3	FLOOD	63

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APPENDIX J – SW Calcs 100year +35% Surcharged Outfall

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	9.969	0.125	79.8	0.028	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	13.294	0.166	80.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	30.138	0.502	60.0	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.000	4.914	0.680	7.2	0.007	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	22.601	1.076	21.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	5.733	0.201	28.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	13.082	0.327	40.0	0.029	4.00	0.0	0.600		o	150	Pipe/Conduit	
S3.001	7.053	0.498	14.2	0.014	0.00	0.0	0.600		o	150	Pipe/Conduit	
S3.002	10.873	0.272	40.0	0.056	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	12.149	1.058	11.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S4.000	2.174	0.036	60.4	0.043	4.00	0.0	0.600		o	225	Pipe/Conduit	
S4.001	4.197	0.064	65.6	0.014	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	31.350	1.280	24.5	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.005	28.271	0.471	60.0	0.073	0.00	0.0	0.600		o	450	Pipe/Conduit	
S5.000	6.978	0.047	148.5	0.000	4.00	0.0	0.600		o	450	Pipe/Conduit	
S6.000	44.701	1.990	22.5	0.063	4.00	0.0		0.030	→|↓|→		Porous Car Park	
S7.000	7.001	0.050	140.0	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
S6.001	20.393	0.690	29.6	0.023	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.002	12.387	0.320	38.7	0.013	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.003	13.882	0.550	25.2	0.022	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.004	36.129	1.300	27.8	0.046	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S6.005	27.655	1.250	22.1	0.034	0.00	0.0		0.030	→|↓|→		Porous Car Park	
S8.000	6.994	0.451	15.5	0.000	4.00	0.0		0.030	o	450	Pipe/Conduit	
S1.005	11.186	0.592	18.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	64.23	4.15	32.300	0.028	0.0	0.0	0.0	1.13	19.9	4.9
S1.001	63.12	4.34	32.175	0.028	0.0	0.0	0.0	1.12	19.9	4.9
S1.002	61.06	4.73	32.009	0.042	0.0	0.0	0.0	1.30	23.0	6.9
S2.000	64.96	4.02	32.187	0.007	0.0	0.0	0.0	3.77	66.7	1.2
S1.003	60.20	4.90	31.507	0.049	0.0	0.0	0.0	2.21	39.0	8.0
S1.004	60.01	4.94	28.550	0.049	0.0	0.0	0.0	2.46	97.8	8.0
S3.000	64.29	4.14	33.130	0.029	0.0	0.0	0.0	1.60	28.2	5.0
S3.001	64.04	4.18	32.803	0.043	0.0	0.0	0.0	2.69	47.6	7.5
S3.002	63.55	4.27	32.230	0.099	0.0	0.0	0.0	2.08	82.5	17.0
S3.003	63.25	4.32	31.958	0.099	0.0	0.0	0.0	3.88	154.4	17.0
S4.000	64.97	4.02	31.000	0.043	0.0	0.0	0.0	1.69	67.0	7.6
S4.001	64.71	4.06	30.964	0.057	0.0	0.0	0.0	1.62	64.3	10.0
S3.004	62.18	4.52	30.900	0.167	0.0	0.0	0.0	2.65	105.6	28.1
S3.005	61.24	4.70	28.820	0.240	0.0	0.0	0.0	2.63	418.0	39.8
S5.000	64.68	4.07	28.396	0.000	0.0	0.0	0.0	1.67	265.0	0.0
S6.000	61.40	4.67	37.005	0.063	0.0	0.0	0.0	1.12	704.1	10.5
S7.000	64.29	4.14	35.015	0.018	0.0	0.0	0.0	0.85	15.0	3.1
S6.001	59.66	5.01	34.965	0.104	0.0	0.0	0.0	0.98	613.8	16.8
S6.002	58.51	5.26	34.275	0.117	0.0	0.0	0.0	0.85	536.3	18.5
S6.003	57.52	5.47	33.955	0.139	0.0	0.0	0.0	1.06	664.2	21.7
S6.004	55.00	6.07	33.405	0.185	0.0	0.0	0.0	1.01	633.0	27.6
S6.005	53.42	6.48	32.105	0.219	0.0	0.0	0.0	1.13	709.4	31.7
S8.000	64.74	4.06	28.800	0.000	0.0	0.0	0.0	1.97	313.7	0.0
S1.005	64.73	4.06	28.349	0.000	24.5	0.0	0.0	3.02	120.3	24.5

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for SW Net01

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	43.052	0.172	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.007	44.900	0.180	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.008	13.385	0.054	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.009	4.402	0.018	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	60.78	4.79	27.682	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.007	57.22	5.54	27.510	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.008	56.25	5.77	27.330	0.000	24.5	0.0	0.0	0.99	70.0	24.5
S1.009	55.94	5.84	27.277	0.000	24.5	0.0	0.0	0.99	70.0	24.5

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Manhole Schedules for SW Net01

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2.00	34.150	1.850	Open Manhole	450	S1.000	32.300	150				
S2.01	34.170	1.995	Open Manhole	1200	S1.001	32.175	150	S1.000	32.175	150	
S2.02	33.760	1.751	Open Manhole	450	S1.002	32.009	150	S1.001	32.009	150	
S2.03	33.187	1.000	Open Manhole	450	S2.000	32.187	150				
S2.04	32.680	1.173	Open Manhole	1200	S1.003	31.507	150	S1.002	31.507	150	
								S2.000	31.507	150	
S2.05	31.630	3.080	Open Manhole	1200	S1.004	28.550	225	S1.003	30.431	150	1806
S2.06	34.130	1.000	Open Manhole	600	S3.000	33.130	150				
S2.07	34.110	1.307	Open Manhole	600	S3.001	32.803	150	S3.000	32.803	150	
S2.08	33.750	1.520	Open Manhole	600	S3.002	32.230	225	S3.001	32.305	150	
S2.09	33.750	1.792	Open Manhole	600	S3.003	31.958	225	S3.002	31.958	225	
S2.10	32.190	1.190	Open Manhole	600	S4.000	31.000	225				
S2.11	32.190	1.226	Open Manhole	600	S4.001	30.964	225	S4.000	30.964	225	
S2.12	32.160	1.260	Open Manhole	600	S3.004	30.900	225	S3.003	30.900	225	
								S4.001	30.900	225	
S2.13	30.875	2.055	Open Manhole	1800	S3.005	28.820	450	S3.004	29.620	225	575
S2.14	31.630	3.234	Open Manhole	1800	S5.000	28.396	450				
S3.00	37.600	0.595	Open Manhole	600	S6.000	37.005					
S3.01	35.535	0.520	Open Manhole	450	S7.000	35.015	150				
S3.02	35.560	0.595	Open Manhole	600	S6.001	34.965		S6.000	35.015		50
								S7.000	34.965	150	
S3.03	34.870	0.595	Open Manhole	600	S6.002	34.275		S6.001	34.275		
S2.15	34.550	0.595	Open Manhole	600	S6.003	33.955		S6.002	33.955		
S2.16	34.000	0.595	Open Manhole	600	S6.004	33.405		S6.003	33.405		
S2.17	32.700	0.595	Open Manhole	600	S6.005	32.105		S6.004	32.105		
STANK	31.754	2.954	Open Manhole	1800	S8.000	28.800	450				
S2.18	31.470	3.121	Open Manhole	2400	S1.005	28.349	225	S1.004	28.349	225	
								S3.005	28.349	450	
								S5.000	28.349	450	
								S6.005	30.855		2726
								S8.000	28.349	450	
S5.08	31.250	3.568	Open Manhole	1350	S1.006	27.682	300	S1.005	27.757	225	
S5.09	30.350	2.840	Open Manhole	1350	S1.007	27.510	300	S1.006	27.510	300	
S5.10	29.750	2.420	Open Manhole	1200	S1.008	27.330	300	S1.007	27.330	300	
S5.11	29.630	2.353	Open Manhole	1350	S1.009	27.277	300	S1.008	27.277	300	
S	31.000	3.741	Open Manhole	0		OUTFALL		S1.009	27.259	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.00	384628.547	399391.096	384628.547	399391.096	Required	
S2.01	384635.818	399397.917	384635.818	399397.917	Required	
S2.02	384626.734	399407.623	384626.734	399407.623	Required	
S2.03	384604.255	399425.092	384604.255	399425.092	Required	
S2.04	384606.142	399429.629	384606.142	399429.629	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2.05	384595.496	399449.566	384595.496	399449.566	Required	
S2.06	384607.456	399377.956	384607.456	399377.956	Required	
S2.07	384598.517	399387.508	384598.517	399387.508	Required	
S2.08	384597.387	399394.470	384597.387	399394.470	Required	
S2.09	384589.955	399402.407	384589.955	399402.407	Required	
S2.10	384591.681	399412.496	384591.681	399412.496	Required	
S2.11	384589.804	399411.400	384589.804	399411.400	Required	
S2.12	384586.568	399414.074	384586.568	399414.074	Required	
S2.13	384571.730	399441.690	384571.730	399441.690	Required	
S2.14	384602.695	399458.532	384602.695	399458.532	Required	
S3.00	384719.304	399422.990	384719.304	399422.990	Required	
S3.01	384681.034	399398.869	384681.034	399398.869	Required	
S3.02	384678.255	399405.294	384678.255	399405.294	Required	
S3.03	384659.530	399397.214	384659.530	399397.214	Required	
S2.15	384647.251	399398.840	384647.251	399398.840	Required	
S2.16	384634.684	399404.738	384634.684	399404.738	Required	
S2.17	384609.764	399430.897	384609.764	399430.897	Required	
STANK	384601.360	399450.106	384601.360	399450.106	Required	
S2.18	384596.565	399455.198	384596.565	399455.198	Required	

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Manhole Schedules for SW Net01

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5.08	384591.210	399465.019	384591.210	399465.019	Required	
S5.09	384553.441	399444.356	384553.441	399444.356	Required	
S5.10	384514.464	399422.066	384514.464	399422.066	Required	
S5.11	384506.391	399411.390	384506.391	399411.390	Required	
S	384502.691	399413.776			No Entry	



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Area Summary for SW Net01

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.028	0.028	0.028
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.014	0.014	0.014
2.000	-	-	100	0.007	0.007	0.007
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.029	0.029	0.029
3.001	-	-	100	0.014	0.014	0.014
3.002	-	-	100	0.056	0.056	0.056
3.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.043	0.043	0.043
4.001	-	-	100	0.014	0.014	0.014
3.004	-	-	100	0.011	0.011	0.011
3.005	-	-	100	0.073	0.073	0.073
5.000	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.063	0.063	0.063
7.000	-	-	100	0.018	0.018	0.018
6.001	-	-	100	0.023	0.023	0.023
6.002	-	-	100	0.013	0.013	0.013
6.003	-	-	100	0.022	0.022	0.022
6.004	-	-	100	0.046	0.046	0.046
6.005	-	-	100	0.034	0.034	0.034
8.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.508	0.508	0.508

Surcharged Outfall Details for SW Net01

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	31.000	27.259	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	30.880	33	30.880	65	30.880	97	30.880	129	30.880	161	30.880	193	30.880
2	30.880	34	30.880	66	30.880	98	30.880	130	30.880	162	30.880	194	30.880
3	30.880	35	30.880	67	30.880	99	30.880	131	30.880	163	30.880	195	30.880
4	30.880	36	30.880	68	30.880	100	30.880	132	30.880	164	30.880	196	30.880
5	30.880	37	30.880	69	30.880	101	30.880	133	30.880	165	30.880	197	30.880
6	30.880	38	30.880	70	30.880	102	30.880	134	30.880	166	30.880	198	30.880
7	30.880	39	30.880	71	30.880	103	30.880	135	30.880	167	30.880	199	30.880
8	30.880	40	30.880	72	30.880	104	30.880	136	30.880	168	30.880	200	30.880
9	30.880	41	30.880	73	30.880	105	30.880	137	30.880	169	30.880	201	30.880
10	30.880	42	30.880	74	30.880	106	30.880	138	30.880	170	30.880	202	30.880
11	30.880	43	30.880	75	30.880	107	30.880	139	30.880	171	30.880	203	30.880
12	30.880	44	30.880	76	30.880	108	30.880	140	30.880	172	30.880	204	30.880
13	30.880	45	30.880	77	30.880	109	30.880	141	30.880	173	30.880	205	30.880
14	30.880	46	30.880	78	30.880	110	30.880	142	30.880	174	30.880	206	30.880
15	30.880	47	30.880	79	30.880	111	30.880	143	30.880	175	30.880	207	30.880
16	30.880	48	30.880	80	30.880	112	30.880	144	30.880	176	30.880	208	30.880
17	30.880	49	30.880	81	30.880	113	30.880	145	30.880	177	30.880	209	30.880
18	30.880	50	30.880	82	30.880	114	30.880	146	30.880	178	30.880	210	30.880
19	30.880	51	30.880	83	30.880	115	30.880	147	30.880	179	30.880	211	30.880
20	30.880	52	30.880	84	30.880	116	30.880	148	30.880	180	30.880	212	30.880
21	30.880	53	30.880	85	30.880	117	30.880	149	30.880	181	30.880	213	30.880
22	30.880	54	30.880	86	30.880	118	30.880	150	30.880	182	30.880	214	30.880
23	30.880	55	30.880	87	30.880	119	30.880	151	30.880	183	30.880	215	30.880
24	30.880	56	30.880	88	30.880	120	30.880	152	30.880	184	30.880	216	30.880
25	30.880	57	30.880	89	30.880	121	30.880	153	30.880	185	30.880	217	30.880
26	30.880	58	30.880	90	30.880	122	30.880	154	30.880	186	30.880	218	30.880
27	30.880	59	30.880	91	30.880	123	30.880	155	30.880	187	30.880	219	30.880
28	30.880	60	30.880	92	30.880	124	30.880	156	30.880	188	30.880	220	30.880
29	30.880	61	30.880	93	30.880	125	30.880	157	30.880	189	30.880	221	30.880
30	30.880	62	30.880	94	30.880	126	30.880	158	30.880	190	30.880	222	30.880
31	30.880	63	30.880	95	30.880	127	30.880	159	30.880	191	30.880	223	30.880
32	30.880	64	30.880	96	30.880	128	30.880	160	30.880	192	30.880	224	30.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
225	30.880	303	30.880	381	30.880	459	30.880	537	30.880	615	30.880	693	30.880
226	30.880	304	30.880	382	30.880	460	30.880	538	30.880	616	30.880	694	30.880
227	30.880	305	30.880	383	30.880	461	30.880	539	30.880	617	30.880	695	30.880
228	30.880	306	30.880	384	30.880	462	30.880	540	30.880	618	30.880	696	30.880
229	30.880	307	30.880	385	30.880	463	30.880	541	30.880	619	30.880	697	30.880
230	30.880	308	30.880	386	30.880	464	30.880	542	30.880	620	30.880	698	30.880
231	30.880	309	30.880	387	30.880	465	30.880	543	30.880	621	30.880	699	30.880
232	30.880	310	30.880	388	30.880	466	30.880	544	30.880	622	30.880	700	30.880
233	30.880	311	30.880	389	30.880	467	30.880	545	30.880	623	30.880	701	30.880
234	30.880	312	30.880	390	30.880	468	30.880	546	30.880	624	30.880	702	30.880
235	30.880	313	30.880	391	30.880	469	30.880	547	30.880	625	30.880	703	30.880
236	30.880	314	30.880	392	30.880	470	30.880	548	30.880	626	30.880	704	30.880
237	30.880	315	30.880	393	30.880	471	30.880	549	30.880	627	30.880	705	30.880
238	30.880	316	30.880	394	30.880	472	30.880	550	30.880	628	30.880	706	30.880
239	30.880	317	30.880	395	30.880	473	30.880	551	30.880	629	30.880	707	30.880
240	30.880	318	30.880	396	30.880	474	30.880	552	30.880	630	30.880	708	30.880
241	30.880	319	30.880	397	30.880	475	30.880	553	30.880	631	30.880	709	30.880
242	30.880	320	30.880	398	30.880	476	30.880	554	30.880	632	30.880	710	30.880
243	30.880	321	30.880	399	30.880	477	30.880	555	30.880	633	30.880	711	30.880
244	30.880	322	30.880	400	30.880	478	30.880	556	30.880	634	30.880	712	30.880
245	30.880	323	30.880	401	30.880	479	30.880	557	30.880	635	30.880	713	30.880
246	30.880	324	30.880	402	30.880	480	30.880	558	30.880	636	30.880	714	30.880
247	30.880	325	30.880	403	30.880	481	30.880	559	30.880	637	30.880	715	30.880
248	30.880	326	30.880	404	30.880	482	30.880	560	30.880	638	30.880	716	30.880
249	30.880	327	30.880	405	30.880	483	30.880	561	30.880	639	30.880	717	30.880
250	30.880	328	30.880	406	30.880	484	30.880	562	30.880	640	30.880	718	30.880
251	30.880	329	30.880	407	30.880	485	30.880	563	30.880	641	30.880	719	30.880
252	30.880	330	30.880	408	30.880	486	30.880	564	30.880	642	30.880	720	30.880
253	30.880	331	30.880	409	30.880	487	30.880	565	30.880	643	30.880	721	30.880
254	30.880	332	30.880	410	30.880	488	30.880	566	30.880	644	30.880	722	30.880
255	30.880	333	30.880	411	30.880	489	30.880	567	30.880	645	30.880	723	30.880
256	30.880	334	30.880	412	30.880	490	30.880	568	30.880	646	30.880	724	30.880
257	30.880	335	30.880	413	30.880	491	30.880	569	30.880	647	30.880	725	30.880
258	30.880	336	30.880	414	30.880	492	30.880	570	30.880	648	30.880	726	30.880
259	30.880	337	30.880	415	30.880	493	30.880	571	30.880	649	30.880	727	30.880
260	30.880	338	30.880	416	30.880	494	30.880	572	30.880	650	30.880	728	30.880
261	30.880	339	30.880	417	30.880	495	30.880	573	30.880	651	30.880	729	30.880
262	30.880	340	30.880	418	30.880	496	30.880	574	30.880	652	30.880	730	30.880
263	30.880	341	30.880	419	30.880	497	30.880	575	30.880	653	30.880	731	30.880
264	30.880	342	30.880	420	30.880	498	30.880	576	30.880	654	30.880	732	30.880
265	30.880	343	30.880	421	30.880	499	30.880	577	30.880	655	30.880	733	30.880
266	30.880	344	30.880	422	30.880	500	30.880	578	30.880	656	30.880	734	30.880
267	30.880	345	30.880	423	30.880	501	30.880	579	30.880	657	30.880	735	30.880
268	30.880	346	30.880	424	30.880	502	30.880	580	30.880	658	30.880	736	30.880
269	30.880	347	30.880	425	30.880	503	30.880	581	30.880	659	30.880	737	30.880
270	30.880	348	30.880	426	30.880	504	30.880	582	30.880	660	30.880	738	30.880
271	30.880	349	30.880	427	30.880	505	30.880	583	30.880	661	30.880	739	30.880
272	30.880	350	30.880	428	30.880	506	30.880	584	30.880	662	30.880	740	30.880
273	30.880	351	30.880	429	30.880	507	30.880	585	30.880	663	30.880	741	30.880
274	30.880	352	30.880	430	30.880	508	30.880	586	30.880	664	30.880	742	30.880
275	30.880	353	30.880	431	30.880	509	30.880	587	30.880	665	30.880	743	30.880
276	30.880	354	30.880	432	30.880	510	30.880	588	30.880	666	30.880	744	30.880
277	30.880	355	30.880	433	30.880	511	30.880	589	30.880	667	30.880	745	30.880
278	30.880	356	30.880	434	30.880	512	30.880	590	30.880	668	30.880	746	30.880
279	30.880	357	30.880	435	30.880	513	30.880	591	30.880	669	30.880	747	30.880
280	30.880	358	30.880	436	30.880	514	30.880	592	30.880	670	30.880	748	30.880
281	30.880	359	30.880	437	30.880	515	30.880	593	30.880	671	30.880	749	30.880
282	30.880	360	30.880	438	30.880	516	30.880	594	30.880	672	30.880	750	30.880
283	30.880	361	30.880	439	30.880	517	30.880	595	30.880	673	30.880	751	30.880
284	30.880	362	30.880	440	30.880	518	30.880	596	30.880	674	30.880	752	30.880
285	30.880	363	30.880	441	30.880	519	30.880	597	30.880	675	30.880	753	30.880
286	30.880	364	30.880	442	30.880	520	30.880	598	30.880	676	30.880	754	30.880
287	30.880	365	30.880	443	30.880	521	30.880	599	30.880	677	30.880	755	30.880
288	30.880	366	30.880	444	30.880	522	30.880	600	30.880	678	30.880	756	30.880
289	30.880	367	30.880	445	30.880	523	30.880	601	30.880	679	30.880	757	30.880
290	30.880	368	30.880	446	30.880	524	30.880	602	30.880	680	30.880	758	30.880
291	30.880	369	30.880	447	30.880	525	30.880	603	30.880	681	30.880	759	30.880
292	30.880	370	30.880	448	30.880	526	30.880	604	30.880	682	30.880	760	30.880
293	30.880	371	30.880	449	30.880	527	30.880	605	30.880	683	30.880	761	30.880
294	30.880	372	30.880	450	30.880	528	30.880	606	30.880	684	30.880	762	30.880
295	30.880	373	30.880	451	30.880	529	30.880	607	30.880	685	30.880	763	30.880
296	30.880	374	30.880	452	30.880	530	30.880	608	30.880	686	30.880	764	30.880
297	30.880	375	30.880	453	30.880	531	30.880	609	30.880	687	30.880	765	30.880
298	30.880	376	30.880	454	30.880	532	30.880	610	30.880	688	30.880	766	30.880
299	30.880	377	30.880	455	30.880	533	30.880	611	30.880	689	30.880	767	30.880
300	30.880	378	30.880	456	30.880	534	30.880	612	30.880	690	30.880	768	30.880
301	30.880	379	30.880	457	30.880	535	30.880	613	30.880	691	30.880	769	30.880
302	30.880	380	30.880	458	30.880	536	30.880	614	30.880	692	30.880	770	30.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
771	30.880	849	30.880	927	30.880	1005	30.880	1083	30.880	1161	30.880	1239	30.880
772	30.880	850	30.880	928	30.880	1006	30.880	1084	30.880	1162	30.880	1240	30.880
773	30.880	851	30.880	929	30.880	1007	30.880	1085	30.880	1163	30.880	1241	30.880
774	30.880	852	30.880	930	30.880	1008	30.880	1086	30.880	1164	30.880	1242	30.880
775	30.880	853	30.880	931	30.880	1009	30.880	1087	30.880	1165	30.880	1243	30.880
776	30.880	854	30.880	932	30.880	1010	30.880	1088	30.880	1166	30.880	1244	30.880
777	30.880	855	30.880	933	30.880	1011	30.880	1089	30.880	1167	30.880	1245	30.880
778	30.880	856	30.880	934	30.880	1012	30.880	1090	30.880	1168	30.880	1246	30.880
779	30.880	857	30.880	935	30.880	1013	30.880	1091	30.880	1169	30.880	1247	30.880
780	30.880	858	30.880	936	30.880	1014	30.880	1092	30.880	1170	30.880	1248	30.880
781	30.880	859	30.880	937	30.880	1015	30.880	1093	30.880	1171	30.880	1249	30.880
782	30.880	860	30.880	938	30.880	1016	30.880	1094	30.880	1172	30.880	1250	30.880
783	30.880	861	30.880	939	30.880	1017	30.880	1095	30.880	1173	30.880	1251	30.880
784	30.880	862	30.880	940	30.880	1018	30.880	1096	30.880	1174	30.880	1252	30.880
785	30.880	863	30.880	941	30.880	1019	30.880	1097	30.880	1175	30.880	1253	30.880
786	30.880	864	30.880	942	30.880	1020	30.880	1098	30.880	1176	30.880	1254	30.880
787	30.880	865	30.880	943	30.880	1021	30.880	1099	30.880	1177	30.880	1255	30.880
788	30.880	866	30.880	944	30.880	1022	30.880	1100	30.880	1178	30.880	1256	30.880
789	30.880	867	30.880	945	30.880	1023	30.880	1101	30.880	1179	30.880	1257	30.880
790	30.880	868	30.880	946	30.880	1024	30.880	1102	30.880	1180	30.880	1258	30.880
791	30.880	869	30.880	947	30.880	1025	30.880	1103	30.880	1181	30.880	1259	30.880
792	30.880	870	30.880	948	30.880	1026	30.880	1104	30.880	1182	30.880	1260	30.880
793	30.880	871	30.880	949	30.880	1027	30.880	1105	30.880	1183	30.880	1261	30.880
794	30.880	872	30.880	950	30.880	1028	30.880	1106	30.880	1184	30.880	1262	30.880
795	30.880	873	30.880	951	30.880	1029	30.880	1107	30.880	1185	30.880	1263	30.880
796	30.880	874	30.880	952	30.880	1030	30.880	1108	30.880	1186	30.880	1264	30.880
797	30.880	875	30.880	953	30.880	1031	30.880	1109	30.880	1187	30.880	1265	30.880
798	30.880	876	30.880	954	30.880	1032	30.880	1110	30.880	1188	30.880	1266	30.880
799	30.880	877	30.880	955	30.880	1033	30.880	1111	30.880	1189	30.880	1267	30.880
800	30.880	878	30.880	956	30.880	1034	30.880	1112	30.880	1190	30.880	1268	30.880
801	30.880	879	30.880	957	30.880	1035	30.880	1113	30.880	1191	30.880	1269	30.880
802	30.880	880	30.880	958	30.880	1036	30.880	1114	30.880	1192	30.880	1270	30.880
803	30.880	881	30.880	959	30.880	1037	30.880	1115	30.880	1193	30.880	1271	30.880
804	30.880	882	30.880	960	30.880	1038	30.880	1116	30.880	1194	30.880	1272	30.880
805	30.880	883	30.880	961	30.880	1039	30.880	1117	30.880	1195	30.880	1273	30.880
806	30.880	884	30.880	962	30.880	1040	30.880	1118	30.880	1196	30.880	1274	30.880
807	30.880	885	30.880	963	30.880	1041	30.880	1119	30.880	1197	30.880	1275	30.880
808	30.880	886	30.880	964	30.880	1042	30.880	1120	30.880	1198	30.880	1276	30.880
809	30.880	887	30.880	965	30.880	1043	30.880	1121	30.880	1199	30.880	1277	30.880
810	30.880	888	30.880	966	30.880	1044	30.880	1122	30.880	1200	30.880	1278	30.880
811	30.880	889	30.880	967	30.880	1045	30.880	1123	30.880	1201	30.880	1279	30.880
812	30.880	890	30.880	968	30.880	1046	30.880	1124	30.880	1202	30.880	1280	30.880
813	30.880	891	30.880	969	30.880	1047	30.880	1125	30.880	1203	30.880	1281	30.880
814	30.880	892	30.880	970	30.880	1048	30.880	1126	30.880	1204	30.880	1282	30.880
815	30.880	893	30.880	971	30.880	1049	30.880	1127	30.880	1205	30.880	1283	30.880
816	30.880	894	30.880	972	30.880	1050	30.880	1128	30.880	1206	30.880	1284	30.880
817	30.880	895	30.880	973	30.880	1051	30.880	1129	30.880	1207	30.880	1285	30.880
818	30.880	896	30.880	974	30.880	1052	30.880	1130	30.880	1208	30.880	1286	30.880
819	30.880	897	30.880	975	30.880	1053	30.880	1131	30.880	1209	30.880	1287	30.880
820	30.880	898	30.880	976	30.880	1054	30.880	1132	30.880	1210	30.880	1288	30.880
821	30.880	899	30.880	977	30.880	1055	30.880	1133	30.880	1211	30.880	1289	30.880
822	30.880	900	30.880	978	30.880	1056	30.880	1134	30.880	1212	30.880	1290	30.880
823	30.880	901	30.880	979	30.880	1057	30.880	1135	30.880	1213	30.880	1291	30.880
824	30.880	902	30.880	980	30.880	1058	30.880	1136	30.880	1214	30.880	1292	30.880
825	30.880	903	30.880	981	30.880	1059	30.880	1137	30.880	1215	30.880	1293	30.880
826	30.880	904	30.880	982	30.880	1060	30.880	1138	30.880	1216	30.880	1294	30.880
827	30.880	905	30.880	983	30.880	1061	30.880	1139	30.880	1217	30.880	1295	30.880
828	30.880	906	30.880	984	30.880	1062	30.880	1140	30.880	1218	30.880	1296	30.880
829	30.880	907	30.880	985	30.880	1063	30.880	1141	30.880	1219	30.880	1297	30.880
830	30.880	908	30.880	986	30.880	1064	30.880	1142	30.880	1220	30.880	1298	30.880
831	30.880	909	30.880	987	30.880	1065	30.880	1143	30.880	1221	30.880	1299	30.880
832	30.880	910	30.880	988	30.880	1066	30.880	1144	30.880	1222	30.880	1300	30.880
833	30.880	911	30.880	989	30.880	1067	30.880	1145	30.880	1223	30.880	1301	30.880
834	30.880	912	30.880	990	30.880	1068	30.880	1146	30.880	1224	30.880	1302	30.880
835	30.880	913	30.880	991	30.880	1069	30.880	1147	30.880	1225	30.880	1303	30.880
836	30.880	914	30.880	992	30.880	1070	30.880	1148	30.880	1226	30.880	1304	30.880
837	30.880	915	30.880	993	30.880	1071	30.880	1149	30.880	1227	30.880	1305	30.880
838	30.880	916	30.880	994	30.880	1072	30.880	1150	30.880	1228	30.880	1306	30.880
839	30.880	917	30.880	995	30.880	1073	30.880	1151	30.880	1229	30.880	1307	30.880
840	30.880	918	30.880	996	30.880	1074	30.880	1152	30.880	1230	30.880	1308	30.880
841	30.880	919	30.880	997	30.880	1075	30.880	1153	30.880	1231	30.880	1309	30.880
842	30.880	920	30.880	998	30.880	1076	30.880	1154	30.880	1232	30.880	1310	30.880
843	30.880	921	30.880	999	30.880	1077	30.880	1155	30.880	1233	30.880	1311	30.880
844	30.880	922	30.880	1000	30.880	1078	30.880	1156	30.880	1234	30.880	1312	30.880
845	30.880	923	30.880	1001	30.880	1079	30.880	1157	30.880	1235	30.880	1313	30.880
846	30.880	924	30.880	1002	30.880	1080	30.880	1158	30.880	1236	30.880	1314	30.880
847	30.880	925	30.880	1003	30.880	1081	30.880	1159	30.880	1237	30.880	1315	30.880
848	30.880	926	30.880	1004	30.880	1082	30.880	1160	30.880	1238	30.880	1316	30.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1317	30.880	1395	30.880	1473	30.880	1551	30.880	1629	30.880	1707	30.880	1785	30.880
1318	30.880	1396	30.880	1474	30.880	1552	30.880	1630	30.880	1708	30.880	1786	30.880
1319	30.880	1397	30.880	1475	30.880	1553	30.880	1631	30.880	1709	30.880	1787	30.880
1320	30.880	1398	30.880	1476	30.880	1554	30.880	1632	30.880	1710	30.880	1788	30.880
1321	30.880	1399	30.880	1477	30.880	1555	30.880	1633	30.880	1711	30.880	1789	30.880
1322	30.880	1400	30.880	1478	30.880	1556	30.880	1634	30.880	1712	30.880	1790	30.880
1323	30.880	1401	30.880	1479	30.880	1557	30.880	1635	30.880	1713	30.880	1791	30.880
1324	30.880	1402	30.880	1480	30.880	1558	30.880	1636	30.880	1714	30.880	1792	30.880
1325	30.880	1403	30.880	1481	30.880	1559	30.880	1637	30.880	1715	30.880	1793	30.880
1326	30.880	1404	30.880	1482	30.880	1560	30.880	1638	30.880	1716	30.880	1794	30.880
1327	30.880	1405	30.880	1483	30.880	1561	30.880	1639	30.880	1717	30.880	1795	30.880
1328	30.880	1406	30.880	1484	30.880	1562	30.880	1640	30.880	1718	30.880	1796	30.880
1329	30.880	1407	30.880	1485	30.880	1563	30.880	1641	30.880	1719	30.880	1797	30.880
1330	30.880	1408	30.880	1486	30.880	1564	30.880	1642	30.880	1720	30.880	1798	30.880
1331	30.880	1409	30.880	1487	30.880	1565	30.880	1643	30.880	1721	30.880	1799	30.880
1332	30.880	1410	30.880	1488	30.880	1566	30.880	1644	30.880	1722	30.880	1800	30.880
1333	30.880	1411	30.880	1489	30.880	1567	30.880	1645	30.880	1723	30.880	1801	30.880
1334	30.880	1412	30.880	1490	30.880	1568	30.880	1646	30.880	1724	30.880	1802	30.880
1335	30.880	1413	30.880	1491	30.880	1569	30.880	1647	30.880	1725	30.880	1803	30.880
1336	30.880	1414	30.880	1492	30.880	1570	30.880	1648	30.880	1726	30.880	1804	30.880
1337	30.880	1415	30.880	1493	30.880	1571	30.880	1649	30.880	1727	30.880	1805	30.880
1338	30.880	1416	30.880	1494	30.880	1572	30.880	1650	30.880	1728	30.880	1806	30.880
1339	30.880	1417	30.880	1495	30.880	1573	30.880	1651	30.880	1729	30.880	1807	30.880
1340	30.880	1418	30.880	1496	30.880	1574	30.880	1652	30.880	1730	30.880	1808	30.880
1341	30.880	1419	30.880	1497	30.880	1575	30.880	1653	30.880	1731	30.880	1809	30.880
1342	30.880	1420	30.880	1498	30.880	1576	30.880	1654	30.880	1732	30.880	1810	30.880
1343	30.880	1421	30.880	1499	30.880	1577	30.880	1655	30.880	1733	30.880	1811	30.880
1344	30.880	1422	30.880	1500	30.880	1578	30.880	1656	30.880	1734	30.880	1812	30.880
1345	30.880	1423	30.880	1501	30.880	1579	30.880	1657	30.880	1735	30.880	1813	30.880
1346	30.880	1424	30.880	1502	30.880	1580	30.880	1658	30.880	1736	30.880	1814	30.880
1347	30.880	1425	30.880	1503	30.880	1581	30.880	1659	30.880	1737	30.880	1815	30.880
1348	30.880	1426	30.880	1504	30.880	1582	30.880	1660	30.880	1738	30.880	1816	30.880
1349	30.880	1427	30.880	1505	30.880	1583	30.880	1661	30.880	1739	30.880	1817	30.880
1350	30.880	1428	30.880	1506	30.880	1584	30.880	1662	30.880	1740	30.880	1818	30.880
1351	30.880	1429	30.880	1507	30.880	1585	30.880	1663	30.880	1741	30.880	1819	30.880
1352	30.880	1430	30.880	1508	30.880	1586	30.880	1664	30.880	1742	30.880	1820	30.880
1353	30.880	1431	30.880	1509	30.880	1587	30.880	1665	30.880	1743	30.880	1821	30.880
1354	30.880	1432	30.880	1510	30.880	1588	30.880	1666	30.880	1744	30.880	1822	30.880
1355	30.880	1433	30.880	1511	30.880	1589	30.880	1667	30.880	1745	30.880	1823	30.880
1356	30.880	1434	30.880	1512	30.880	1590	30.880	1668	30.880	1746	30.880	1824	30.880
1357	30.880	1435	30.880	1513	30.880	1591	30.880	1669	30.880	1747	30.880	1825	30.880
1358	30.880	1436	30.880	1514	30.880	1592	30.880	1670	30.880	1748	30.880	1826	30.880
1359	30.880	1437	30.880	1515	30.880	1593	30.880	1671	30.880	1749	30.880	1827	30.880
1360	30.880	1438	30.880	1516	30.880	1594	30.880	1672	30.880	1750	30.880	1828	30.880
1361	30.880	1439	30.880	1517	30.880	1595	30.880	1673	30.880	1751	30.880	1829	30.880
1362	30.880	1440	30.880	1518	30.880	1596	30.880	1674	30.880	1752	30.880	1830	30.880
1363	30.880	1441	30.880	1519	30.880	1597	30.880	1675	30.880	1753	30.880	1831	30.880
1364	30.880	1442	30.880	1520	30.880	1598	30.880	1676	30.880	1754	30.880	1832	30.880
1365	30.880	1443	30.880	1521	30.880	1599	30.880	1677	30.880	1755	30.880	1833	30.880
1366	30.880	1444	30.880	1522	30.880	1600	30.880	1678	30.880	1756	30.880	1834	30.880
1367	30.880	1445	30.880	1523	30.880	1601	30.880	1679	30.880	1757	30.880	1835	30.880
1368	30.880	1446	30.880	1524	30.880	1602	30.880	1680	30.880	1758	30.880	1836	30.880
1369	30.880	1447	30.880	1525	30.880	1603	30.880	1681	30.880	1759	30.880	1837	30.880
1370	30.880	1448	30.880	1526	30.880	1604	30.880	1682	30.880	1760	30.880	1838	30.880
1371	30.880	1449	30.880	1527	30.880	1605	30.880	1683	30.880	1761	30.880	1839	30.880
1372	30.880	1450	30.880	1528	30.880	1606	30.880	1684	30.880	1762	30.880	1840	30.880
1373	30.880	1451	30.880	1529	30.880	1607	30.880	1685	30.880	1763	30.880	1841	30.880
1374	30.880	1452	30.880	1530	30.880	1608	30.880	1686	30.880	1764	30.880	1842	30.880
1375	30.880	1453	30.880	1531	30.880	1609	30.880	1687	30.880	1765	30.880	1843	30.880
1376	30.880	1454	30.880	1532	30.880	1610	30.880	1688	30.880	1766	30.880	1844	30.880
1377	30.880	1455	30.880	1533	30.880	1611	30.880	1689	30.880	1767	30.880	1845	30.880
1378	30.880	1456	30.880	1534	30.880	1612	30.880	1690	30.880	1768	30.880	1846	30.880
1379	30.880	1457	30.880	1535	30.880	1613	30.880	1691	30.880	1769	30.880	1847	30.880
1380	30.880	1458	30.880	1536	30.880	1614	30.880	1692	30.880	1770	30.880	1848	30.880
1381	30.880	1459	30.880	1537	30.880	1615	30.880	1693	30.880	1771	30.880	1849	30.880
1382	30.880	1460	30.880	1538	30.880	1616	30.880	1694	30.880	1772	30.880	1850	30.880
1383	30.880	1461	30.880	1539	30.880	1617	30.880	1695	30.880	1773	30.880	1851	30.880
1384	30.880	1462	30.880	1540	30.880	1618	30.880	1696	30.880	1774	30.880	1852	30.880
1385	30.880	1463	30.880	1541	30.880	1619	30.880	1697	30.880	1775	30.880	1853	30.880
1386	30.880	1464	30.880	1542	30.880	1620	30.880	1698	30.880	1776	30.880	1854	30.880
1387	30.880	1465	30.880	1543	30.880	1621	30.880	1699	30.880	1777	30.880	1855	30.880
1388	30.880	1466	30.880	1544	30.880	1622	30.880	1700	30.880	1778	30.880	1856	30.880
1389	30.880	1467	30.880	1545	30.880	1623	30.880	1701	30.880	1779	30.880	1857	30.880
1390	30.880	1468	30.880	1546	30.880	1624	30.880	1702	30.880	1780	30.880	1858	30.880
1391	30.880	1469	30.880	1547	30.880	1625	30.880	1703	30.880	1781	30.880	1859	30.880
1392	30.880	1470	30.880	1548	30.880	1626	30.880	1704	30.880	1782	30.880	1860	30.880
1393	30.880	1471	30.880	1549	30.880	1627	30.880	1705	30.880	1783	30.880	1861	30.880
1394	30.880	1472	30.880	1550	30.880	1628	30.880	1706	30.880	1784	30.880	1862	30.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1863	30.880	1941	30.880	2019	30.880	2097	30.880	2175	30.880	2253	30.880	2331	30.880
1864	30.880	1942	30.880	2020	30.880	2098	30.880	2176	30.880	2254	30.880	2332	30.880
1865	30.880	1943	30.880	2021	30.880	2099	30.880	2177	30.880	2255	30.880	2333	30.880
1866	30.880	1944	30.880	2022	30.880	2100	30.880	2178	30.880	2256	30.880	2334	30.880
1867	30.880	1945	30.880	2023	30.880	2101	30.880	2179	30.880	2257	30.880	2335	30.880
1868	30.880	1946	30.880	2024	30.880	2102	30.880	2180	30.880	2258	30.880	2336	30.880
1869	30.880	1947	30.880	2025	30.880	2103	30.880	2181	30.880	2259	30.880	2337	30.880
1870	30.880	1948	30.880	2026	30.880	2104	30.880	2182	30.880	2260	30.880	2338	30.880
1871	30.880	1949	30.880	2027	30.880	2105	30.880	2183	30.880	2261	30.880	2339	30.880
1872	30.880	1950	30.880	2028	30.880	2106	30.880	2184	30.880	2262	30.880	2340	30.880
1873	30.880	1951	30.880	2029	30.880	2107	30.880	2185	30.880	2263	30.880	2341	30.880
1874	30.880	1952	30.880	2030	30.880	2108	30.880	2186	30.880	2264	30.880	2342	30.880
1875	30.880	1953	30.880	2031	30.880	2109	30.880	2187	30.880	2265	30.880	2343	30.880
1876	30.880	1954	30.880	2032	30.880	2110	30.880	2188	30.880	2266	30.880	2344	30.880
1877	30.880	1955	30.880	2033	30.880	2111	30.880	2189	30.880	2267	30.880	2345	30.880
1878	30.880	1956	30.880	2034	30.880	2112	30.880	2190	30.880	2268	30.880	2346	30.880
1879	30.880	1957	30.880	2035	30.880	2113	30.880	2191	30.880	2269	30.880	2347	30.880
1880	30.880	1958	30.880	2036	30.880	2114	30.880	2192	30.880	2270	30.880	2348	30.880
1881	30.880	1959	30.880	2037	30.880	2115	30.880	2193	30.880	2271	30.880	2349	30.880
1882	30.880	1960	30.880	2038	30.880	2116	30.880	2194	30.880	2272	30.880	2350	30.880
1883	30.880	1961	30.880	2039	30.880	2117	30.880	2195	30.880	2273	30.880	2351	30.880
1884	30.880	1962	30.880	2040	30.880	2118	30.880	2196	30.880	2274	30.880	2352	30.880
1885	30.880	1963	30.880	2041	30.880	2119	30.880	2197	30.880	2275	30.880	2353	30.880
1886	30.880	1964	30.880	2042	30.880	2120	30.880	2198	30.880	2276	30.880	2354	30.880
1887	30.880	1965	30.880	2043	30.880	2121	30.880	2199	30.880	2277	30.880	2355	30.880
1888	30.880	1966	30.880	2044	30.880	2122	30.880	2200	30.880	2278	30.880	2356	30.880
1889	30.880	1967	30.880	2045	30.880	2123	30.880	2201	30.880	2279	30.880	2357	30.880
1890	30.880	1968	30.880	2046	30.880	2124	30.880	2202	30.880	2280	30.880	2358	30.880
1891	30.880	1969	30.880	2047	30.880	2125	30.880	2203	30.880	2281	30.880	2359	30.880
1892	30.880	1970	30.880	2048	30.880	2126	30.880	2204	30.880	2282	30.880	2360	30.880
1893	30.880	1971	30.880	2049	30.880	2127	30.880	2205	30.880	2283	30.880	2361	30.880
1894	30.880	1972	30.880	2050	30.880	2128	30.880	2206	30.880	2284	30.880	2362	30.880
1895	30.880	1973	30.880	2051	30.880	2129	30.880	2207	30.880	2285	30.880	2363	30.880
1896	30.880	1974	30.880	2052	30.880	2130	30.880	2208	30.880	2286	30.880	2364	30.880
1897	30.880	1975	30.880	2053	30.880	2131	30.880	2209	30.880	2287	30.880	2365	30.880
1898	30.880	1976	30.880	2054	30.880	2132	30.880	2210	30.880	2288	30.880	2366	30.880
1899	30.880	1977	30.880	2055	30.880	2133	30.880	2211	30.880	2289	30.880	2367	30.880
1900	30.880	1978	30.880	2056	30.880	2134	30.880	2212	30.880	2290	30.880	2368	30.880
1901	30.880	1979	30.880	2057	30.880	2135	30.880	2213	30.880	2291	30.880	2369	30.880
1902	30.880	1980	30.880	2058	30.880	2136	30.880	2214	30.880	2292	30.880	2370	30.880
1903	30.880	1981	30.880	2059	30.880	2137	30.880	2215	30.880	2293	30.880	2371	30.880
1904	30.880	1982	30.880	2060	30.880	2138	30.880	2216	30.880	2294	30.880	2372	30.880
1905	30.880	1983	30.880	2061	30.880	2139	30.880	2217	30.880	2295	30.880	2373	30.880
1906	30.880	1984	30.880	2062	30.880	2140	30.880	2218	30.880	2296	30.880	2374	30.880
1907	30.880	1985	30.880	2063	30.880	2141	30.880	2219	30.880	2297	30.880	2375	30.880
1908	30.880	1986	30.880	2064	30.880	2142	30.880	2220	30.880	2298	30.880	2376	30.880
1909	30.880	1987	30.880	2065	30.880	2143	30.880	2221	30.880	2299	30.880	2377	30.880
1910	30.880	1988	30.880	2066	30.880	2144	30.880	2222	30.880	2300	30.880	2378	30.880
1911	30.880	1989	30.880	2067	30.880	2145	30.880	2223	30.880	2301	30.880	2379	30.880
1912	30.880	1990	30.880	2068	30.880	2146	30.880	2224	30.880	2302	30.880	2380	30.880
1913	30.880	1991	30.880	2069	30.880	2147	30.880	2225	30.880	2303	30.880	2381	30.880
1914	30.880	1992	30.880	2070	30.880	2148	30.880	2226	30.880	2304	30.880	2382	30.880
1915	30.880	1993	30.880	2071	30.880	2149	30.880	2227	30.880	2305	30.880	2383	30.880
1916	30.880	1994	30.880	2072	30.880	2150	30.880	2228	30.880	2306	30.880	2384	30.880
1917	30.880	1995	30.880	2073	30.880	2151	30.880	2229	30.880	2307	30.880	2385	30.880
1918	30.880	1996	30.880	2074	30.880	2152	30.880	2230	30.880	2308	30.880	2386	30.880
1919	30.880	1997	30.880	2075	30.880	2153	30.880	2231	30.880	2309	30.880	2387	30.880
1920	30.880	1998	30.880	2076	30.880	2154	30.880	2232	30.880	2310	30.880	2388	30.880
1921	30.880	1999	30.880	2077	30.880	2155	30.880	2233	30.880	2311	30.880	2389	30.880
1922	30.880	2000	30.880	2078	30.880	2156	30.880	2234	30.880	2312	30.880	2390	30.880
1923	30.880	2001	30.880	2079	30.880	2157	30.880	2235	30.880	2313	30.880	2391	30.880
1924	30.880	2002	30.880	2080	30.880	2158	30.880	2236	30.880	2314	30.880	2392	30.880
1925	30.880	2003	30.880	2081	30.880	2159	30.880	2237	30.880	2315	30.880	2393	30.880
1926	30.880	2004	30.880	2082	30.880	2160	30.880	2238	30.880	2316	30.880	2394	30.880
1927	30.880	2005	30.880	2083	30.880	2161	30.880	2239	30.880	2317	30.880	2395	30.880
1928	30.880	2006	30.880	2084	30.880	2162	30.880	2240	30.880	2318	30.880	2396	30.880
1929	30.880	2007	30.880	2085	30.880	2163	30.880	2241	30.880	2319	30.880	2397	30.880
1930	30.880	2008	30.880	2086	30.880	2164	30.880	2242	30.880	2320	30.880	2398	30.880
1931	30.880	2009	30.880	2087	30.880	2165	30.880	2243	30.880	2321	30.880	2399	30.880
1932	30.880	2010	30.880	2088	30.880	2166	30.880	2244	30.880	2322	30.880	2400	30.880
1933	30.880	2011	30.880	2089	30.880	2167	30.880	2245	30.880	2323	30.880	2401	30.880
1934	30.880	2012	30.880	2090	30.880	2168	30.880	2246	30.880	2324	30.880	2402	30.880
1935	30.880	2013	30.880	2091	30.880	2169	30.880	2247	30.880	2325	30.880	2403	30.880
1936	30.880	2014	30.880	2092	30.880	2170	30.880	2248	30.880	2326	30.880	2404	30.880
1937	30.880	2015	30.880	2093	30.880	2171	30.880	2249	30.880	2327	30.880	2405	30.880
1938	30.880	2016	30.880	2094	30.880	2172	30.880	2250	30.880	2328	30.880	2406	30.880
1939	30.880	2017	30.880	2095	30.880	2173	30.880	2251	30.880	2329	30.880	2407	30.880
1940	30.880	2018	30.880	2096	30.880	2174	30.880	2252	30.880	2330	30.880	2408	30.880

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Surcharged Outfall Details for SW Net01

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2409	30.880	2477	30.880	2545	30.880	2613	30.880	2681	30.880	2749	30.880	2817	30.880
2410	30.880	2478	30.880	2546	30.880	2614	30.880	2682	30.880	2750	30.880	2818	30.880
2411	30.880	2479	30.880	2547	30.880	2615	30.880	2683	30.880	2751	30.880	2819	30.880
2412	30.880	2480	30.880	2548	30.880	2616	30.880	2684	30.880	2752	30.880	2820	30.880
2413	30.880	2481	30.880	2549	30.880	2617	30.880	2685	30.880	2753	30.880	2821	30.880
2414	30.880	2482	30.880	2550	30.880	2618	30.880	2686	30.880	2754	30.880	2822	30.880
2415	30.880	2483	30.880	2551	30.880	2619	30.880	2687	30.880	2755	30.880	2823	30.880
2416	30.880	2484	30.880	2552	30.880	2620	30.880	2688	30.880	2756	30.880	2824	30.880
2417	30.880	2485	30.880	2553	30.880	2621	30.880	2689	30.880	2757	30.880	2825	30.880
2418	30.880	2486	30.880	2554	30.880	2622	30.880	2690	30.880	2758	30.880	2826	30.880
2419	30.880	2487	30.880	2555	30.880	2623	30.880	2691	30.880	2759	30.880	2827	30.880
2420	30.880	2488	30.880	2556	30.880	2624	30.880	2692	30.880	2760	30.880	2828	30.880
2421	30.880	2489	30.880	2557	30.880	2625	30.880	2693	30.880	2761	30.880	2829	30.880
2422	30.880	2490	30.880	2558	30.880	2626	30.880	2694	30.880	2762	30.880	2830	30.880
2423	30.880	2491	30.880	2559	30.880	2627	30.880	2695	30.880	2763	30.880	2831	30.880
2424	30.880	2492	30.880	2560	30.880	2628	30.880	2696	30.880	2764	30.880	2832	30.880
2425	30.880	2493	30.880	2561	30.880	2629	30.880	2697	30.880	2765	30.880	2833	30.880
2426	30.880	2494	30.880	2562	30.880	2630	30.880	2698	30.880	2766	30.880	2834	30.880
2427	30.880	2495	30.880	2563	30.880	2631	30.880	2699	30.880	2767	30.880	2835	30.880
2428	30.880	2496	30.880	2564	30.880	2632	30.880	2700	30.880	2768	30.880	2836	30.880
2429	30.880	2497	30.880	2565	30.880	2633	30.880	2701	30.880	2769	30.880	2837	30.880
2430	30.880	2498	30.880	2566	30.880	2634	30.880	2702	30.880	2770	30.880	2838	30.880
2431	30.880	2499	30.880	2567	30.880	2635	30.880	2703	30.880	2771	30.880	2839	30.880
2432	30.880	2500	30.880	2568	30.880	2636	30.880	2704	30.880	2772	30.880	2840	30.880
2433	30.880	2501	30.880	2569	30.880	2637	30.880	2705	30.880	2773	30.880	2841	30.880
2434	30.880	2502	30.880	2570	30.880	2638	30.880	2706	30.880	2774	30.880	2842	30.880
2435	30.880	2503	30.880	2571	30.880	2639	30.880	2707	30.880	2775	30.880	2843	30.880
2436	30.880	2504	30.880	2572	30.880	2640	30.880	2708	30.880	2776	30.880	2844	30.880
2437	30.880	2505	30.880	2573	30.880	2641	30.880	2709	30.880	2777	30.880	2845	30.880
2438	30.880	2506	30.880	2574	30.880	2642	30.880	2710	30.880	2778	30.880	2846	30.880
2439	30.880	2507	30.880	2575	30.880	2643	30.880	2711	30.880	2779	30.880	2847	30.880
2440	30.880	2508	30.880	2576	30.880	2644	30.880	2712	30.880	2780	30.880	2848	30.880
2441	30.880	2509	30.880	2577	30.880	2645	30.880	2713	30.880	2781	30.880	2849	30.880
2442	30.880	2510	30.880	2578	30.880	2646	30.880	2714	30.880	2782	30.880	2850	30.880
2443	30.880	2511	30.880	2579	30.880	2647	30.880	2715	30.880	2783	30.880	2851	30.880
2444	30.880	2512	30.880	2580	30.880	2648	30.880	2716	30.880	2784	30.880	2852	30.880
2445	30.880	2513	30.880	2581	30.880	2649	30.880	2717	30.880	2785	30.880	2853	30.880
2446	30.880	2514	30.880	2582	30.880	2650	30.880	2718	30.880	2786	30.880	2854	30.880
2447	30.880	2515	30.880	2583	30.880	2651	30.880	2719	30.880	2787	30.880	2855	30.880
2448	30.880	2516	30.880	2584	30.880	2652	30.880	2720	30.880	2788	30.880	2856	30.880
2449	30.880	2517	30.880	2585	30.880	2653	30.880	2721	30.880	2789	30.880	2857	30.880
2450	30.880	2518	30.880	2586	30.880	2654	30.880	2722	30.880	2790	30.880	2858	30.880
2451	30.880	2519	30.880	2587	30.880	2655	30.880	2723	30.880	2791	30.880	2859	30.880
2452	30.880	2520	30.880	2588	30.880	2656	30.880	2724	30.880	2792	30.880	2860	30.880
2453	30.880	2521	30.880	2589	30.880	2657	30.880	2725	30.880	2793	30.880	2861	30.880
2454	30.880	2522	30.880	2590	30.880	2658	30.880	2726	30.880	2794	30.880	2862	30.880
2455	30.880	2523	30.880	2591	30.880	2659	30.880	2727	30.880	2795	30.880	2863	30.880
2456	30.880	2524	30.880	2592	30.880	2660	30.880	2728	30.880	2796	30.880	2864	30.880
2457	30.880	2525	30.880	2593	30.880	2661	30.880	2729	30.880	2797	30.880	2865	30.880
2458	30.880	2526	30.880	2594	30.880	2662	30.880	2730	30.880	2798	30.880	2866	30.880
2459	30.880	2527	30.880	2595	30.880	2663	30.880	2731	30.880	2799	30.880	2867	30.880
2460	30.880	2528	30.880	2596	30.880	2664	30.880	2732	30.880	2800	30.880	2868	30.880
2461	30.880	2529	30.880	2597	30.880	2665	30.880	2733	30.880	2801	30.880	2869	30.880
2462	30.880	2530	30.880	2598	30.880	2666	30.880	2734	30.880	2802	30.880	2870	30.880
2463	30.880	2531	30.880	2599	30.880	2667	30.880	2735	30.880	2803	30.880	2871	30.880
2464	30.880	2532	30.880	2600	30.880	2668	30.880	2736	30.880	2804	30.880	2872	30.880
2465	30.880	2533	30.880	2601	30.880	2669	30.880	2737	30.880	2805	30.880	2873	30.880
2466	30.880	2534	30.880	2602	30.880	2670	30.880	2738	30.880	2806	30.880	2874	30.880
2467	30.880	2535	30.880	2603	30.880	2671	30.880	2739	30.880	2807	30.880	2875	30.880
2468	30.880	2536	30.880	2604	30.880	2672	30.880	2740	30.880	2808	30.880	2876	30.880
2469	30.880	2537	30.880	2605	30.880	2673	30.880	2741	30.880	2809	30.880	2877	30.880
2470	30.880	2538	30.880	2606	30.880	2674	30.880	2742	30.880	2810	30.880	2878	30.880
2471	30.880	2539	30.880	2607	30.880	2675	30.880	2743	30.880	2811	30.880	2879	30.880
2472	30.880	2540	30.880	2608	30.880	2676	30.880	2744	30.880	2812	30.880	2880	30.880
2473	30.880	2541	30.880	2609	30.880	2677	30.880	2745	30.880	2813	30.880		
2474	30.880	2542	30.880	2610	30.880	2678	30.880	2746	30.880	2814	30.880		
2475	30.880	2543	30.880	2611	30.880	2679	30.880	2747	30.880	2815	30.880		
2476	30.880	2544	30.880	2612	30.880	2680	30.880	2748	30.880	2816	30.880		

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Simulation Criteria for SW Net01

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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Online Controls for SW Net01

Hydro-Brake® Optimum Manhole: S2.18, DS/PN: S1.005, Volume (m³): 36.4

Unit Reference	MD-SHE-0193-2310-2300-2310
Design Head (m)	2.300
Design Flow (l/s)	23.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	193
Invert Level (m)	28.349
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	23.1	Kick-Flo®	1.404	18.2
Flush-Flo™	0.671	23.1	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.800	22.9	2.000	21.6	4.000	30.1	7.000	39.4
0.200	17.8	1.000	22.3	2.200	22.6	4.500	31.9	7.500	40.8
0.300	20.7	1.200	21.0	2.400	23.6	5.000	33.5	8.000	42.0
0.400	22.0	1.400	18.4	2.600	24.5	5.500	35.1	8.500	43.3
0.500	22.7	1.600	19.4	3.000	26.2	6.000	36.6	9.000	44.5
0.600	23.0	1.800	20.5	3.500	28.2	6.500	38.0	9.500	45.7

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Storage Structures for SW Net01

Porous Car Park Pipe: S6.000

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	44.7
Membrane Percolation (mm/hr)	10000	Slope (1:X)	22.5
Max Percolation (l/s)	558.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	37.005		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.001

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	20.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	29.6
Max Percolation (l/s)	254.9	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.965		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.002

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	12.4
Membrane Percolation (mm/hr)	10000	Slope (1:X)	38.7
Max Percolation (l/s)	154.8	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	34.275		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.003

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	13.9
Membrane Percolation (mm/hr)	10000	Slope (1:X)	25.2
Max Percolation (l/s)	173.5	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.955		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.004

Manning's N	0.030	Width (m)	4.5
Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	36.1
Membrane Percolation (mm/hr)	10000	Slope (1:X)	27.8
Max Percolation (l/s)	451.6	Depression Storage (mm)	5
Safety Factor	2.0	Evaporation (mm/day)	3
Porosity	0.30	Membrane Depth (mm)	150
Invert Level (m)	33.405		

Under Drain Details

Depth above Invert Level (m)	0.000	Number of Pipes	1
Diameter (m)	0.225	Manning's N	0.012

Porous Car Park Pipe: S6.005

Manning's N	0.030	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30
Membrane Percolation (mm/hr)	10000	Invert Level (m)	32.105
Max Percolation (l/s)	345.7	Width (m)	4.5

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Porous Car Park Pipe: S6.005

Length (m) 27.7 Evaporation (mm/day) 3
Slope (1:X) 22.1 Membrane Depth (mm) 150
Depression Storage (mm) 5

Under Drain Details
Depth above Invert Level (m) 0.000 Number of Pipes 1
Diameter (m) 0.225 Manning's N 0.012

Cellular Storage Manhole: STANK, DS/PN: S8.000

Invert Level (m) 28.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	91.3	91.3	1.840	91.3	171.5	1.841	0.0	171.5

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	2	+0%					32.352	-0.098
S1.001	S2.01	15 Summer	2	+0%					32.227	-0.098
S1.002	S2.02	15 Winter	2	+0%	100/15 Summer				32.064	-0.094
S2.000	S2.03	15 Winter	2	+0%					32.202	-0.135
S1.003	S2.04	15 Winter	2	+0%					31.553	-0.104
S1.004	S2.05	2880 Winter	2	+0%	2/15 Summer				29.707	0.932
S3.000	S2.06	15 Winter	2	+0%					33.174	-0.106
S3.001	S2.07	15 Winter	2	+0%					32.844	-0.109
S3.002	S2.08	15 Winter	2	+0%					32.299	-0.156
S3.003	S2.09	15 Winter	2	+0%					32.007	-0.176
S4.000	S2.10	15 Winter	2	+0%					31.074	-0.151
S4.001	S2.11	15 Winter	2	+0%					31.041	-0.148
S3.004	S2.12	15 Winter	2	+0%					30.976	-0.149
S3.005	S2.13	2880 Winter	2	+0%	2/120 Winter				29.707	0.437
S5.000	S2.14	2880 Winter	2	+0%	2/15 Summer				29.707	0.861
S6.000	S3.00	15 Winter	2	+0%					37.031	-0.419
S7.000	S3.01	15 Summer	2	+0%					35.064	-0.101
S6.001	S3.02	15 Winter	2	+0%					35.002	-0.408
S6.002	S3.03	15 Winter	2	+0%					34.317	-0.403
S6.003	S2.15	15 Winter	2	+0%					33.995	-0.405
S6.004	S2.16	15 Winter	2	+0%					33.453	-0.397
S6.005	S2.17	15 Winter	2	+0%					32.153	-0.397
S8.000	STANK	2880 Winter	2	+0%	2/120 Winter				29.707	0.457
S1.005	S2.18	2880 Winter	2	+0%	2/15 Summer				29.707	1.133
S1.006	S5.08	2880 Winter	2	+0%	2/15 Summer				29.703	1.721
S1.007	S5.09	2880 Winter	2	+0%	2/15 Summer				29.703	1.893
S1.008	S5.10	2880 Winter	2	+0%	2/15 Summer	30/960 Winter			29.703	2.073
S1.009	S5.11	2880 Winter	2	+0%	2/15 Summer	2/480 Winter			29.703	2.127

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.26			4.7	OK	
S1.001	S2.01	0.000	0.26			4.7	OK	
S1.002	S2.02	0.000	0.29			6.4	OK	
S2.000	S2.03	0.000	0.02			1.2	OK	
S1.003	S2.04	0.000	0.20			7.5	OK	
S1.004	S2.05	0.000	0.02			1.0	SURCHARGED	
S3.000	S2.06	0.000	0.19			4.8	OK	
S3.001	S2.07	0.000	0.16			6.7	OK	
S3.002	S2.08	0.000	0.20			14.1	OK	
S3.003	S2.09	0.000	0.11			14.0	OK	
S4.000	S2.10	0.000	0.24			7.2	OK	
S4.001	S2.11	0.000	0.25			9.0	OK	
S3.004	S2.12	0.000	0.25			24.4	OK	
S3.005	S2.13	0.000	0.00			1.3	SURCHARGED	
S5.000	S2.14	0.000	0.01			2.3	SURCHARGED	

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S3.00	0.000	0.02		5	10.5	OK	
S7.000	S3.01	0.000	0.24			3.0	OK	
S6.001	S3.02	0.000	0.03		5	16.1	OK	
S6.002	S3.03	0.000	0.03		6	17.9	OK	
S6.003	S2.15	0.000	0.03		6	20.5	OK	
S6.004	S2.16	0.000	0.04		7	25.8	OK	
S6.005	S2.17	0.000	0.04		7	29.3	OK	
S8.000	STANK	0.000	0.07		154	18.7	SURCHARGED	
S1.005	S2.18	0.000	0.22			22.7	SURCHARGED	
S1.006	S5.08	0.000	0.67			43.9	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.2	SURCHARGED	
S1.008	S5.10	0.000	1.13			65.2	FLOOD RISK	29
S1.009	S5.11	73.220	7.65			364.8	FLOOD	63

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	30	+0%					32.375	-0.075
S1.001	S2.01	15 Summer	30	+0%					32.249	-0.076
S1.002	S2.02	15 Summer	30	+0%	100/15 Summer				32.093	-0.066
S2.000	S2.03	15 Winter	30	+0%					32.207	-0.130
S1.003	S2.04	15 Winter	30	+0%					31.574	-0.083
S1.004	S2.05	360 Winter	30	+0%	2/15 Summer				29.845	1.070
S3.000	S2.06	15 Winter	30	+0%					33.192	-0.088
S3.001	S2.07	15 Winter	30	+0%					32.863	-0.090
S3.002	S2.08	15 Summer	30	+0%					32.336	-0.119
S3.003	S2.09	15 Summer	30	+0%					32.032	-0.151
S4.000	S2.10	15 Winter	30	+0%					31.106	-0.119
S4.001	S2.11	15 Summer	30	+0%					31.077	-0.112
S3.004	S2.12	15 Summer	30	+0%					31.018	-0.107
S3.005	S2.13	360 Winter	30	+0%	2/120 Winter				29.847	0.577
S5.000	S2.14	360 Winter	30	+0%	2/15 Summer				29.844	0.998
S6.000	S3.00	15 Winter	30	+0%					37.043	-0.407
S7.000	S3.01	15 Winter	30	+0%					35.085	-0.080
S6.001	S3.02	15 Summer	30	+0%					35.021	-0.389
S6.002	S3.03	15 Winter	30	+0%					34.337	-0.383
S6.003	S2.15	15 Winter	30	+0%					34.016	-0.384
S6.004	S2.16	15 Winter	30	+0%					33.478	-0.372
S6.005	S2.17	15 Winter	30	+0%					32.178	-0.372
S8.000	STANK	360 Winter	30	+0%	2/120 Winter				29.844	0.594
S1.005	S2.18	360 Winter	30	+0%	2/15 Summer				29.844	1.270
S1.006	S5.08	2880 Winter	30	+0%	2/15 Summer				29.788	1.806
S1.007	S5.09	2880 Winter	30	+0%	2/15 Summer				29.787	1.978
S1.008	S5.10	2880 Winter	30	+0%	2/15 Summer	30/960 Winter			29.788	2.157
S1.009	S5.11	2880 Winter	30	+0%	2/15 Summer	2/480 Winter			29.788	2.211

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.50			8.8	OK	
S1.001	S2.01	0.000	0.49			8.8	OK	
S1.002	S2.02	0.000	0.59			13.1	OK	
S2.000	S2.03	0.000	0.04			2.2	OK	
S1.003	S2.04	0.000	0.41			15.2	OK	
S1.004	S2.05	0.000	0.03			2.0	SURCHARGED	
S3.000	S2.06	0.000	0.36			9.1	OK	
S3.001	S2.07	0.000	0.33			13.6	OK	
S3.002	S2.08	0.000	0.45			31.2	OK	
S3.003	S2.09	0.000	0.24			31.2	OK	
S4.000	S2.10	0.000	0.45			13.6	OK	
S4.001	S2.11	0.000	0.50			18.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.004	S2.12	0.000	0.53			52.6	OK	
S3.005	S2.13	0.000	0.03			10.1	SURCHARGED	
S5.000	S2.14	0.000	0.00			0.1	SURCHARGED	
S6.000	S3.00	0.000	0.03		5	19.9	OK	
S7.000	S3.01	0.000	0.44			5.7	OK	
S6.001	S3.02	0.000	0.05		4	31.6	OK	
S6.002	S3.03	0.000	0.07		6	34.8	OK	
S6.003	S2.15	0.000	0.06		6	40.1	OK	
S6.004	S2.16	0.000	0.08		6	52.1	OK	
S6.005	S2.17	0.000	0.08		6	58.5	OK	
S8.000	STANK	0.000	0.01			2.2	SURCHARGED	
S1.005	S2.18	0.000	0.12			11.9	SURCHARGED	
S1.006	S5.08	0.000	0.55			35.7	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.3	SURCHARGED	
S1.008	S5.10	37.503	2.36			136.3	FLOOD	29
S1.009	S5.11	157.513	7.80			372.0	FLOOD	63

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.358 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S2.00	15 Winter	100	+45%					32.431	-0.019
S1.001	S2.01	15 Winter	100	+45%					32.325	0.000
S1.002	S2.02	15 Winter	100	+45%	100/15 Summer				32.205	0.046
S2.000	S2.03	15 Winter	100	+45%					32.215	-0.122
S1.003	S2.04	15 Winter	100	+45%					31.603	-0.054
S1.004	S2.05	180 Winter	100	+45%	2/15 Summer				30.593	1.818
S3.000	S2.06	15 Winter	100	+45%					33.219	-0.061
S3.001	S2.07	15 Winter	100	+45%					32.889	-0.064
S3.002	S2.08	15 Summer	100	+45%					32.389	-0.066
S3.003	S2.09	15 Summer	100	+45%					32.063	-0.120
S4.000	S2.10	15 Winter	100	+45%					31.160	-0.065
S4.001	S2.11	15 Summer	100	+45%					31.141	-0.048
S3.004	S2.12	15 Summer	100	+45%					31.085	-0.040
S3.005	S2.13	180 Winter	100	+45%	2/120 Winter				30.596	1.326
S5.000	S2.14	180 Winter	100	+45%	2/15 Summer				30.591	1.745
S6.000	S3.00	15 Winter	100	+45%					37.060	-0.390
S7.000	S3.01	15 Winter	100	+45%					35.120	-0.045
S6.001	S3.02	15 Summer	100	+45%					35.046	-0.364
S6.002	S3.03	15 Winter	100	+45%					34.366	-0.354
S6.003	S2.15	15 Winter	100	+45%					34.044	-0.356
S6.004	S2.16	15 Winter	100	+45%					33.512	-0.338
S6.005	S2.17	15 Winter	100	+45%					32.213	-0.337
S8.000	STANK	180 Winter	100	+45%	2/120 Winter				30.590	1.340
S1.005	S2.18	180 Winter	100	+45%	2/15 Summer				30.591	2.017
S1.006	S5.08	2880 Winter	100	+45%	2/15 Summer				29.915	1.933
S1.007	S5.09	2880 Winter	100	+45%	2/15 Summer				29.914	2.104
S1.008	S5.10	2880 Winter	100	+45%	2/15 Summer	30/960 Winter			29.913	2.283
S1.009	S5.11	2880 Winter	100	+45%	2/15 Summer	2/480 Winter			29.913	2.337

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2.00	0.000	0.93			16.4	OK	
S1.001	S2.01	0.000	0.86			15.6	OK	
S1.002	S2.02	0.000	1.05			23.0	SURCHARGED	
S2.000	S2.03	0.000	0.08			4.1	OK	
S1.003	S2.04	0.000	0.73			26.8	OK	
S1.004	S2.05	0.000	0.10			6.4	SURCHARGED	
S3.000	S2.06	0.000	0.66			17.1	OK	
S3.001	S2.07	0.000	0.63			25.4	OK	
S3.002	S2.08	0.000	0.84			58.4	OK	
S3.003	S2.09	0.000	0.44			58.4	OK	
S4.000	S2.10	0.000	0.85			25.4	OK	
S4.001	S2.11	0.000	0.94			33.6	OK	

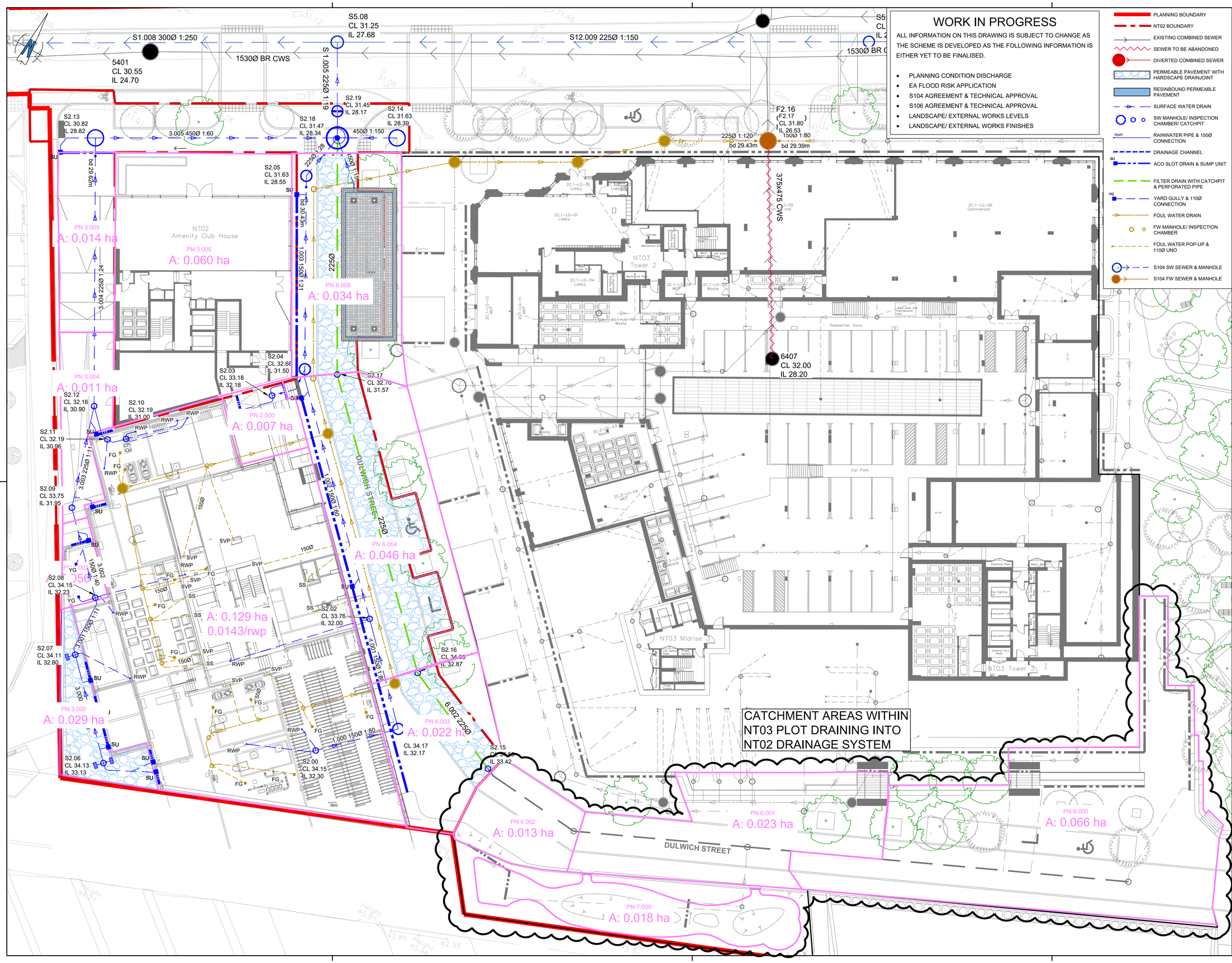
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW Net01

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.004	S2.12	0.000	1.00			98.4	OK	
S3.005	S2.13	0.000	0.09			32.2	FLOOD RISK	
S5.000	S2.14	0.000	0.00			0.6	SURCHARGED	
S6.000	S3.00	0.000	0.05		5	37.2	OK	
S7.000	S3.01	0.000	0.83			10.6	OK	
S6.001	S3.02	0.000	0.10		4	59.5	OK	
S6.002	S3.03	0.000	0.13		6	65.7	OK	
S6.003	S2.15	0.000	0.12		5	75.9	OK	
S6.004	S2.16	0.000	0.16		6	98.6	OK	
S6.005	S2.17	0.000	0.16		6	110.3	OK	
S8.000	STANK	0.000	0.07			19.2	SURCHARGED	
S1.005	S2.18	0.000	0.23			23.0	SURCHARGED	
S1.006	S5.08	0.000	0.69			45.0	SURCHARGED	
S1.007	S5.09	0.000	0.92			60.3	SURCHARGED	
S1.008	S5.10	163.236	4.61			265.4	FLOOD	29
S1.009	S5.11	283.231	8.02			382.3	FLOOD	63

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APPENDIX K – Drainage Catchments



WORK IN PROGRESS

ALL INFORMATION ON THIS DRAWING IS SUBJECT TO CHANGE AS THE SCHEME IS DEVELOPED AS THE FOLLOWING INFORMATION IS EITHER YET TO BE FINALISED.

- PLANNING CONDITION DISCHARGE
- EA FLOOD RISK APPLICATION
- S104 AGREEMENT & TECHNICAL APPROVAL
- S106 AGREEMENT & TECHNICAL APPROVAL
- LANDSCAPE/ EXTERNAL WORKS LEVELS
- LANDSCAPE/ EXTERNAL WORKS FINISHES

- PLANNING BOUNDARY
- NT02 BOUNDARY
- EXISTING COMBINED SEWER
- SEWER TO BE ABANDONED
- DIVERTED COMBINED SEWER
- PERMEABLE PAVEMENT WITH HARDSCAPE DRAINJOINT
- RESINBOUND PERMEABLE PAVEMENT
- SURFACE WATER DRAIN
- SW MANHOLE/ INSPECTION CHAMBER/ CATCHPIT
- RAINWATER PIPE & 150Ø CONNECTION
- DRAINAGE CHANNEL
- ACO SLOT DRAIN & SUMP UNIT
- FILTER DRAIN WITH CATCHPIT & PERFORATED PIPE
- YARD GULLY & 110Ø CONNECTION
- FOUL WATER DRAIN
- FW MANHOLE/ INSPECTION CHAMBER
- FOUL WATER POP-UP & 110Ø UNO
- S104 SW SEWER & MANHOLE
- S104 FW SEWER & MANHOLE

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NOTES

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
3. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
4. BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.
5. ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
6. CLASS Z CONCRETE SURROUND TO BE PROVIDED FOR PIPES WITH COVER LESS THAN 1.2m ABOVE THE CROWN OF THE PIPE FOR ROADS AND 0.6m FOR SOFT AND PEDESTRIAN AREAS ONLY AND UNDER ALL FOUNDATIONS AND WHERE PIPES LAID WITHIN 1m OF FOUNDATIONS.
7. CONNECTIONS TO EXISTING PUBLIC SEWERS IN ACCORDANCE WITH UNITED UTILITIES REQUIREMENTS, TO BE APPROVED / AGREED WITH THE WATER AUTHORITY.
8. PROPOSED COVER LEVELS ARE APPROXIMATE AND SHALL BE CHECKED BY THE CONTRACTOR ON SITE TO SUIT THE EXACT FINISHED LEVEL AND GRADIENT.
9. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY AND IN CONJUNCTION WITH ALL RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND 'SEWERS FOR ADOPTION' 7th EDITION.
10. ACCESS COVERS AND FRAMES SHALL COMPLY WITH THE LOADINGS SPECIFIED AND TO BS EN 124 AND KITEMARKED OR IF RECESSED COVERS ARE SPECIFIED THEN IN ACCORDANCE WITH FACTA ASSOCIATION EQUIVALENT. ALLOW FOR RECESS MANHOLE COVERS TO ACCEPT LANDSCAPE ARCHITECT FINISHES TO ALL NON-ASPHALT EXTERNAL AREAS.
11. THE PROPOSED BUILDING LAYOUTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS
12. FOR SETTING OUT DIMENSIONS OF SSS, SVPS, RWPS, FLOOR GULLY'S & OTHER DRAINAGE 'POP UP' LOCATIONS, REFER TO ARCHITECTS OR MECHANICAL & ELECTRICAL ENGINEERS DRAWINGS.
13. ALL DRAINAGE PIPEWORK SHOWN SHALL BE 100mm DIAMETER FOR FOUL AND 150mm FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL DRAINAGE PIPEWORK SHALL BE LAID SOFFIT TO SOFFIT UNLESS OTHERWISE STATED.
14. ALL UNDERSLAB DRAINAGE SHALL BE LAID AT GRADIENTS OF 1:80 MIN. FOR FOUL PIPEWORK AND 1:100 MIN. FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL UNDERSLAB DRAINAGE SHALL BE CLEAR OF FOUNDATIONS UNLESS SHOWN OTHERWISE. USE OF SHORT LONG RADIUS BENDS IS ACCEPTABLE PROVIDED THEY ARE KEPT TO A MINIMUM AND USED WHERE UNAVOIDABLE.
15. AT LEAST ONE SOIL PIPE AT THE HEAD OF EACH FOUL RUN SHALL BE VENTED TO THE ATMOSPHERE. ALL RAINWATER PIPES SHALL HAVE ABOVE GROUND RODDING ACCESS.
16. ALL PRIVATE DRAINAGE PIPEWORK FOR FOUL AND SURFACE WATER SYSTEMS HAVE BEEN DESIGNED ON THE BASIS OF UPVC TO BS EN 1401-1, UNLESS NOTED OTHERWISE.
17. CONCRETE ENCASEMENT OF THE PIPEWORK SHALL BE REQUIRED WHERE THE VERTICAL CLEARANCE BETWEEN TWO PIPES CROSSING IS LESS THAN 300MM.
18. WHERE NEW DRAINAGE IS SITUATED WITHIN 5 METRES OF NEW OR EXISTING TREES THE PIPEWORK SHALL BE ENCASED IN CONCRETE TO REDUCE THE RISK OF ROOT INGRESS.
19. ALL NEW DRAINAGE INSTALLATIONS TOGETHER WITH ANY EXISTING DRAINAGE RETAINED SHALL BE JETTED AND CCTV SURVEYED UPON COMPLETION. CONTRACTOR TO ENSURE THAT THE DRAINAGE SYSTEM IS FULLY OPERATIONAL, FREE OF EXCESS DEBRIS/SILT AND ALL IDENTIFIED FAULTS RECTIFIED.
20. ATTENUATION STORAGE CALCULATIONS INCLUDE CLIMATE CHANGE ALLOWANCE OF 40% IN ACCORDANCE WITH CURRENT ENVIRONMENT AGENCY GUIDELINES.

REV.	DATE	DETAILS	DRN.	CHK
P01	12/09/25	ISSUED FOR CONDITION DISCHARGE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

RIBA STAGE
STAGE 4

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
ARJ	SEP 25	1:200
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
PAW	SEP 25	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	SEP 25	info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

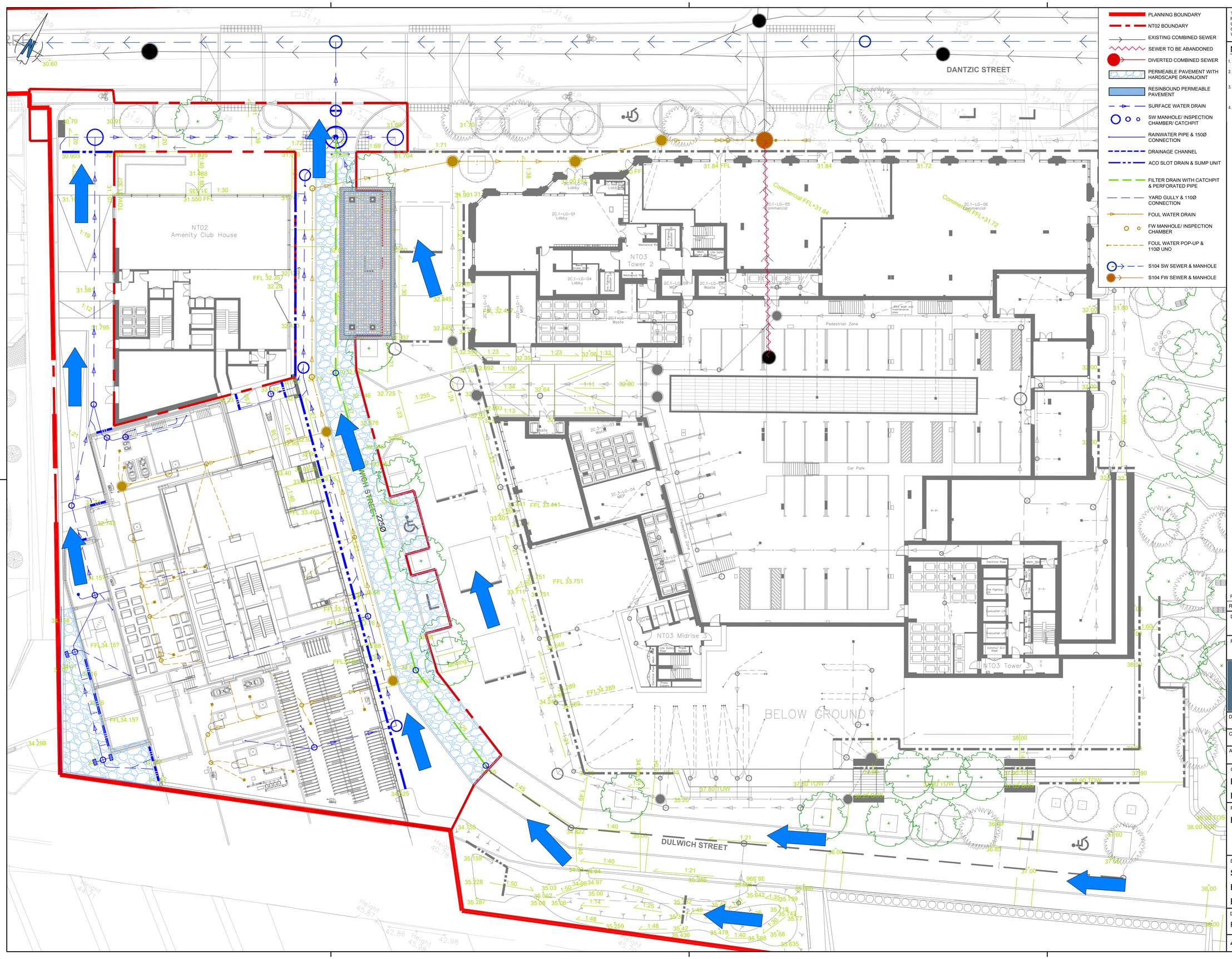
DRAWING TITLE
SURFACE WATER DRAINAGE CATCHMENT AREAS BLOCK 2B

DRAWING No.	REV.
RDB/ROC/2B/XX/SK/C/83/0500	P01

4328

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APPENDIX L – Exceedance Flow Paths



- PLANNING BOUNDARY
- NT02 BOUNDARY
- EXISTING COMBINED SEWER
- SEWER TO BE ABANDONED
- DIVERTED COMBINED SEWER
- PERMEABLE PAVEMENT WITH HARDSCAPE DRAINJOINT
- RESINBOUND PERMEABLE PAVEMENT
- SURFACE WATER DRAIN
- SW MANHOLE/ INSPECTION CHAMBER/ CATCHPIT
- RAINWATER PIPE & 150Ø CONNECTION
- DRAINAGE CHANNEL
- ACO SLOT DRAIN & SUMP UNIT
- FILTER DRAIN WITH CATCHPIT & PERFORATED PIPE
- YARD GULLY & 110Ø CONNECTION
- FOUL WATER DRAIN
- FW MANHOLE/ INSPECTION CHAMBER
- FOUL WATER POP-UP & 110Ø UNO
- S104 SW SEWER & MANHOLE
- S104 FW SEWER & MANHOLE

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4. BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.

REV.	DATE	DETAILS	DRN.	CHK.
P01	12/09/25	ISSUED FOR CONDITION DISCHARGE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

RIBA STAGE
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Manchester M15 4PZ
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DRAWN ARJ	DATE SEP 25	SCALES 1:200
CHECKED PAW	DATE SEP 25	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
APPRVD. JAS	DATE SEP 25	EMAIL FOR DRAWINGS info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
SURFACE WATER DRAINAGE EXCEEDANCE FLOW PATHS BLOCK 2B

DRAWING No.	REV.
RDB/ROC/2B/XX/SK/C/83/0501	P01

4328

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APPENDIX M – Drainage General Arrangement

NOTE:
REFER TO ROC S104 DRAWINGS FOR DETAILS OF OFF-SITE DRAINAGE

INDICATIVE FUTURE CONNECTION FOR PLOTS RB16 AND RB17

FLOW CONTROL CHAMBER (S2.18) WITH INTEGRAL HYDROBRAKE OPTIMUM OR EQUIVALENT APPROVED.
REF: MD-SHE-0193-2310-2300-2310
QMAX: 23.1 l/s, HEAD: 2.3m, CL: 31.47m IL: 28.34m
(22 l/s/ha) (1.05ha) (NT02 & NT03)

PROPOSED FPMCANN STORMCLEANSER HYDRODYNAMIC SEPARATOR. REF: PRE-SC1200.

PROPOSED ACO STORMBRIXX HD GEOCELLULAR ATTENUATION TANK OR EQUIVALENT APPROVED. VOL MAX: 160m³, 16.87m x 5.42m 1.84m DEEP. IL 28.80m. POSITION OF TANK TBC PENDING FURTHER COORDINATION WITH LANDSCAPE/ SITE WIDE SERVICES

NEW MANHOLE ON EXISTING PUBLIC COMBINED SEWER. UPSTREAM LENGTH TO BE ABANDONED AND REMOVED. SUBJECT TO S116/ S106 APPLICATION TO UNITED UTILITIES

PROPOSED MANHOLE FOR FUTURE CONNECTION FROM NT03 DEVELOPMENT

DANTZIC STREET

DULWICH STREET

S5.09 CL 30.35 IL 27.51
S1.009 300Ø 1:250
1550Ø BR CWS
S1.008 300Ø 1:250
5401 CL 30.55 IL 24.70
1530Ø BR CWS
S5.08 CL 31.25 IL 27.68
S1.005 225Ø 1:19
S12.009 225Ø 1:150
300Ø VC CWS
375x475 CWS

S2.19 CL 31.45 IL 28.17
S2.18 CL 31.47 IL 28.34
S2.14 CL 31.63 IL 28.39
S2.13 CL 30.82 IL 28.82
S2.05 CL 31.63 IL 28.55
S2.12 CL 32.16 IL 30.90
S2.11 CL 32.19 IL 30.96
S2.10 CL 32.19 IL 31.00
S2.09 CL 33.75 IL 31.95
S2.08 CL 34.15 IL 32.23
S2.07 CL 34.11 IL 32.80
S2.06 CL 34.13 IL 33.13
S2.04 CL 32.68 IL 31.50
S2.03 CL 33.18 IL 32.18
S2.17 CL 32.70 IL 31.57
S2.16 CL 34.00 IL 32.87
S2.15 CL 34.55 IL 33.42
S2.01 CL 34.17 IL 32.17
S2.00 CL 34.15 IL 32.30

F2.16 (F2.17) IL 31.80 IL 26.53
F2.15 CL 31.80 IL 29.53
F2.14 CL 31.95 IL 29.62
F2.13 CL 32.00 IL 29.74
F2.12 CL 31.74 IL 29.90
F2.11 CL 32.70 IL 30.18
F2.10 CL 32.92 IL 30.26
F2.09 CL 32.19 IL 30.52
F2.08 CL 32.19 IL 30.65
F2.07 CL 32.99 IL 31.47
F2.06 CL 32.99 IL 31.56
F2.05 CL 32.99 IL 31.80
F2.04 CL 33.52 IL 32.13
F2.03 CL 34.00 IL 32.35
F2.02 CL 34.15 IL 32.62
F2.01 CL 34.15 IL 32.91
F2.00 CL 34.15 IL 33.00

3.005 450Ø 1:60
450Ø 1:150
225Ø 1:28
225Ø 1:100
225Ø 1:120
150Ø 1:80
150Ø 1:40
3.004 225Ø 1:24
1.003 150Ø 1:21
1.006 225Ø 1:80
6.009 225Ø
6.004 225Ø
6.003 225Ø
3.003 225Ø 1:11
3.002 150Ø 1:40
3.001 150Ø 1:11
3.000 150Ø 1:40
4.001 150Ø 1:80
1.000 150Ø 1:80
1.002 150Ø 1:80
BD 29.82m
bd 30.43m
BD 31.97m
bd 29.42m
bd 29.39m

NT02 Amenity Club House
NT03 Tower 2
NT03 Midrise
Car Park
Pedestrian Zone
BELOW GROUND
6407 CL 32.00 IL 28.20

PERMEABLE PAVING TO DISCHARGE VIA PERMAVOID DIFFUSER UNITS LOCATED WITHIN OPEN GRADED SUB-BASE. DETAILS TBC PENDING FURTHER CO-ORDINATION

CENTRAL 225Ø PERFORATED RIDGITREAT PIPE BY POLYPIPE LAID IN NARROW TRENCH FOR DISPERSAL/ CONVEYANCE/ TREATMENT OF SURFACE WATER RUN-OFF FROM PERMEABLE PAVEMENT ABOVE.

- PLANNING BOUNDARY
- NT02 BOUNDARY
- EXISTING COMBINED SEWER
- SEWER TO BE ABANDONED
- DIVERTED COMBINED SEWER
- PERMEABLE PAVEMENT WITH HARDSCAPE DRAINJOINT
- RESINBOUND PERMEABLE PAVEMENT
- SURFACE WATER DRAIN
- SW MANHOLE/ INSPECTION CHAMBER/ CATCHPIT
- RWP RAINWATER PIPE & 150Ø CONNECTION
- DRAINAGE CHANNEL
- SU ACO SLOT DRAIN & SUMP UNIT
- FILTER DRAIN WITH CATCHPIT & PERFORATED PIPE
- YG YARD GULLY & 110Ø CONNECTION
- FOUL WATER DRAIN
- FW MANHOLE/ INSPECTION CHAMBER
- FOUL WATER POP-UP & 110Ø UNO
- S104 SW SEWER & MANHOLE
- S104 FW SEWER & MANHOLE

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NOTES

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
3. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
4. BEFORE STARTING ANY WORKS, CONTRACTOR TO CHECK INVERT LEVELS AND POSITIONS OF EXISTING DRAINS, SEWERS, INSPECTIONS CHAMBERS AND MANHOLES AGAINST INFORMATION SHOWN ON THIS DRAWING.
5. ROCKER PIPES ARE TO BE PROVIDED AT ALL CONCRETE CASED INTERFACES.
6. CLASS Z CONCRETE SURROUND TO BE PROVIDED FOR PIPES WITH COVER LESS THAN 1.2m ABOVE THE CROWN OF THE PIPE FOR ROADS AND 0.6m FOR SOFT AND PEDESTRIAN AREAS ONLY AND UNDER ALL FOUNDATIONS AND WHERE PIPES LAID WITHIN 1m OF FOUNDATIONS.
7. CONNECTIONS TO EXISTING PUBLIC SEWERS IN ACCORDANCE WITH UNITED UTILITIES REQUIREMENTS, TO BE APPROVED / AGREED WITH THE WATER AUTHORITY.
8. PROPOSED COVER LEVELS ARE APPROXIMATE AND SHALL BE CHECKED BY THE CONTRACTOR ON SITE TO SUIT THE EXACT FINISHED LEVEL AND GRADIENT.
9. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY AND IN CONJUNCTION WITH ALL RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND 'SEWERS FOR ADOPTION' 7th EDITION.
10. ACCESS COVERS AND FRAMES SHALL COMPLY WITH THE LOADINGS SPECIFIED AND TO BS EN 124 AND KITEMARKED OR IF RECESSED COVERS ARE SPECIFIED THEN IN ACCORDANCE WITH FACTA ASSOCIATION EQUIVALENT. ALLOW FOR RECESS MANHOLE COVERS TO ACCEPT LANDSCAPE ARCHITECT FINISHES TO ALL NON-ASPHALT EXTERNAL AREAS.
11. THE PROPOSED BUILDING LAYOUTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS
12. FOR SETTING OUT DIMENSIONS OF SSS, SVPS, RWPS, FLOOR GULLY'S & OTHER DRAINAGE 'POP UP' LOCATIONS, REFER TO ARCHITECTS OR MECHANICAL & ELECTRICAL ENGINEERS DRAWINGS.
13. ALL DRAINAGE PIPEWORK SHOWN SHALL BE 100mm DIAMETER FOR FOUL AND 150mm FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL DRAINAGE PIPEWORK SHALL BE LAID SOFFIT TO SOFFIT UNLESS OTHERWISE STATED.
14. ALL UNDERSLAB DRAINAGE SHALL BE LAID AT GRADIENTS OF 1:80 MIN. FOR FOUL PIPEWORK AND 1:100 MIN. FOR SURFACE WATER UNLESS NOTED OTHERWISE. ALL UNDERSLAB DRAINAGE SHALL BE CLEAR OF FOUNDATIONS UNLESS SHOWN OTHERWISE. USE OF SHORT LONG RADIUS BENDS IS ACCEPTABLE PROVIDED THEY ARE KEPT TO A MINIMUM AND USED WHERE UNAVOIDABLE.
15. AT LEAST ONE SOIL PIPE AT THE HEAD OF EACH FOUL RUN SHALL BE VENTED TO THE ATMOSPHERE. ALL RAINWATER PIPES SHALL HAVE ABOVE GROUND RODDING ACCESS.
16. ALL PRIVATE DRAINAGE PIPEWORK FOR FOUL AND SURFACE WATER SYSTEMS HAVE BEEN DESIGNED ON THE BASIS OF UPVC TO BS EN 1401-1, UNLESS NOTED OTHERWISE.
17. CONCRETE ENCASEMENT OF THE PIPEWORK SHALL BE REQUIRED WHERE THE VERTICAL CLEARANCE BETWEEN TWO PIPES CROSSING IS LESS THAN 300MM.
18. WHERE NEW DRAINAGE IS SITUATED WITHIN 5 METRES OF NEW OR EXISTING TREES THE PIPEWORK SHALL BE ENCASED IN CONCRETE TO REDUCE THE RISK OF ROOT INGRESS.
19. ALL NEW DRAINAGE INSTALLATIONS TOGETHER WITH ANY EXISTING DRAINAGE RETAINED SHALL BE JETTED AND CCTV SURVEYED UPON COMPLETION. CONTRACTOR TO ENSURE THAT THE DRAINAGE SYSTEM IS FULLY OPERATIONAL, FREE OF EXCESS DEBRIS/SILT AND ALL IDENTIFIED FAULTS RECTIFIED.
20. ATTENUATION STORAGE CALCULATIONS INCLUDE CLIMATE CHANGE ALLOWANCE OF 40% IN ACCORDANCE WITH CURRENT ENVIRONMENT AGENCY GUIDELINES.

WORK IN PROGRESS

ALL INFORMATION ON THIS DRAWING IS SUBJECT TO CHANGE AS THE SCHEME IS DEVELOPED AS THE FOLLOWING INFORMATION IS EITHER YET TO BE FINALISED.

- PLANNING CONDITION DISCHARGE
- EA FLOOD RISK APPLICATION
- S104 AGREEMENT & TECHNICAL APPROVAL
- S106 AGREEMENT & TECHNICAL APPROVAL
- LANDSCAPE/ EXTERNAL WORKS LEVELS
- LANDSCAPE/ EXTERNAL WORKS FINISHES

REV.	DATE	DETAILS	DRN.	CHK.
P04	12/09/2025	UPDATE FOR CONDITION DISCHARGE	ARJ	JAS
P03	17/12/2024	COORDINATION	ARJ	JAS
P02	22/11/2024	COORDINATION	ARJ	JAS
P01	15/11/2024	FIRST ISSUE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

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DRAWN	DATE	SCALES
ARJ	OCT 24	1:200
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
PAW	OCT 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	OCT 24	info@rocconsulting.com

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PROJECT TITLE
REDBANK DEVELOPMENT

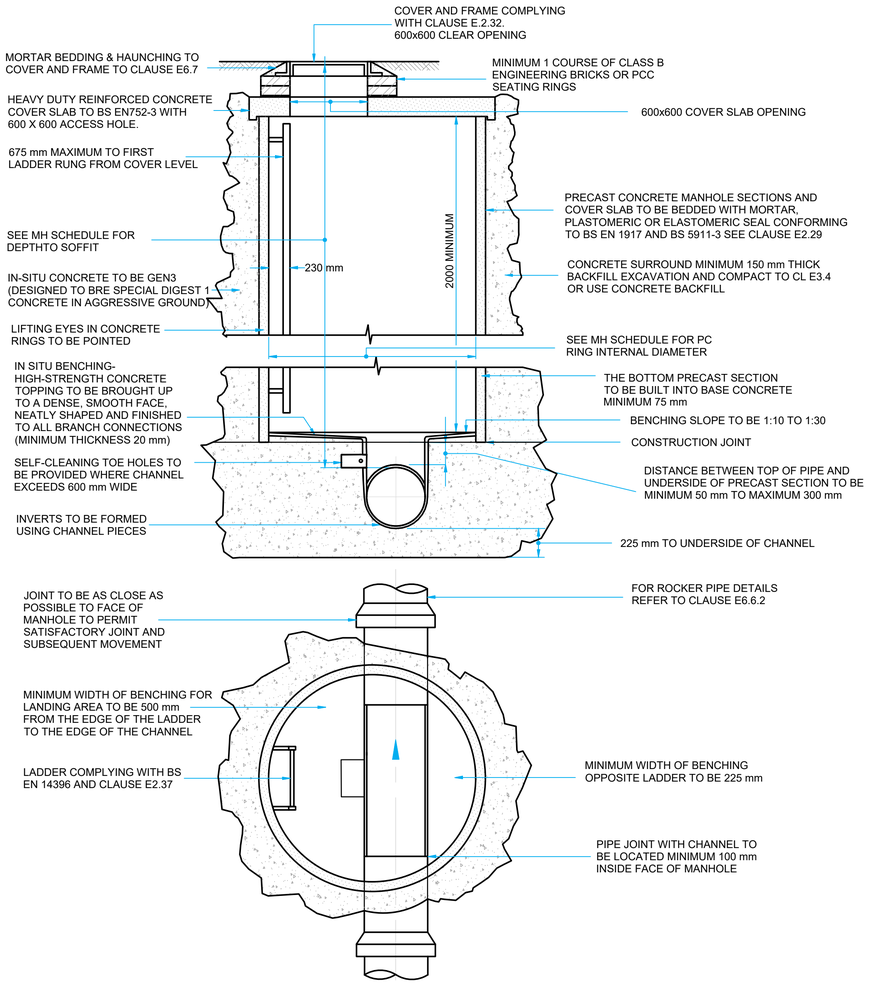
DRAWING TITLE
FW & SW DRAINAGE GENERAL ARRANGEMENT BLOCK 2B

DRAWING No.	REV.
RDB/ROC/2B/XX/DR/C/83/0500	P04

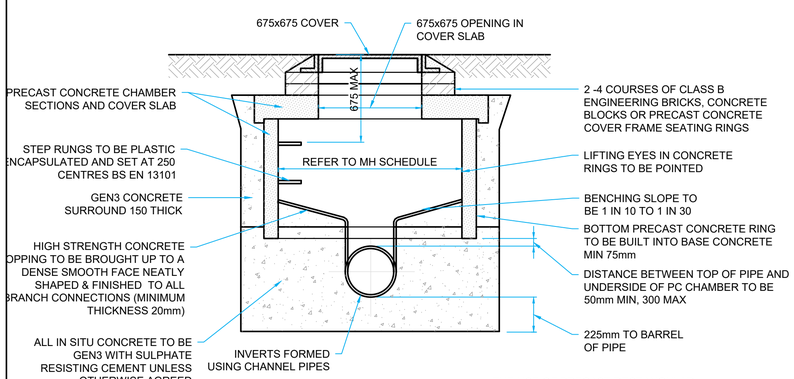
4328

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APPENDIX N – Drainage Details

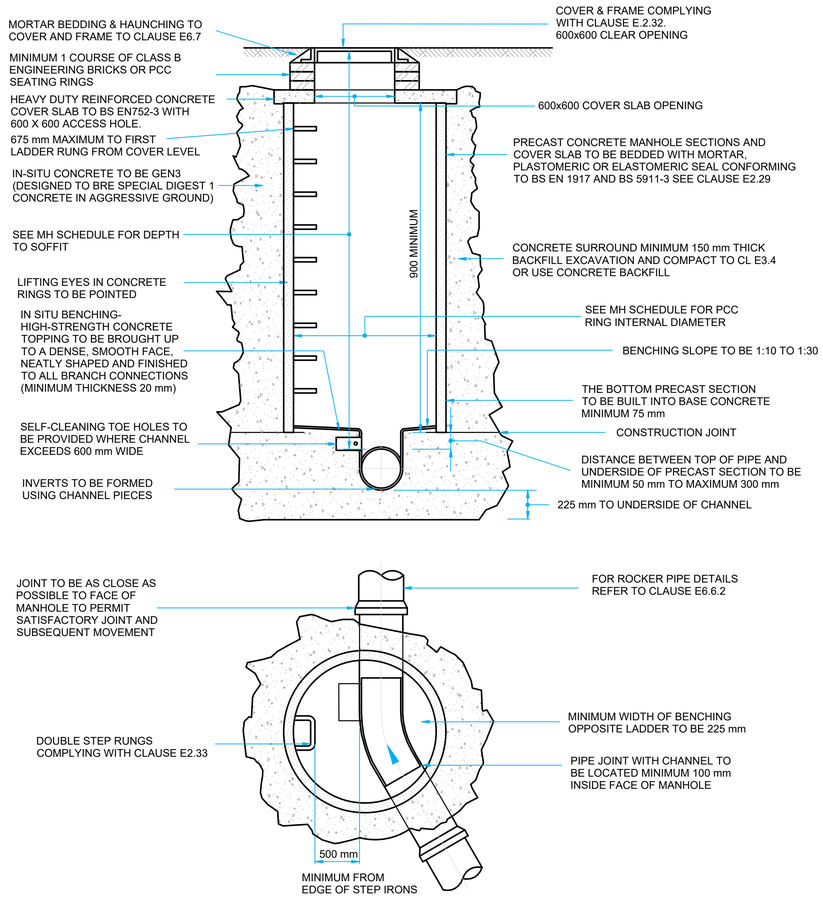


TYPICAL MANHOLE DETAIL - TYPE A
(DEPTH TO SOFFIT 3m - 6m)
SCALE - NTS

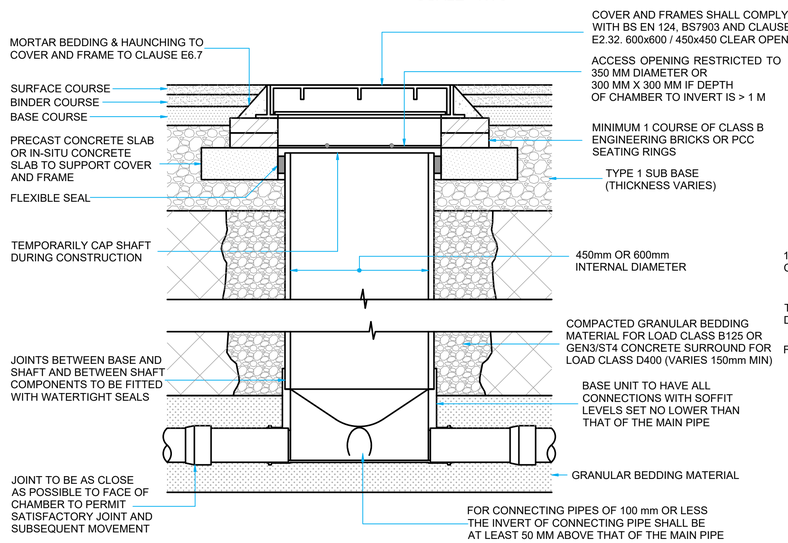


THE USE OF PRECAST RECTANGULAR CONCRETE MANHOLE UNITS WITH 150 GEN3 CONCRETE SURROUND SHALL BE PERMITTED WHERE ACCEPTED BY THE ENGINEER AND THE UNDERTAKER.

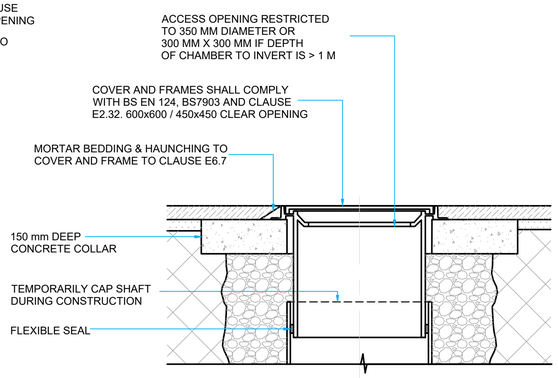
MANHOLE DETAIL - TYPE C
(DEPTH TO SOFFIT 1.0m - 1.5m)
SCALE - NTS



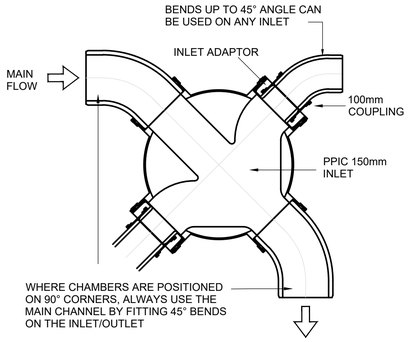
TYPICAL MANHOLE DETAIL - TYPE B
(DEPTH TO SOFFIT 1.5 - 3m)
SCALE - NTS

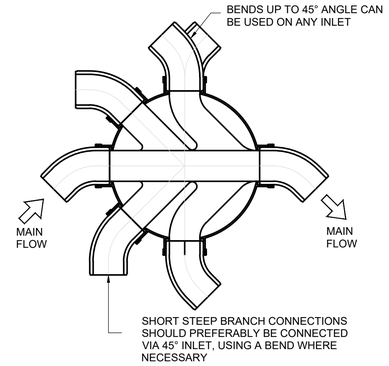


INSPECTION CHAMBER DETAIL - TYPE D
450Ø & 600Ø (DEPTH TO SOFFIT 3m)
D400 COVER
SCALE - NTS



INSPECTION CHAMBER DETAIL - TYPE D
B125 COVER
SCALE - NTS





PPIC
BASE DETAIL
SCALE - NTS

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4. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.

REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	JAS

DRAWING STATUS
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PAW	NOV 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	NOV 24	info@rocconsulting.com

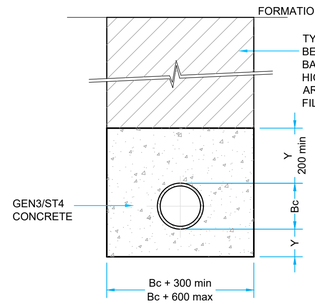
CLIENT
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PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 1

DRAWING No.	REV.
RDB/ROC/2B/XX/DR/C/83/0501	P01

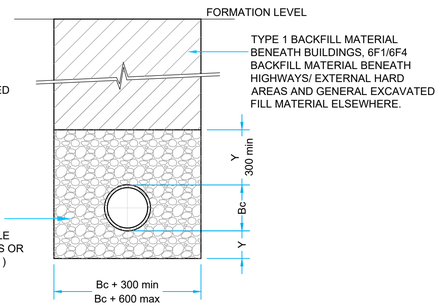
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TO BE USED WHERE COVER TO PIPE IS:
1. LESS THAN 1.2m IN TRAFFICKED AREAS
2. LESS THAN 0.90m IN FIELDS
3. LESS THAN 0.6m IN LANDSCAPED AREAS
4. LESS THAN 0.3m BENEATH BUILDING SLABS

CLASS Z BEDDING DETAIL

Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN)
BC = OUTSIDE PIPE DIAMETER

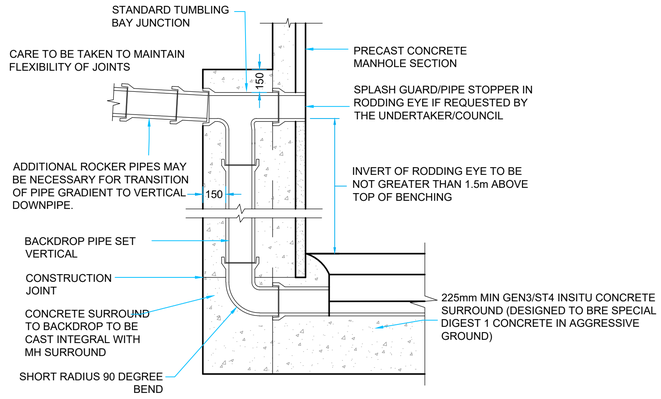


CLASS S BEDDING DETAIL

Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN).
BC = OUTSIDE PIPE DIAMETER

TRENCH WIDTHS

PIPE I.D	OVERALL TRENCH WIDTH
100	550
150	600
225	700
300	850
375	1050
450	1150
525	1200
600	1350
675	1450
750	1500
825	1600
900	1900
1050	2100
1200	2300
1350	2500
1500	2700
1800	3100



TYPICAL VERTICAL BACKDROP DETAIL

NOTE : WHERE THE DROP IS NOT EXCESSIVE A 45° DROP PIPE MAY BE USED

SEWER DIAMETER (mm)	DROP SHAFT DIAMETER (mm)
225-300	225
375	300
450	375
525-600	450
675	525
750-900	600

THE CONNECTION AT THE BOTTOM OF THE BACKDROP IS TO BE MADE AT SOFFIT LEVEL IN MANHOLES MAX. PIPE SIZE 825mm AND AT SPRINGING LEVEL IN MANHOLES PIPE SIZE 900 TO 1500mm

VERTICAL RODDING EYE MAY BE REQUIRED IN SITUATIONS WHERE BLOCKAGES ARE HIGH RISK.
THE TUMBLING BAY SHALL BE BUILT INTO THE MANHOLE CHAMBER BELOW ANY REUCING SLAB

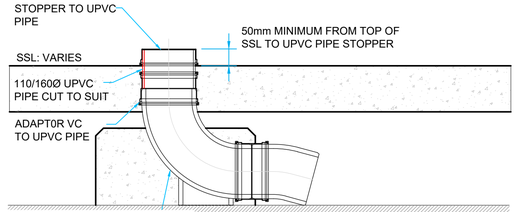
BS EN 1610:1998 ANNEX B TABLE B.15 COARSE AGGREGATE - PIPE BEDDING							
SIEVE SIZE (mm)	PERCENTAGE BY MASS PASSING BS SIEVES FOR NOMINAL SIZES						
	GRADED AGGREGATE (mm)			SINGLE-SIZED AGGREGATE (mm)			
	40 to 5	20 to 5	14 to 5	40	20	14	10
50.0	100	-----	-----	100	-----	-----	-----
37.5	90 - 100	100	-----	85 - 100	100	-----	-----
20.0	35 - 70	90 - 100	100	0 - 25	85 - 100	100	-----
14.0	-----	-----	90 - 100	-----	-----	85 - 100	100
10.0	10 - 40	30 - 60	50 - 85	0 - 5	0 - 25	0 - 50	85 - 100
5.0	0 - 5	0 - 10	0 - 10	-----	0 - 5	0 - 10	0 - 25
2.36	-----	-----	-----	-----	-----	-----	0 - 5

RIGID PIPES BEDDING GRADING

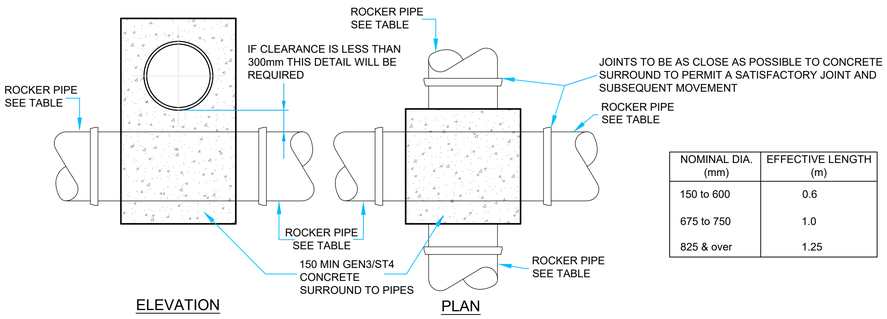
FOR RIGID PIPES THE BEDDING SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5mm UP TO A MAX SIZE OF 10mm FOR 100mm PIPES; 14mm FOR 150mm PIPES; 20mm FOR 225mm TO 600mm PIPES; 40mm FOR OVER 600mm PIPES

BS EN 13242, COARSE AGGREGATE (CLAUSE 4.3.2)		
CATEGORY FOR GENERAL GRADING REQUIREMENTS	Gc80-20	
CATEGORY FOR TOLERANCES AT MID-SIZE SIEVES	GTnr (NO REQUIREMENTS)	
CATEGORY PF MAXIMUM VALUES OF FINES CONTENTS	GRAVEL - F1.5 CRUSHED ROCK, RECYCLED AGGREGATE - F4	
NOMINAL PIPE DIAMETER, mm	AGGREGATE SIZE, mm	
	GRADED	SINGLE SIZED
NOT EXCEEDING 140	-	4/10
EXCEEDING 140 BUT NOT EXCEEDING 400	2/14 or 4/20	4/10, 6/14 or 10/20
EXCEEDING 400	2/14, 4/20 or 4/40	4/10, 6/14, 10/20 or 20/40

FLEXIBLE PIPE BEDDING, HAUNCHING AND SURROUND MATERIAL



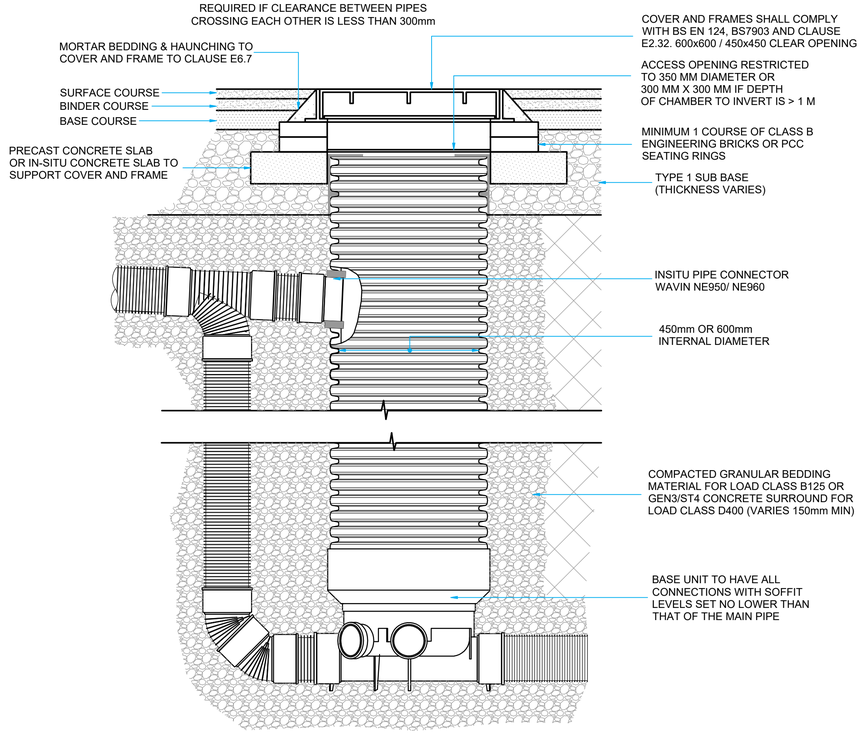
TYPICAL BELOW GROUND WASTE PIPE CONNECTION DETAIL



NOMINAL DIA. (mm)	EFFECTIVE LENGTH (m)
150 to 600	0.6
675 to 750	1.0
825 & over	1.25

SPECIAL PIPE CROSSOVER DETAIL

REQUIRED IF CLEARANCE BETWEEN PIPES CROSSING EACH OTHER IS LESS THAN 300mm



INSPECTION CHAMBER BACKDROP DETAIL - TYPE D 450Ø & 600Ø (DEPTH TO SOFFIT 3m) D400 COVER

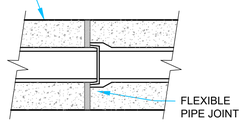
SCALE - NTS

COMPRESSIBLE BOARD OR PREFORMED JOINT FILLER FOR FULL THICKNESS OF CONCRETE BED OR SURROUND

PIPE Ø	JOINT THICKNESS
< 450	18mm
450 - 1200	36mm
>1200	54mm

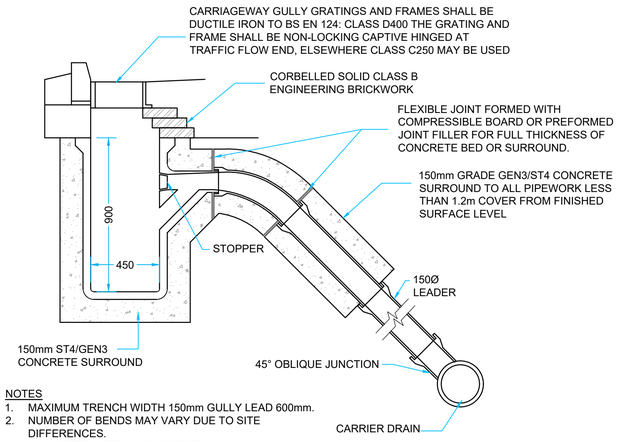
COMPRESSIBLE FILLER TABLE

(BITUMEN IMPREGNATED INSULATING BOARD TO BS EN 622-1 AND BS EN 622-4)



JOINTS FOR CONCRETE SURROUND TO PIPES

(AT EACH PIPE JOINT)



NOTES
1. MAXIMUM TRENCH WIDTH 150mm GULLY LEAD 600mm.
2. NUMBER OF BENDS MAY VARY DUE TO SITE DIFFERENCES.
3. CONCRETE SURROUND OF PIPES SHALL ALWAYS FINISH AT A JOINT.

TYPICAL ROAD GULLY DETAIL

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REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	JAS

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PAW	NOV 24	
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JAS	NOV 24	info@rocconsulting.com

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PROJECT TITLE
REDBANK DEVELOPMENT

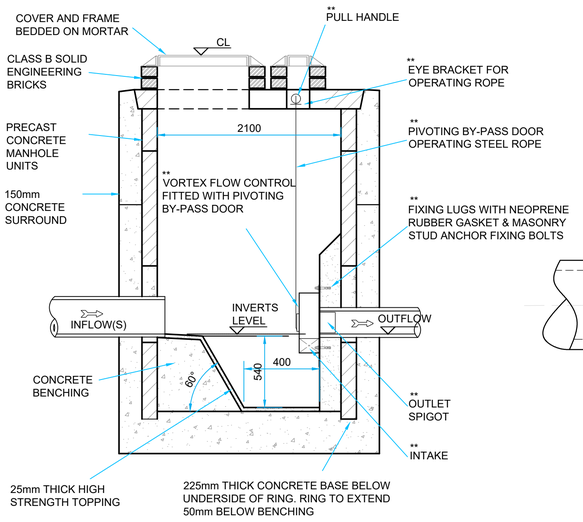
DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 2

DRAWING No.
RDB/ROC/2B/XX/DR/C/83/0502

REV.
P01

4328

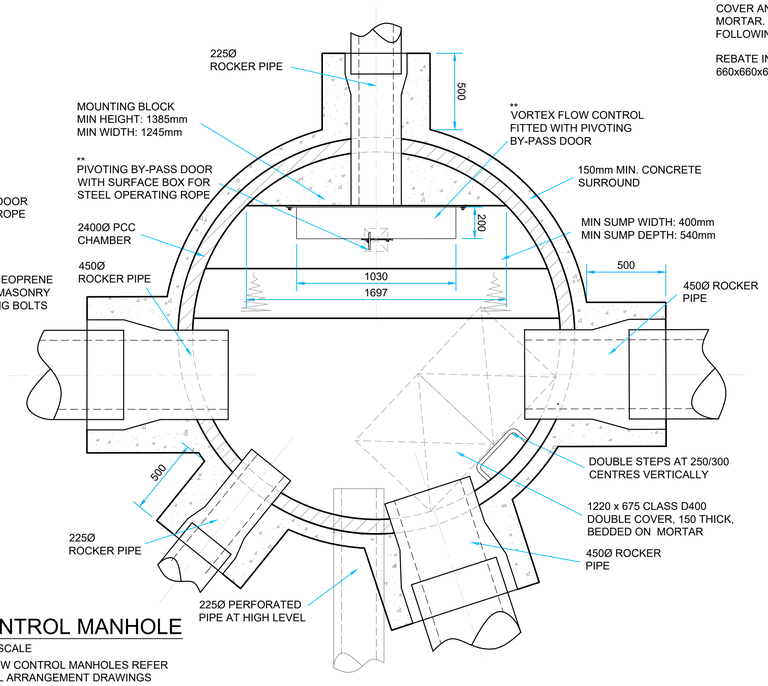
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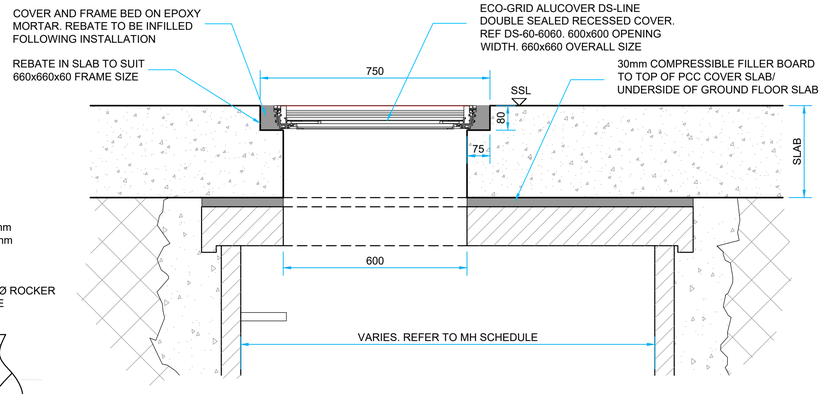


VORTEX FLOW CONTROL MANHOLE

NOT TO SCALE

FOR LOCATION OF VORTEX FLOW CONTROL MANHOLES REFER TO ROC DRAINAGE GENERAL ARRANGEMENT DRAWINGS

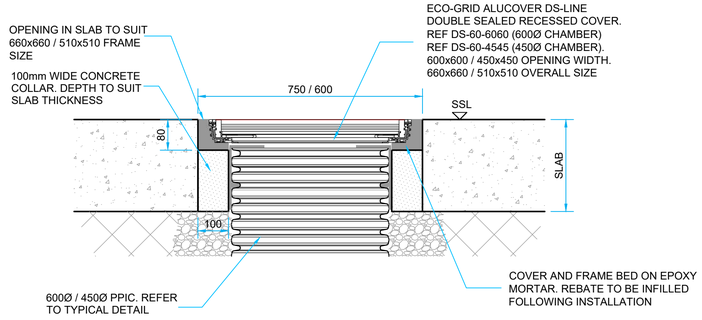




INTERNAL MANHOLE DETAIL TYPE A, B & C

NOT TO SCALE

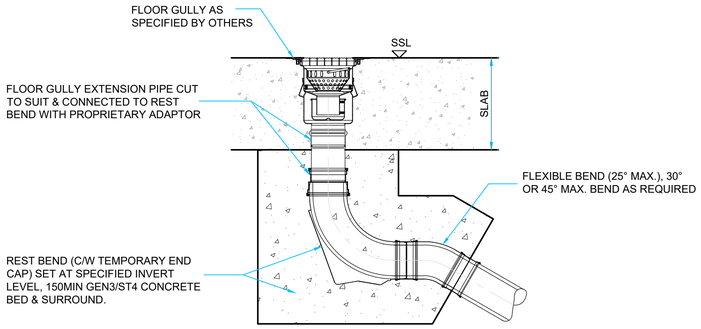
NOTE: COVER SET AT SSL. ARCHITECT TO DETAIL INTERFACE WITH PROPOSED FLOOR FINISH



INTERNAL MANHOLE DETAIL TYPE D

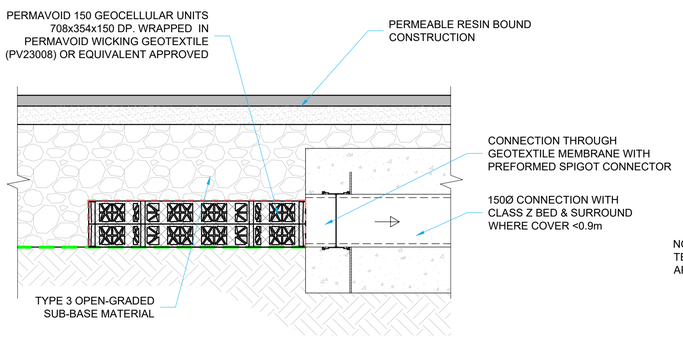
NOT TO SCALE

NOTE: COVER SET AT SSL. ARCHITECT TO DETAIL INTERFACE WITH PROPOSED FLOOR FINISH



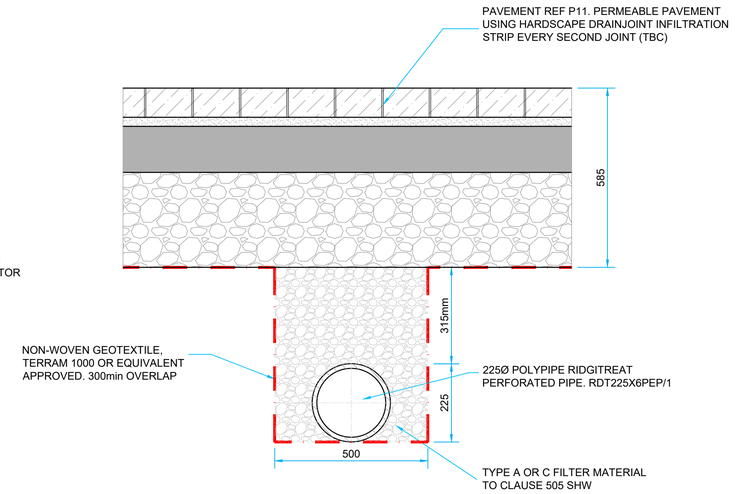
TRAPPED INTERNAL FLOOR GULLY DETAIL

NOT TO SCALE



TYPICAL PERMAVOID OUTLET DETAIL

SCALE - 1:10



DULWICH STREET PERMEABLE PAVEMENT UNDERDRAIN

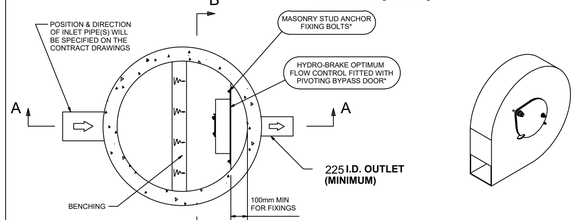
NOT TO SCALE

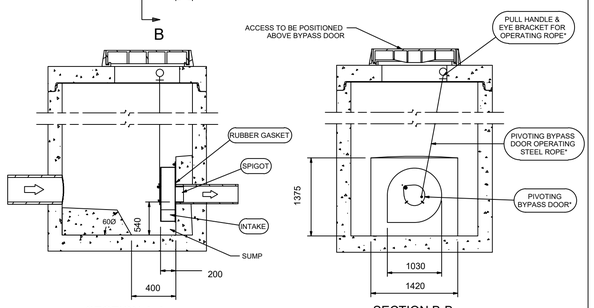
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.300	23.100
Flush-Flo	0.671	23.062
Kick-Flo	1.404	18.249
Mean Flow		20.146

Hydro-Brake Optimum Flow Control including:

- 5 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Variable flow rate post installation via adjustable inlet
- Indicative weight: 100kg





SECTION A-A SECTION B-B

IMPORTANT: LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE FLOW CONTROL & HYDRO-BRAKE OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !	The head/flow characteristics of this SHE-0193-2310-2300-2310 Hydro-Brake Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**	
DATE		SHE-0193-2310-2300-2310 Hydro-Brake Optimum
SITE	NT02-03 REDBANK	
DESIGNER	Andy James	
REF	4328	

© 2019 Hydro International Ltd, Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD. Tel: 01275 878371 Fax: 01275 87497 Web: www.hydro-int.com Email: enquiries@hydro-int.com

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4. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.

REV	DATE	DETAILS	DRN	CHK
P02	17.12.24	FLOW CONTROL DETAIL UPDATED	ARJ	JAS
P01	22.11.24	FIRST ISSUE	ARJ	JAS

DRAWING STATUS
PRELIMINARY

RIBA STAGE
STAGE 4

ROC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
ARJ	NOV 24	AS SHOWN
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
PAW	NOV 24	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	NOV 24	info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

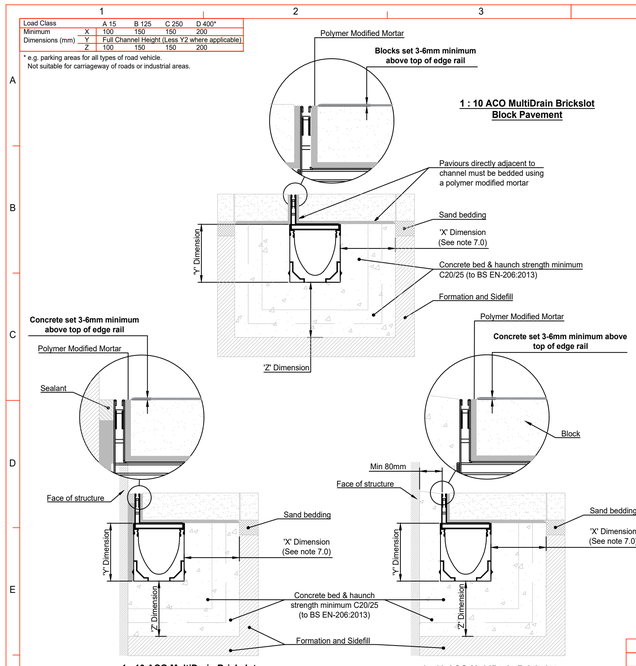
DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 3

DRAWING No.	REV.
RDB/ROC/2B/XX/DR/C/83/0503	P02

4328 © RgCp Ltd.

Load Class		A 15	B 125	C 250	D 400*
Minimum	X	100	150	150	200
Dimensions (mm)	Y	Full Channel Height (Less Y2 where applicable)			
	Z	100	150	150	200

* e.g. parking areas for all types of road vehicle.
Not suitable for carriageway of roads or industrial areas.



1 : 10 ACO MultiDrain Brickslot Block Pavement

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 1

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 2

NBS Specification:
ACO MultiDrain® Brickslot should be specified in section Q10:170. Assistance in completing this clause can be found in ACO Technologies product entries in NBS Plus, or a model specification can be downloaded from www.aco.co.uk. For further assistance, contact the ACO Water Management Design Services Team.

Best Practice and Workmanship:
ACO can give guidance with respect to the most suitable methods of installation for each of the products in the ACO MultiDrain® Brickslot range. ACO MultiDrain® Brickslot should be installed using levels of workmanship that accord with the National Code of Practice (UK: BS8000-0:2014) and in keeping with BS EN 1433:2002 (Drainage channels for vehicular and pedestrian areas).

Detailed installation statements and methodologies will vary for all sites as each will have different aspects deserving particular consideration, consequently the relevant approvals should be sought from the consulting engineer and/or the installer.

1.0 Load Class
Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions
The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Jointing
Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.
Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints
The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ Slab
Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation
A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

7.0 Block Pavements
The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

8.0 Grate Locking System
Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

9.0 Channel Protection
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the grating, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. (Please note that ACO channels must be installed with the grating in place to prevent deformation of the channel).

10.0 Watertight Installation to BS EN 1433:2002
Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

For Guidance a typical method of application follows:
- The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
- Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
- Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
- Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
- Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
- The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
- Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
- The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

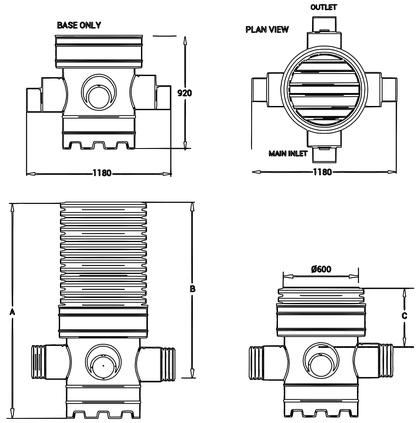
Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

Version	Date	Description	Name
E	28.6.2016	Updated title block	TS
D	31.5.2016	Revised to comments 12/04/16	TS
C	23.3.2016	Revised to comments 15/03/16	TS
B	2.3.2016	General revisions	TS

ACO Technologies plc
ACO Business Park, Hitchin Road, Shefford, Bedfordshire, SG17 5TE, UK
Tel: 01462 816666
www.aco.co.uk

Created by: IM	Released by: TS	Drawing Number: 22116	Revision: E
Created at: 4.2.2016	Released at: 28.6.2016	Title: ACO MULTIDRAIN M150D/DS 0.0 CHANNEL BRICKSLOT INSTALLATION DETAIL DRAWING	
Replacement for: E1-E01-031-3	Replaced by:	Projection: ISO-A	Units: mm / Format: A3 / Scale: 1 : 10 / Sheet: 1 of 1

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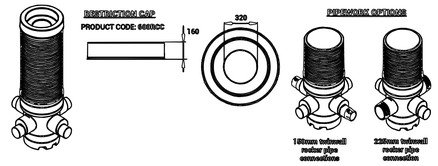
Product Code	Main pipework connections Ø (mm)	Optional Side inlets Ø (mm)	Depth A (mm)	inlet invert B (mm)	Soffit Depth C (mm)	Approx. Weight (kg)
ACCP6000CB150D (Base Only)	150-225	150-225	920	580	355	16
ACCP6000CB150D/1	150-225	150-225	1255	715	490	28
ACCP6000CB150D/1.5	150-225	150-225	1450	1110	885	36
ACCP6000CB150D/2	150-225	150-225	1965	1625	1400	46
ACCP6000CB150D/2.5	150-225	150-225	2365	2015	1790	54
ACCP6000CB150D/3	150-225	150-225	3005	2665	2440	66

Please Note: Chambers deeper than 1000mm to soffit of pipework (C), require a Restriction Cap 6029CC to comply with DCG

RESTRICTION CAPS

NEW DESIGN & CONSTRUCTION GUIDANCE (DCG), HAS NOW EFFECTIVELY SUPERCEDED S167 (SEWERS FOR ADOPTION 7). DCG STATES THAT ACCESS MUST BE RESTRICTED TO A MAXIMUM OF 350MM, ON ANY TYPE D OR E INSPECTION CHAMBER, DEEPER THAN 1000MM FROM COVER LEVEL TO SOFFIT OF PIPE.

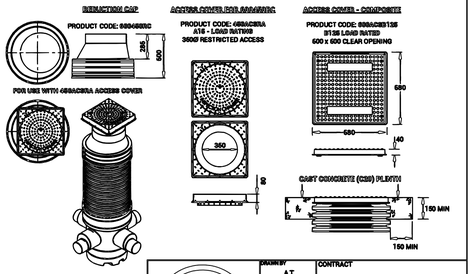
OUR 600RCC - RESTRICTION CAP IS DESIGNED TO FIT OVER THE ACCESS SHAFT AND PROVIDE A Ø320MM ACCESS.



RESTRICTION CAP & ACCESS COVERS

ALTERNATIVELY CHAMBERS CAN BE SUPPLIED WITH OUR 6029CC - REDUCTION CAP, WHICH WILL ACCOMMODATE OUR ACCESS COVER 600ACSRA, WHICH FITS DIRECTLY INTO THE CAP. THE FRAME HAS THE REQUIRED RESTRICTED ACCESS OF Ø350MM MOULDED INTEGRALLY. THE COVER LOADING IS A15 RATED.

IF REQUIRED A B125 LOADING ACCESS COVER CAN BE PROVIDED 600ACB125. PLEASE NOTE: THIS NEEDS TO BE INSTALLED INTO A CONCRETE PLINTH (SEE DETAIL BELOW).



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TURTLE ENVIRO

ACCESSO DRAINAGE SYSTEMS

DRAWN BY	A.T
CHANGE DATE	4/2/2022
APPROVED BY	D.A
APPROVED DATE	4/2/2022

CONTRACT

PRODUCT DESCRIPTION: BLUE RANGE 600 SERIES - CATCHPITS

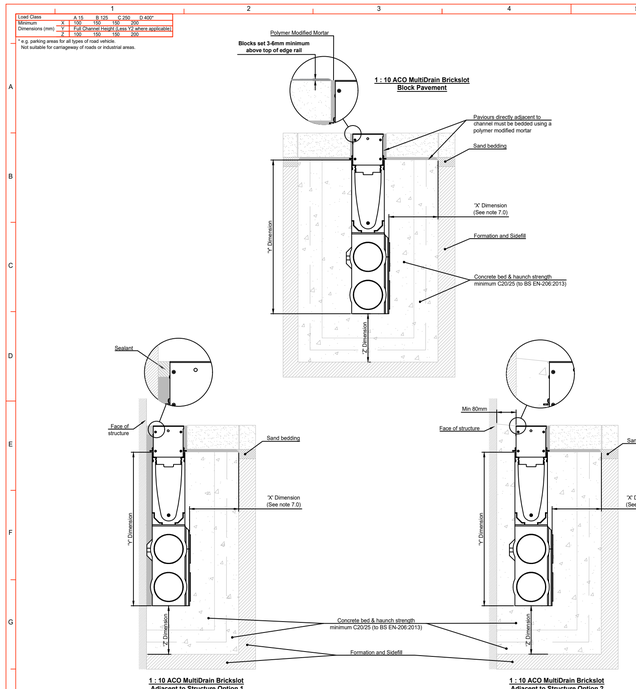
PRODUCT/CODE: ACCP6000CB150D

SCALE: | SHEET/SIZE: A4 | REV: 1

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1 : 10 ACO MultiDrain Brickslot Block Pavement

1 : 10 ACO MultiDrain Brickslot Adjacent to Structure Option 1

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Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

Version	Date	Description	Name
D	28.6.2016	Updated title block	TS
C	15.6.2016	Revised to comments 15/03/16	TS
B	2.3.2016	Revised grating detail	TS

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Tel: 01462 816666
www.aco.co.uk

Created by: IM	Released by: TS	Drawing Number: 22123	Revision: D
Created at: 4.2.2016	Released at: 28.6.2016	Title: ACO MULTIDRAIN M100D/DS UNIVERSAL SUMP BRICKSLOT INSTALLATION DETAIL DRAWING	
Replacement for: E1-E01-031-3	Replaced by:	Projection: ISO-A	Units: mm / Format: A3 / Scale: 1 : 10 / Sheet: 1 of 1

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REV.	DATE	DETAILS	DRN.	CHK.
P01	22.11.24	FIRST ISSUE	ARJ	PAW

DRAWING STATUS
PRELIMINARY

RIBA STAGE
STAGE 4

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN ARJ	DATE NOV 24	SCALES AS SHOWN
CHECKED PAW	DATE NOV 24	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
APPRVD. JAS	DATE NOV 24	EMAIL FOR DRAWINGS info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
FW & SW DRAINAGE CONSTRUCTION DETAILS SHEET 4

DRAWING No.: RDB/ROC/2B/XX/DR/C/83/0504

REV.: P01

4328

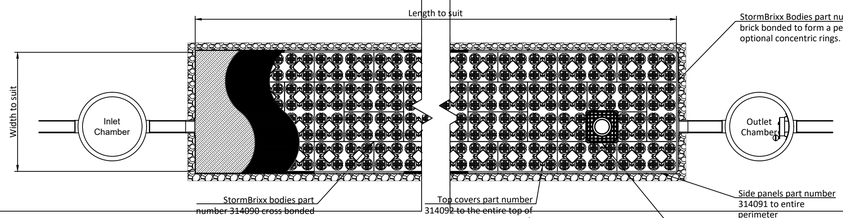
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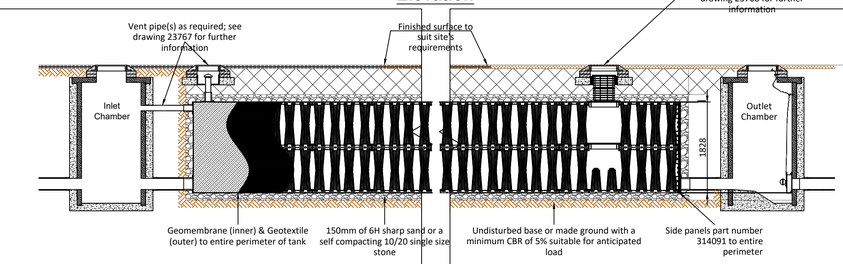
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Plan



Elevation



Version	Date	Description	Name
B	30/01/19	Revised Side Panel Layout	P.J

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Shefford
Bedfordshire
SG17 5TE, UK
Tel: 01462 816666
www.aco.co.uk

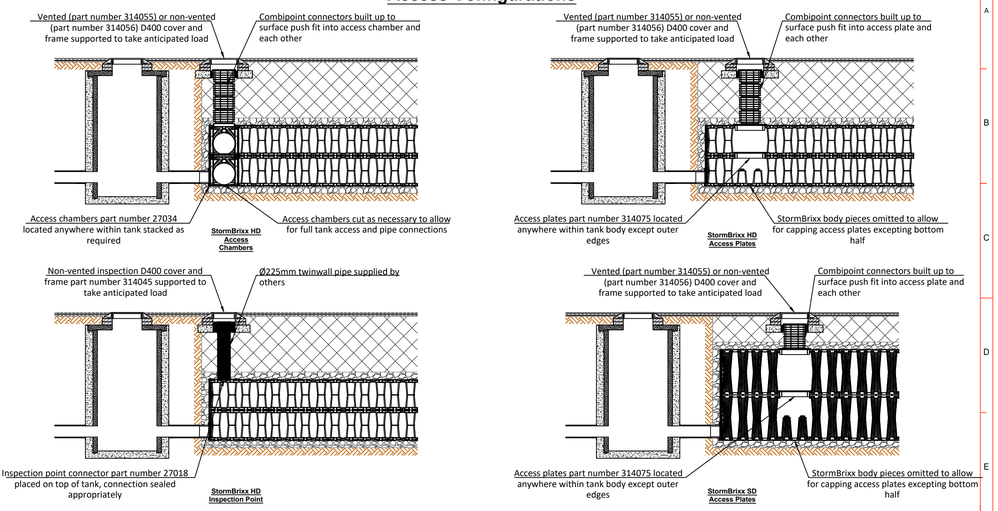
Drawing Number: 23764 — Revision: A

Title: ACO StormBrixx SD Attenuation 2 Layer Tank Installation Detail Drawing

Created by: P.J	Released by: L.D	Projection: ISO-A	Format: A3
Created at: 25/10/17	Released at: 25/10/17	Units: mm	Scale: 1 : 50
Replacement for: -	Replaced by: -		Sheet: 1 of 1

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Access Configurations



Version	Date	Description	Name
A	25/10/17	Initial Issue	P.J

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ACO Business Park
Hitchin Road
Shefford
Bedfordshire
SG17 5TE, UK
Tel: 01462 816666
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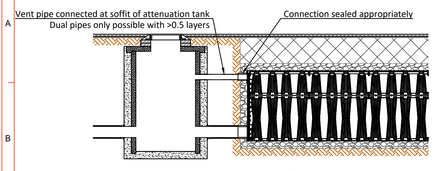
Drawing Number: 23768 — Revision: A

Title: ACO StormBrixx Typical Access Detail Installation Detail Drawing

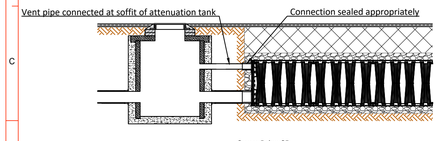
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Created at: 25/10/17	Released at: 25/10/17	Units: mm	Scale: 1 : 5
Replacement for: -	Replaced by: -		Sheet: 1 of 1

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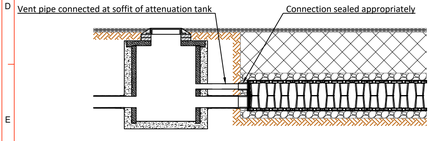
Vent Returning to Manhole



StormBrixx SD with Half Layer

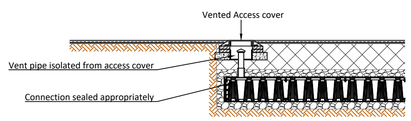


StormBrixx SD

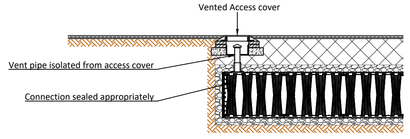


StormBrixx HD

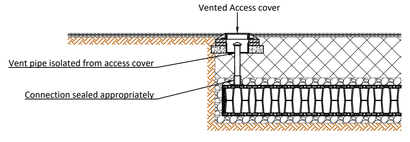
Vertical Vent



StormBrixx SD Half Layer



StormBrixx SD



StormBrixx HD

Version	Date	Description	Name
B	13/02/19	SD Half Layer added, layout changed	P.J

ACO Technologies plc
ACO Business Park
Hitchin Road
Shefford
Bedfordshire
SG17 5TE, UK
Tel: 01462 816666
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Drawing Number: 23767 — Revision: B

Title: ACO StormBrixx Typical Vent Detail Installation Detail Drawing

Created by: P.J	Released by: L.D	Projection: ISO-A	Format: A3
Created at: 25/10/17	Released at: 25/10/17	Units: mm	Scale: 1 : 30
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P01	22.11.24	FIRST ISSUE	ARJ	PAW

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STAGE 4

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DRAWN ARJ	DATE NOV 24	SCALES AS SHOWN
CHECKED PAW	DATE NOV 24	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
APPRVD. JAS	DATE NOV 24	EMAIL FOR DRAWINGS info@rocconsulting.com

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PROJECT TITLE
PLOTS NT02, NT03 & NT04
NORTHERN GATEWAY

DRAWING TITLE
FW & SW DRAINAGE
CONSTRUCTION DETAILS
SHEET 5

DRAWING No.
RDB/ROC/2B/XX/DR/C/83/0505

REV.
P01

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APPENDIX O – S104 Drawings

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10. ACCESS COVERS AND FRAMES SHALL COMPLY WITH THE LOADINGS SPECIFIED AND TO BS EN 124
11. THE PROPOSED BUILDING LAYOUTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. REFER TO ARCHITECTS PLANS FOR PRECISE LOCATION SETTING OUT INFORMATION AND DETAILS
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RDB-ROC-XX-XX-DR-C-83-0500
Viewport 3

RDB-ROC-XX-XX-DR-C-83-0500
Viewport 2

RDB-ROC-XX-XX-DR-C-83-0500
Viewport 1

- PLANNING BOUNDARY
- NT02 BOUNDARY
- EXISTING COMBINED SEWER
- SURFACE WATER DRAIN
- FOUL WATER DRAIN
- S104 SW SEWER & MANHOLE
- S104 FW SEWER & MANHOLE

REV.	DATE	DETAILS	DRN.	CHK.
P01	12/09/25	FIRST ISSUE	ARJ	PAW

DRAWING STATUS
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DRAWN	DATE	SCALES
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CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE –DO NOT SCALE–
PAW	SEP 25	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JAS	SEP 25	info@rocconsulting.com

CLIENT
FAR EAST CONSORTIUM INTERNATIONAL LTD

PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
SURFACE WATER DRAINAGE
S104 LOCATION PLAN
DANTZIC STREET

DRAWING No. RDB/ROC/XX/XX/DR/C/83/0500
REV. P01

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PLANNING BOUNDARY
NT02 BOUNDARY
EXISTING COMBINED SEWER
SURFACE WATER DRAIN
FOUL WATER DRAIN
S104 SW SEWER & MANHOLE
S104 FW SEWER & MANHOLE

S104 General Arrangement - Viewport 1

Scale 1:200

S5.04 CL 30.55 IL 29.00
S12.006 150Ø 1:29
OV CL 32.73 IL (TBC)
S5.03 CL 32.97 IL 30.66
480x630 BR CWS
DALTON STREET
bd 31.60
12.005 150Ø 1:13
S5.01 CL 35.30 IL 33.93
480x630 BR CWS
225Ø VC CWS
1500Ø BR CWS
7503 CL 30.16 IL 25.00
480x630 BR CWS
300Ø VC CWS
S12.007 150Ø 1:100
1550Ø BR CWS
S14.002 150Ø 1:105
S5.02 CL 33.05 IL 30.72
12.004 150Ø 1:100
S5.00 CL 36.00 IL 34.02
SURFACE WATER DEMARCATION CHAMBER AT SITE BOUNDARY
SURFACE WATER DEMARCATION CHAMBER AT SITE BOUNDARY

S104 General Arrangement - Viewport 2

Scale 1:200

3600 VC CWS
S5.08 CL 31.25 IL 27.68
S12.009 225Ø 1:150
S5.07 CL 31.55 IL 28.17
300Ø VC CWS
S12.008 225Ø 1:150
S5.06 CL 31.15 IL 28.43
S12.007 150Ø 1:100
S1.005 225Ø 1:19
1530Ø BR CWS
6401 CL 31.29 IL 24.77
DANTZIC STREET
1550Ø BR CWS
S16.012 150Ø 1:47
3750 VC CWS
375x475 CWS
F2.16 CL 31.80 IL 26.53
S5.05 CL 31.32 IL 28.74
225Ø 1:120 bd 29.43m
150Ø 1:80 bd 29.39m
PROPOSED OUTFALL FROM PLOTS NT02/NT03. REFER TO ROC DRAWING RDB/ROC/2B/XX/DR/C/83/0500 FOR DETAILS OF ON PLOT DRAINAGE
NEW MANHOLE ON EXISTING PUBLIC COMBINED SEWER. UPSTREAM LENGTH ABANDONED UNDER ENABLING WORKS CONTRACT (AS AGREED WITH UNITED UTILITIES). SUBJECT TO S106 AGREEMENT
7501 CL 31.57 IL 29.36

S104 General Arrangement - Viewport 3

Scale 1:200

INDICATIVE FUTURE CONNECTION FOR PLOTS RB16 AND RB17
OUTFALL POINT TO THE RIVER IRK. PIPE TO PROJECT 75mm PAST FACE OF RIVER WALL. NO FLAP VALVE AS PER ENVIRONMENT AGENCY REQUIREMENTS.
S5.10 CL 29.75 IL 27.40
S1.009 300Ø 1:250
S5.09 CL 30.35 IL 27.50
DANTZIC STREET
S1.008 300Ø 1:250
S5.08 CL 31.25 IL 27.68
S12.009 225Ø 1:150
S1.010 300Ø 1:250
1550Ø BR CWS
5401 CL 30.55 IL 24.70
1530Ø BR CWS
S1.005 225Ø 1:19
S5.11 CL 29.63 IL 27.35
PROPOSED OUTFALL FROM PLOTS NT02/NT03. REFER TO ROC DRAWING RDB/ROC/2B/XX/DR/C/83/0500 FOR DETAILS OF ON PLOT DRAINAGE
NT02 Amenity Club House

REV.	DATE	DETAILS	DRN	CHK
P01	12/09/25	FIRST ISSUE	ARJ	JAS

DRAWING STATUS: PRELIMINARY

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ARJ	SEP 25	1:200
CHECKED PAW	DATE SEP 25	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
APPRVD. JAS	DATE SEP 25	EMAIL FOR DRAWINGS info@rocconsulting.com

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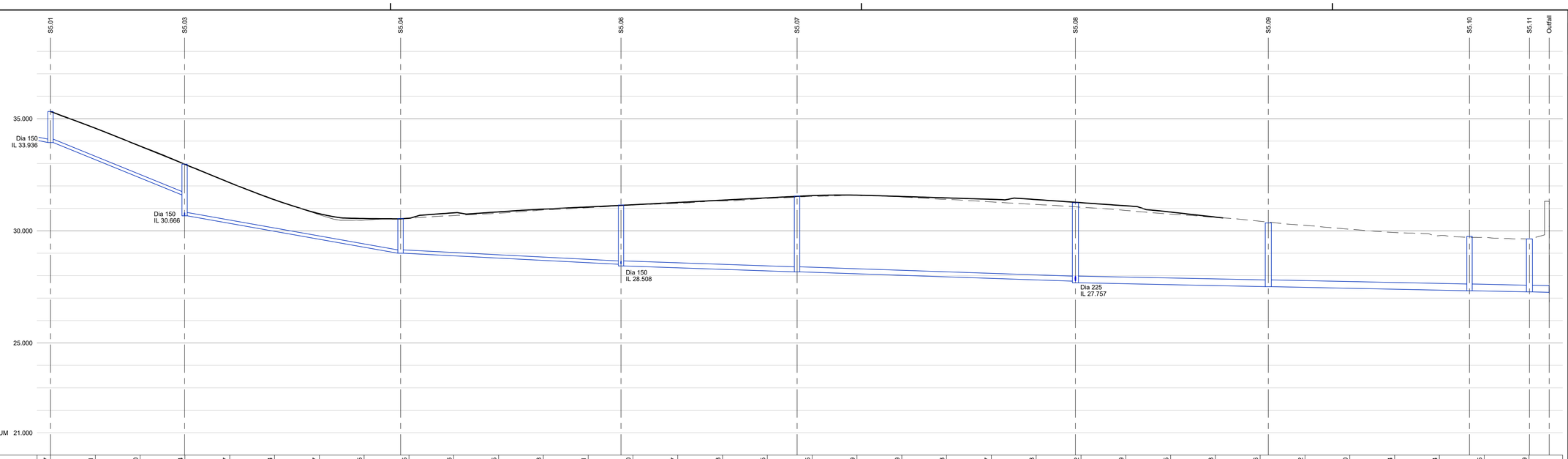
PROJECT TITLE: REDBANK DEVELOPMENT

DRAWING TITLE: SURFACE WATER DRAINAGE
S104 GENERAL ARRANGEMENT
DANTZIC STREET

DRAWING No.	REV.
RDB/ROC/XX/XX/DR/C/83/0500	P01

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	S5.01			S5.03			S5.04			S5.06			S5.07			S5.08			S5.09			S5.10		S5.11	Outfall
GROUND LEVEL	35.307	34.581	33.790	32.974	32.137	31.394	30.717	30.475	30.555	30.676	30.785	30.928	31.031	31.170	31.227	31.333	31.445	31.535	31.579	31.509	31.403	31.287	31.173	31.052	30.909	30.745	30.603	30.426	30.242	30.070	29.924	29.784	29.705	29.639	
COVER LEVEL	35.307			32.974				30.550						31.150				31.550						31.250				30.350					29.750	29.639	
INVERT LEVEL	33.936			31.600	30.666			29.000	29.000					28.508	28.433			28.171	28.171					27.757	27.682			27.510	27.510				27.330	27.330	27.276	27.276	27.258
PIPE DETAILS	Pipe 12.005 150Ø Class S CLAY 1 in 13				Pipe 12.006 150Ø Class S CLAY 1 in 29				Pipe 12.007 150Ø Class S CLAY 1 in 100					Pipe 12.008 225Ø Class S CLAY 1 in 150				Pipe 12.009 225Ø Class S CLAY 1 in 150							Pipe 1.008 300Ø Class S CLAY 1 in 250				Pipe 1.009 300Ø Class S CLAY 1 in 249						Pipe 1.010 300Ø Class S CLAY 1 in 248		1.011 300Ø Class S CLAY 1:245
PIPE LENGTH	29.926				48.209				49.196					39.301				62.129						43.052				44.900					13.385		4.402	

MANHOLE SCHEDULE
Sheet 1 of 2

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
S5.00	36.000	1	12.003	34.020	150	450	D	D400
E. 384799.428	1.830	0	12.004	34.020	150			
N. 399511.041								
S5.01	35.307	1	12.004	33.936	150	1200	C	D400
E. 384800.472	1.221	0	12.005	33.936	150			
N. 399519.424								
S5.02	33.050	1	14.001	30.724	150	450	D	D400
E. 384769.988	2.176	0	14.002	30.724	150			
N. 399520.045								
S5.03	32.974	1	14.002	30.666	150	1200	B	D400
E. 384771.282	2.158	2	12.005	31.600	150			
N. 399526.021		0	12.006	30.666	150			
S5.04	30.550	1	12.006	29.000	150	1200	B	D400
E. 384724.098	1.400	0	12.007	29.000	150			
N. 399535.909								
S5.05	31.320	1	16.011	28.746	150	600	D	D400
E. 384685.695	2.424	0	16.012	28.746	150			
N. 399503.591								

MANHOLE SCHEDULE
Sheet 2 of 2

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
S5.06	31.150	2	16.012	28.508	150	1200	B	D400
E. 384680.271	2.492	1	12.007	28.508	150			
N. 399513.561		0	12.008	28.433	225			
S5.07	31.550	1	12.008	28.171	225	1200	A	D400
E. 384645.762	3.154	0	12.009	28.171	225			
N. 399494.752								
S5.08	31.250	2	1.007	27.757	225	1350	A	D400
E. 384591.210	3.268	1	12.009	27.757	225			
N. 399465.019		0	1.008	27.682	300			
S5.09	30.350	1	1.008	27.510	300	1350	B	D400
E. 384553.441	2.540	0	1.009	27.510	300			
N. 399444.356								
S5.10	29.750	1	1.009	27.330	300	1200	B	D400
E. 384514.464	2.120	0	1.010	27.330	300			
N. 399422.066								
S5.11	29.639	1	1.010	27.276	300	1350	B	D400
E. 384506.391	2.063	0	1.011	27.276	300			
N. 399411.390								

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KEY:

- EXISTING GROUND PROFILE
- PROPOSED GROUND PROFILE

REV.	DATE	DETAILS	DRN.	CHK.
P01	12/09/25	FIRST ISSUE	ARJ	JAS

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STAGE 4

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JAS	SEP 25	info@rocconsulting.com

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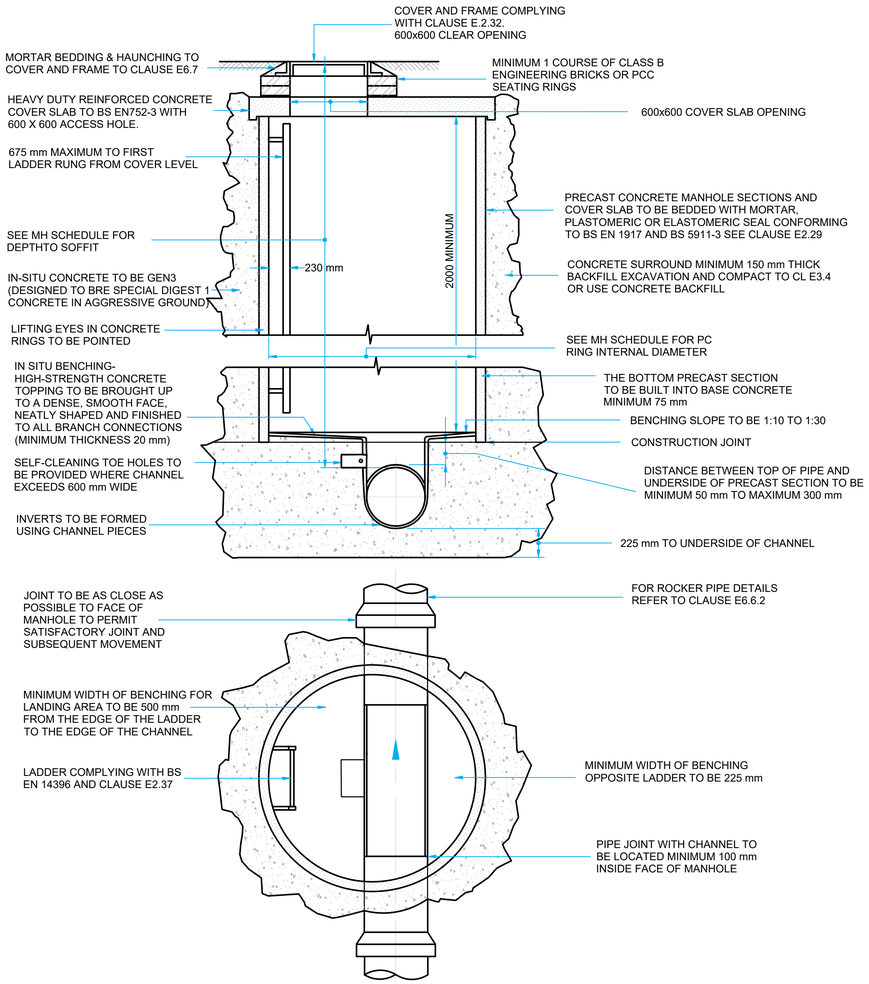
PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
SURFACE WATER DRAINAGE
S104 LONG SECTION & SCHEDULE
DANTZIC STREET

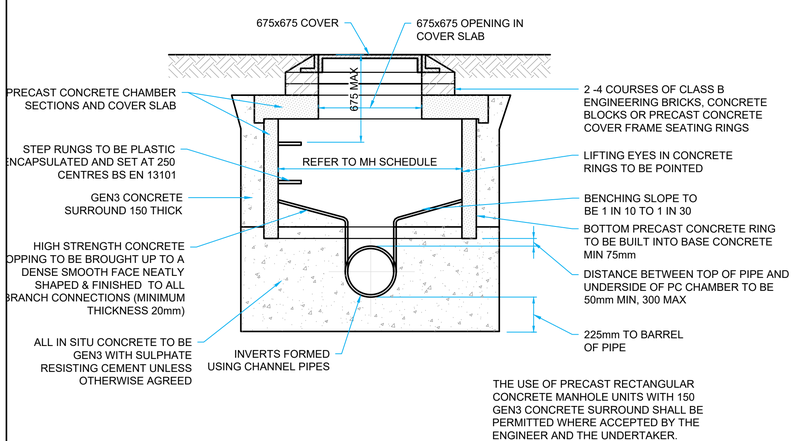
DRAWING No.	REV.
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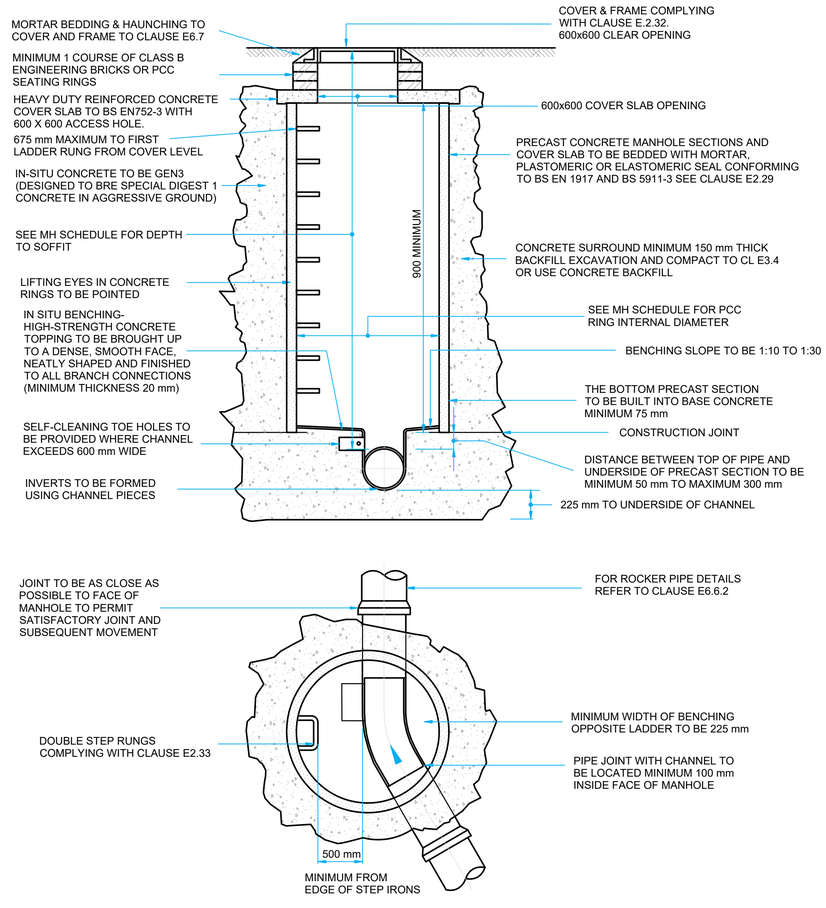


TYPICAL MANHOLE DETAIL - TYPE A
(DEPTH TO SOFFIT 3m - 6m)
SCALE - NTS

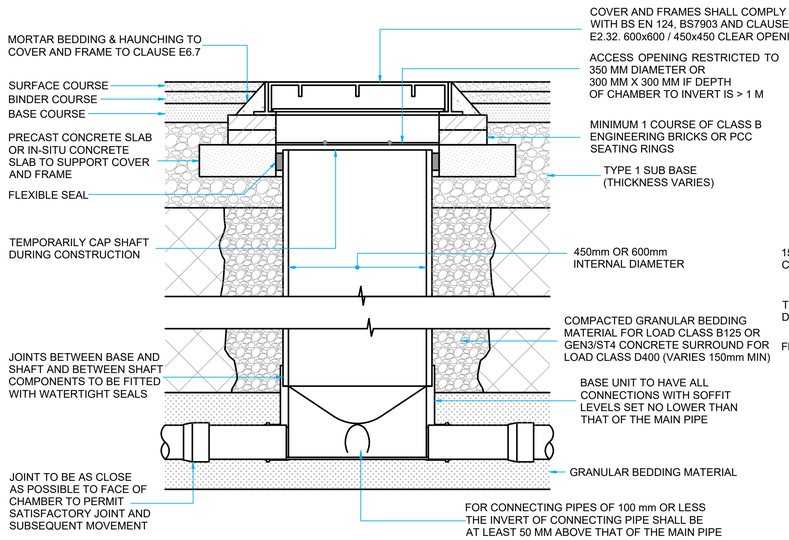


THE USE OF PRECAST RECTANGULAR CONCRETE MANHOLE UNITS WITH 150 GEN3 CONCRETE SURROUND SHALL BE PERMITTED WHERE ACCEPTED BY THE ENGINEER AND THE UNDERTAKER.

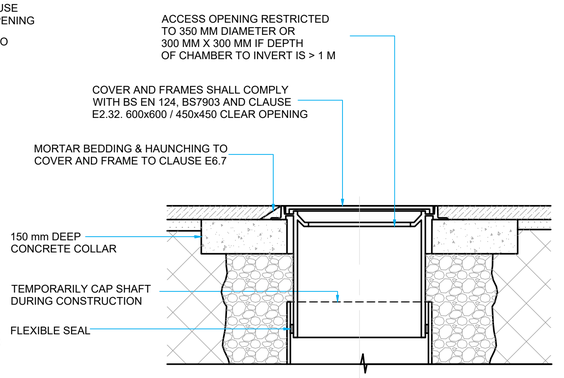
MANHOLE DETAIL - TYPE C
(DEPTH TO SOFFIT 1.0m - 1.5m)
SCALE - NTS



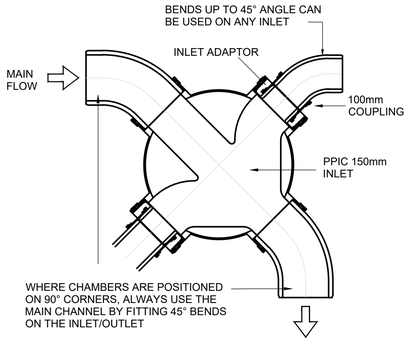
TYPICAL MANHOLE DETAIL - TYPE B
(DEPTH TO SOFFIT 1.5 - 3m)
SCALE - NTS

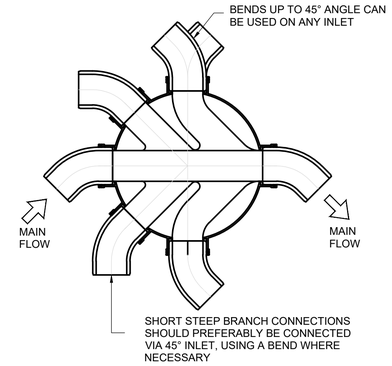


INSPECTION CHAMBER DETAIL - TYPE D
450Ø & 600Ø (DEPTH TO SOFFIT 3m)
D400 COVER
SCALE - NTS



INSPECTION CHAMBER DETAIL - TYPE D
B125 COVER
SCALE - NTS





PPIC
BASE DETAIL
SCALE - NTS

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REV.	DATE	DETAILS	DRN.	CHK.
P01	12/09/25	FIRST ISSUE	ARJ	PAW

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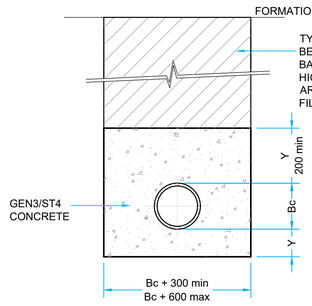
PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
SURFACE WATER DRAINAGE
S104 CONSTRUCTION DETAILS
SHEET 1

DRAWING No.	REV.
RDB/ROC/XX/XX/DR/C/83/0503	P01

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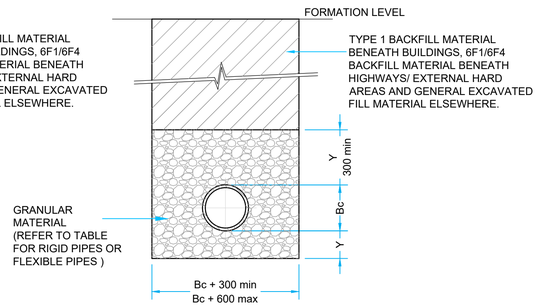
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TO BE USED WHERE COVER TO PIPE IS:
1. LESS THAN 1.2m IN TRAFFICKED AREAS
2. LESS THAN 0.90m IN FIELDS
3. LESS THAN 0.6m IN LANDSCAPED AREAS
4. LESS THAN 0.3m BENEATH BUILDING SLABS

CLASS Z BEDDING DETAIL

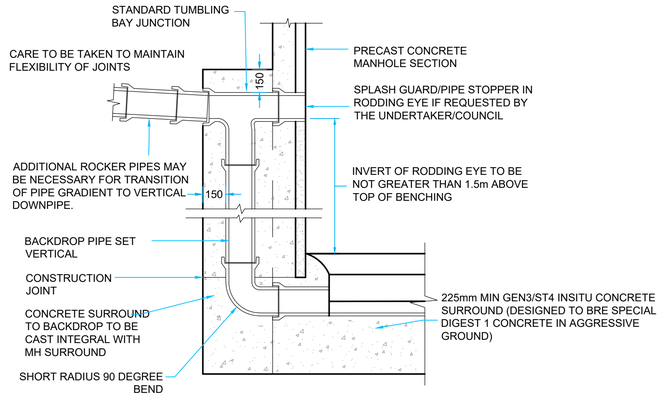
Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN)
BC = OUTSIDE PIPE DIAMETER



CLASS S BEDDING DETAIL

Y VALUE: HARD SPOTS/IRREGULAR TRENCH BOTTOM BC/4 (200mm MIN), EVEN TRENCH BOTTOM BC/6 (100mm MIN).
BC = OUTSIDE PIPE DIAMETER

TRENCH WIDTHS	
PIPE Ø	OVERALL TRENCH WIDTH
100	550
150	600
225	700
300	850
375	1050
450	1150
525	1200
600	1350
675	1450
750	1500
825	1600
900	1900
1050	2100
1200	2300
1350	2500
1500	2700
1800	3100



TYPICAL VERTICAL BACKDROP DETAIL

NOTE : WHERE THE DROP IS NOT EXCESSIVE A 45° DROP PIPE MAY BE USED

SEWER DIAMETER (mm)	DROP SHAFT DIAMETER (mm)
225-300	225
375	300
450	375
525-600	450
675	525
750-900	600

THE CONNECTION AT THE BOTTOM OF THE BACKDROP IS TO BE MADE AT SOFFIT LEVEL IN MANHOLES MAX. PIPE SIZE 825mm AND AT SPRINGING LEVEL IN MANHOLES PIPE SIZE 900 TO 1500mm

VERTICAL RODDING EYE MAY BE REQUIRED IN SITUATIONS WHERE BLOCKAGES ARE HIGH RISK.
THE TUMBLING BAY SHALL BE BUILT INTO THE MANHOLE CHAMBER BELOW ANY REUCING SLAB

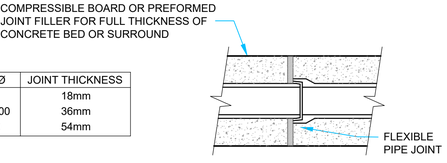
BS EN 1610:1998 ANNEX B TABLE B.15 COARSE AGGREGATE - PIPE BEDDING							
SIEVE SIZE (mm)	PERCENTAGE BY MASS PASSING BS SIEVES FOR NOMINAL SIZES						
	GRADED AGGREGATE (mm)			SINGLE-SIZED AGGREGATE (mm)			
	40 to 5	20 to 5	14 to 5	40	20	14	10
50.0	100	-----	-----	100	-----	-----	-----
37.5	90 - 100	100	-----	85 - 100	100	-----	-----
20.0	35 - 70	90 - 100	100	0 - 25	85 - 100	100	-----
14.0	-----	-----	90 - 100	-----	-----	85 - 100	100
10.0	10 - 40	30 - 60	50 - 85	0 - 5	0 - 25	0 - 50	85 - 100
5.0	0 - 5	0 - 10	0 - 10	-----	0 - 5	0 - 10	0 - 25
2.36	-----	-----	-----	-----	-----	-----	0 - 5

RIGID PIPES BEDDING GRADING

FOR RIGID PIPES THE BEDDING SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5mm UP TO A MAX SIZE OF 10mm FOR 100mm PIPES; 14mm FOR 150mm PIPES; 20mm FOR 225mm TO 600mm PIPES; 40mm FOR OVER 600mm PIPES

BS EN 13242, COARSE AGGREGATE (CLAUSE 4.3.2)		
CATEGORY FOR GENERAL GRADING REQUIREMENTS	Gc80-20	
CATEGORY FOR TOLERANCES AT MID-SIZE SIEVES	GTnr (NO REQUIREMENTS)	
CATEGORY PF MAXIMUM VALUES OF FINES CONTENTS	GRAVEL - F1.5 CRUSHED ROCK, RECYCLED AGGREGATE - F4	
NOMINAL PIPE DIAMETER, mm	AGGREGATE SIZE, mm	
	GRADED	SINGLE SIZED
NOT EXCEEDING 140	-	4/10
EXCEEDING 140 BUT NOT EXCEEDING 400	2/14 or 4/20	4/10, 6/14 or 10/20
EXCEEDING 400	2/14, 4/20 or 4/40	4/10, 6/14, 10/20 or 20/40

FLEXIBLE PIPE BEDDING, HAUNCHING AND SURROUND MATERIAL



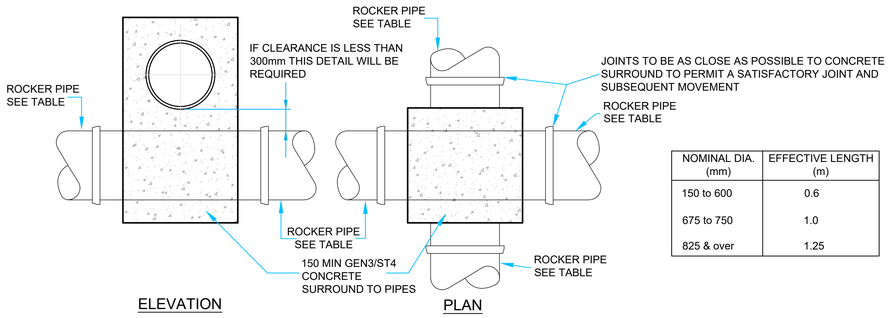
PIPE Ø	JOINT THICKNESS
< 450	18mm
450 - 1200	36mm
>1200	54mm

COMPRESSIBLE FILLER TABLE

(BITUMEN IMPREGNATED INSULATING BOARD TO BS EN 622-1 AND BS EN 622-4)

JOINTS FOR CONCRETE SURROUND TO PIPES

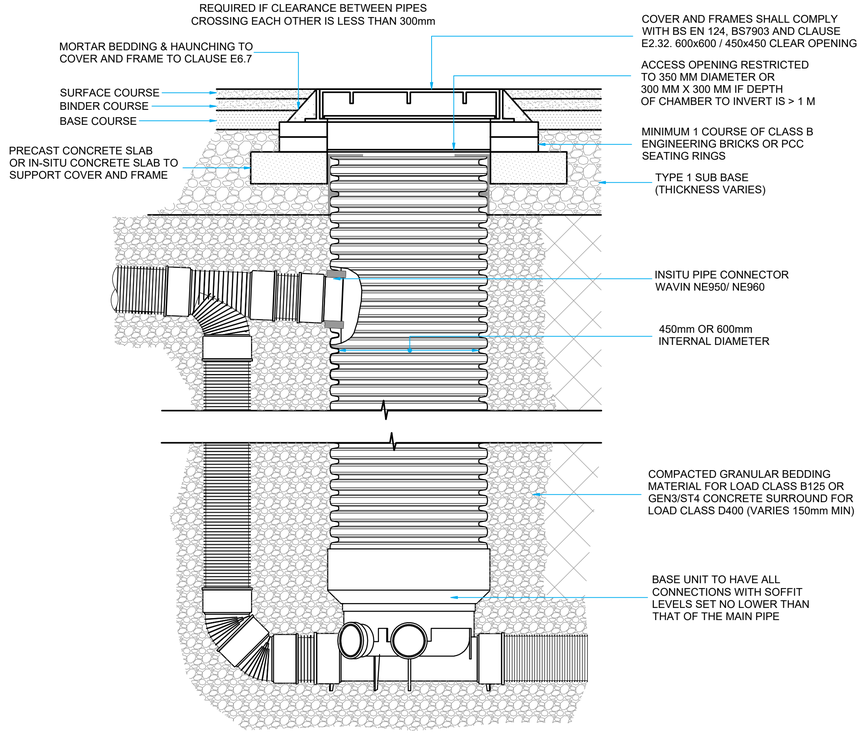
(AT EACH PIPE JOINT)



NOMINAL DIA. (mm)	EFFECTIVE LENGTH (m)
150 to 600	0.6
675 to 750	1.0
825 & over	1.25

SPECIAL PIPE CROSSOVER DETAIL

REQUIRED IF CLEARANCE BETWEEN PIPES CROSSING EACH OTHER IS LESS THAN 300mm



INSPECTION CHAMBER BACKDROP DETAIL - TYPE D
450Ø & 600Ø (DEPTH TO SOFFIT 3m)
D400 COVER

SCALE - NTS

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PROJECT TITLE
REDBANK DEVELOPMENT

DRAWING TITLE
SURFACE WATER DRAINAGE
S104 CONSTRUCTION DETAILS
SHEET 2

DRAWING No. RDB/ROC/XX/XX/DR/C/83/0504
REV. P01

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APPENDIX P – EA FRAP

APPENDIX Q – Maintenance Record

COMPLEX CHALLENGES ...
MADE SIMPLE

Pipework, Access and General Maintenance

Inspection Date:

Pipework and Manhole Access Maintenance	Frequency	Details	Action required	Date completed
Inspection of inlets and outlets. Ensure they are clear and flows are not impeded.	Bi-annually			
Inspection of manholes, gullies, sumps, and channel drains for debris and signs of blockages.	Bi-annually			
Inspection of manhole covers and frames for damage and ensure correctly bolted together.	Bi-annually			
Inspection of water quality. Ensure water quality is free of algae, oils, or odours.	Bi-annually			
Visual inspection for inefficiencies - such as surface water building up at the inlet.	Bi-annually			
Remove litter and debris from gully and channel drain surface.	Bi-annually			
Remove or control tree roots where they are encroaching the sides of the gully	Bi-annually			
Inspection of gully and channel drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage.	Bi-annually			

COMPLEX CHALLENGES ...
MADE SIMPLE

Control Chamber Maintenance

Inspection Date:

Control Chamber Maintenance	Frequency	Details	Action required	Date completed
Inspection of the Vortex Flow Control device to ensure that the outlet is clear and unit is undamaged	Monthly for 6 months after installation then Bi-annually			
Inspection of the Vortex Flow Control By-Pass Penstock to ensure it is operational	Monthly for 6 months after installation then Bi-annually			
Inspection of Orifice Control to ensure hole is clear and undamaged	Monthly for 6 months after installation then Bi-annually			
Inspection of incoming and outgoing pipework for blockages and clear if required.	Monthly for 6 months after installation then Bi-annually			
Remove sediment and debris from control chamber sump	Monthly for 6 months after installation then Bi-annually			

COMPLEX CHALLENGES ...
MADE SIMPLE

Attenuation Tank Maintenance

Inspection Date:

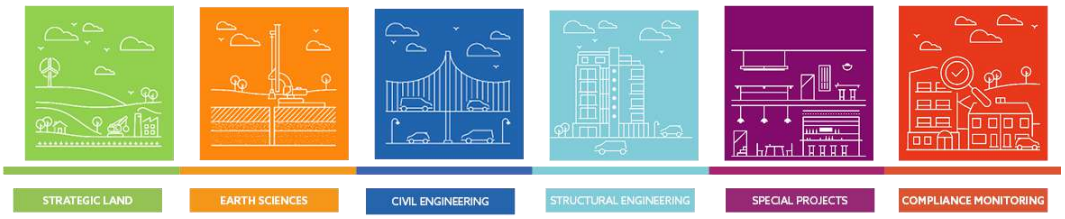
Attenuation Tank Maintenance	Frequency	Details	Action required	Date completed
Inspect and identify any areas that are not operating correctly. IF required, take remedial action	Monthly for 3 months then annually			
Remove debris from the catchment surface (where it has the potential to cause risks to performance)	Monthly			
Remove sediment from upstream/ downstream catchpits/ access points	Annually or as required			
Inspect all inlets, outlets, vents and overflows to ensure they are not blocked/ damaged and are operating as designed	Annually			
Survey inside of tank for sediment build-up and remove as necessary	Every 5 years or as required			

COMPLEX CHALLENGES ...
MADE SIMPLE

Permeable Paving Maintenance

Inspection Date:

Permeable Paving Maintenance	Frequency	Details	Action required	Date completed
Brushing and vacuuming (standard cosmetic sweep across whole surface)	3 times annually or as required			
Inspect for evidence of poor operation and/ or weed growth. If required take remedial action.	3 monthly			
Inspect filter/ under drain via upstream/ downstream inspection chambers & flow control. Remove silt as required	Annually			
Stabilise and mow adjacent landscaped areas.	As required			
Remove weeds or management using proprietary weed killer applied directly	As required			
Remedial works to any depressions, rutting and cracked or broken blocks.	As required			
Replace lost jointing materials	As required			
Rehabilitation of surface and upper sub-structure if performance is significantly reduced.	As required			



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